Module 12: Erosion and Sedimentation Controls
[§§77.458/77.461/77.466/77.525/77.527/77.531/Chapter 102]

12.1 Diversion Controls

Provide a plan for the collection and conveyance to a natural drainageway of the runoff from upslope undisturbed areas. Provide a separate general design for a temporary highwall diversion which limits the amount of runoff which can enter the pit (where applicable). Include design criteria, capacity calculations, profile of proposed channel slopes, typical cross-sections, required channel linings and applicable details on 12.1 Data Sheet.

In the Pit #1 Area an upslope Diversion Ditch (DD-1) will be established above the proposed final highwall and an earthen berm (B-1) will be established at the north end of the mining area. Diversion Ditch DD-1 will outlet to a properly sized riprap apron to promote infiltration and sheet flow of the water collected by DD-1. Earthen berm (B-1) will outlet to collection ditch CD-1. A new diversion ditch DD-2 will be installed near the second set of underground mine entries 5. 6 and 7.

A 12.1 ditch data sheet is included for all installed and proposed diversion ditches and berms along with details for the rip aprons. Many of the diversion controls on this site were installed as a part of the 2011 above ground permit submission and are included herein. See Exhibit 9 for the layout of the E & S Plan and site details.

12.2 Erosion and Sediment Control

Provide a plan for the control of erosion and sedimentation for lands within the permit area to be disturbed by mining activities. Include a narrative describing the implementation of the plan, and detailed design and construction plans and specifications for structures or facilities used in the plan. The plan must include each phase or phases of mining. Include design criteria, capacity calculations, profile of proposed channel slopes, typical cross-sections, required channel linings and applicable details on 12.1 Diversion/Collection Ditch Data Sheet for collection and interceptor ditches. Provide documentation of the capacity of the existing drainage system and the effect proposed mining activities will have on the drainage. Show discharge points to natural drainageways and culverts that intercept upslope drainage or carry drainage away from the site. Show facilities to scale on Modules 9 and 16 as appropriate.

Collection ditch CD-1, as shown on the Operations Map, will be extended into the area being added to the permit and will collect runoff from the entirety of Pit #1. Prior to the start of mining on Pit#2, an earthen berm (B-2) will be constructed along the 100' barrier of UNT E. Collection ditch CD-2 will collect runoff from Pit #2 during its reclamation. While mining Pit #2, runoff water will accumulate in the incised pit and will be pumped to Pond P-1. Culverts C-4 thru C-6 (see table below for specifications) will be installed to carry the flow in CD-2 under various pit roads. Please refer to the Operations Map. CD-2, the earthen berm and culverts C-4, C-5 and C-6 will be removed after the Pit #2 area has been backfilled, topsoiled, planted and meets the successful revegetation standard outlined under 77.618(b). *Collection channels CD-1 and CD-2 are designed to handle over 2.6 cfs/acre and will convey the site runoff water to Sedimentation Pond P-1 for clarification prior to discharge.*

The design drainage area of the existing Sedimentation Pond P-1 (see design of pages 13-5 and 13-6) has been expanded to include additional acreage that will drain to the pond from the Pit #2 area. Presently, the pond is not functioning properly and will have to be reconstructed regardless of the increased drainage. A portion of the Hawkins permit that is located to the east-northeast of the pond has been reclaimed. The toe elevation of this activity is lower than the sedimentation pond and hence the runoff from this area will be controlled by utilizing a super filter fabric fence (see standard construction detail sheet).

The erosion and sedimentation controls along the haul road, Sumps 1 through 6 and Road Ditches RD-1 through RD-7, are constructed and functioning.

Culvert No.	Dia. (inches)	Length (feet)	Invert Elev. (Inlet)	Invert Elev. (Outlet)	Slope (%)	Type
C-4	15	32	100.3	100.0	1.00	SLCPP
C-5	15	60	100.6	100.0	1.00	SLCPP
C-6	18	30	100.3	100.0	1.00	SLCPP

See Exhibit 18 for the proposed final contours.

12.3 Haul Roads

Provide the following information for each haul road to be constructed, reconstructed or used in the operation:

Note: Activities proposed to be conducted under General permit for Temporary Road Crossings (BMR-GP-101) and General Permit for Access Road Crossings (BMR-GP-102) must include a completed Notification Form, with attachments, for the respective General Permit (i.e., Form 5600-FM-MR0054 for BMR-GP-101 and Form 5600-FM-MR0059 for BMR-GP-102). BMR-GP-102 may not be used for haul roads.

a) Location; show on Exhibit 9 (and Exhibit 18 if road will remain as part of postmining land use);

The haul road location will not change from its present constructed location under the Neiswonger Construction, Inc. Maggie Lynn SMP #63100401.

The haul road enters the site from Morey Road, SR 2041, and proceeds west to the mining area.

b) Description and typical cross-sections showing the construction of the haul road including existing ground, grades, slopes, culvert locations, outlet protection and other drainage control;

The haul road will be crowned and maintained with a minimum 6" of durable crushed stone, neither erodible nor tending to produce toxic discharge. The material will prevent mud from being carried onto the public road. The slopes of the haul road will not exceed 10%.

Culverts C-1 thru C-3 are in place and functioning to carry the uncontaminated upslope surface runoff under the haul road to below the road embankment. The rock aprons are installed at the outlet of the culverts as per the details.

Roadside sumps 1 thru 6 are installed and roadside ditches RD-1 thru RD-7 are constructed to divert haul road runoff to the roadside sumps.

c) Measures to control and prevent erosion and sedimentation; include proposed spacing of sediment traps, turnouts, culverts, check dams, etc.

E & S measures to control runoff from the haul road include:

1. Use of crushed non-toxic stone on the first 100' of the haul road, adjacent to Morey Road, SR 2041, where access to the site is gained. This will help prevent erosion and dirt build-up on the public road.

2. The use of sumps and energy dissipaters prior to discharge to natural drainageways.

3. The use of super filter fence and filter fence, installed downslope of the road fill areas, during road construction.

d) Plan for reclamation after mining is completed;

The haul road and associated E&S controls will remain following mining. See Exhibit 18. A copy of the landowner request to allow the haul road to remain after mining is attached on in Module 10. The original is on file under SMP #63100401.

e) If the haul road involves the crossing of any intermittent or perennial stream or wetland include Module 14 Streams/Wetlands;

Please refer to Module 14.1.

f) Will a PennDOT highway occupancy permit be needed? ☒ Yes ☐ No

If yes, PennDOT Occupancy Permit number must be submitted prior to permit activation.
PennDOT occupancy permit was submitted with the original application.

Please see attached PennDOT HOP approval letter.

M-945P (1-97)

959661

COMMONWEALTH OF PENNSYLVANIA

PENNDOT

HIGHWAY OCCUPANCY PERMIT

PERMIT NO.	12033343
ORGANIZATION	124
DATE ISSUED	121310
PERMIT FEES	50.00
ACCOUNT NO.	
COUNTY	62
TOWNSHIP/BORO	412

1

DESCRIPTION	521	
STATE ROUTE NO.	2041	
SEGMENT(S)	0050	0050
OFFSET TO OFFSET	2328	2378

2

DESCRIPTION		
STATE ROUTE NO.		
SEGMENT(S)		
OFFSET TO OFFSET		

3

DESCRIPTION		
STATE ROUTE NO.		
SEGMENT(S)		
OFFSET TO OFFSET		

4

TOWNSHIP/BORO		
DESCRIPTION		
STATE ROUTE NO.		
SEGMENT(S)		
OFFSET TO OFFSET		

PERMITTEE
JOHN ALAN & STACY A. KOSKY

ADDRESS
P O BOX 136

POST OFFICE
CUDDY

ZIP CODE
PA 15631-

COUNTY WASHINGTON

TOWNSHIP/BORO DEEMSTON

BOND/AGREEMENT NUMBER

ALL WORK UNDER THIS PERMIT MAY BE STARTED ON 12/13/10

AND SHALL BE COMPLETED ON OR BEFORE 12/13/11

Immediately upon completion of the work, Permittee shall notify the permit office where application was made. Subject to all the conditions, restrictions, and regulations prescribed by the Pennsylvania Department of Transportation, (see in particular 67 Pa. Code, Chapter 203/212, 441 and 459) and subject to the plans, special conditions, or restrictions herein set forth or attached hereto. This permit shall be located at the work site and shall be available for inspection by any police officer or department representative.

DESCRIPTION OF WORK

INSTALL LOW VOLUME DRIVEWAY AT
SR 2041 SEG 0050 OFFSET 2378 TO SEG 0050 OFFSET 2370
ALL DISTURBED AREAS OUTSIDE THE PVMT OR SHOULDER SHALL BE RESTORED TO A CONDITION AT LEAST = TO THAT WHICH EXISTED B4 THE START OF WORK.
IT IS THE PERMITTEE'S RESPONSIBILITY TO KEEP VEGETATION TRIMMED IN ORDER TO MAINTAIN MINIMUM SIGHT DISTANCE. NO OBJECTS MAY BE PLACED WITHIN THE LINE OF SIGHT.
PERMITTEE MUST MAINTAIN ACCESS FROM THE PAVEMENT EDGE TO AT LEAST 20 FEET OUTSIDE THE HIGHWAY RIGHT OF WAY.
PERMITTEE IS RESPONSIBLE FOR ENSURING THAT MUD, SILT AND OTHER DEBRIS IS REMOVED FROM VEHICLES AND TIRES (BY POWER WASH, ETC.) BEFORE ENTERING ONTO THE HIGHWAY.
MINIMUM WORK ZONE TRAFFIC CONTROL TO BE IN ACCORDANCE WITH PUB. 213, FIGURE(S): 5, 10A. SEE PUB 212 FOR ADDL. DETAILS.
APP #169133 CK #000294 APVD BY FUDALA ON 12/06/10
X
X
X
X
X
X
X

THIS PERMIT IS NOT VALID UNTIL SIGNED BY THE DISTRICT ENGINEER OR HIS AUTHORIZED REPRESENTATIVE

Acknowledgement of Completion

Permitted work has been completed.

Date _____ By _____

David K Hewitt

ALLEN D. BIEHLER, P.E.
Secretary of Transportation

JOSEPH SZCZUR, P.E.
District Executive

DISTRICT PERMIT OFFICE

Ditch and Berm Calculation Methods

Collection Ditches, Diversion Ditches and the Earthen Berms are sized using the module 12.1 Diversion/Collection ditch data sheets. The internal formulas of the excel ditch design sheets come from the Engineering Manual for Mining Operations. The specification of the data sheet is also placed in the Worksheet 11 from the PA DEP Erosion and Sedimentation Control Manual (E&S Manual). All of which are shown in module 12.

The surface runoff for each collection channel is determined using methodology in the US Soil Conservation Service Field Manual. The "Peak Rates of Discharge" for steep runoff chart is shown on the following page. The example shown on the type II storm distribution chart is given for collection channel, CD-1b of the Maggie Lynn Quarry site, which has been determined to have at contributory acreage of 36.9 Acres. The intersection of the line at 36.9 acres goes to a Cn location of 85. That intersects with a peak discharge of 48. The peak discharge is increased by a runoff multiplier. This is determined by the sheet shown as page 12-5.

The rainfall depth for the selected runoff curve number is 3.35. This is the 10-year storm event given on Table 5.1 "Pennsylvania rainfall by county", for Washington County on page 109 of the E&S Manual. Interpolating between numbers highlighted in yellow gives a multiplier of 1.89. This is shown on page 12-6.

The total runoff capacity required for Collection Ditch CD-1b, is 48 x 1.89 = 90.7 cfs. All the peak discharges for the collection channels, diversion ditches and earthen berms have been determined using this methodology.

The shear stresses calculated for the earthen berm (B-1) shows very high shears stresses. This is expected as the slope of that berm is given as a maximum of 78.3%. The two sections of that berm show a calculated design shear stress of 11.79 lb/ft^2 and 24.43 lb/ft^2. This is high, but it is also determined that it is not an issue. Using the methodology outlined on page 141 of the PA DEP Erosion and Sedimentation control Manual. If a 40% void space within the 18" R-4 Riprap is assumed the 0.7' flow of the earthen berm is completely consumed within the void space and no visible flow runs above the R-4 rip rap. As a result, the shear stress on the surface of the lining of the riprap doesn't exist and is not an issue.

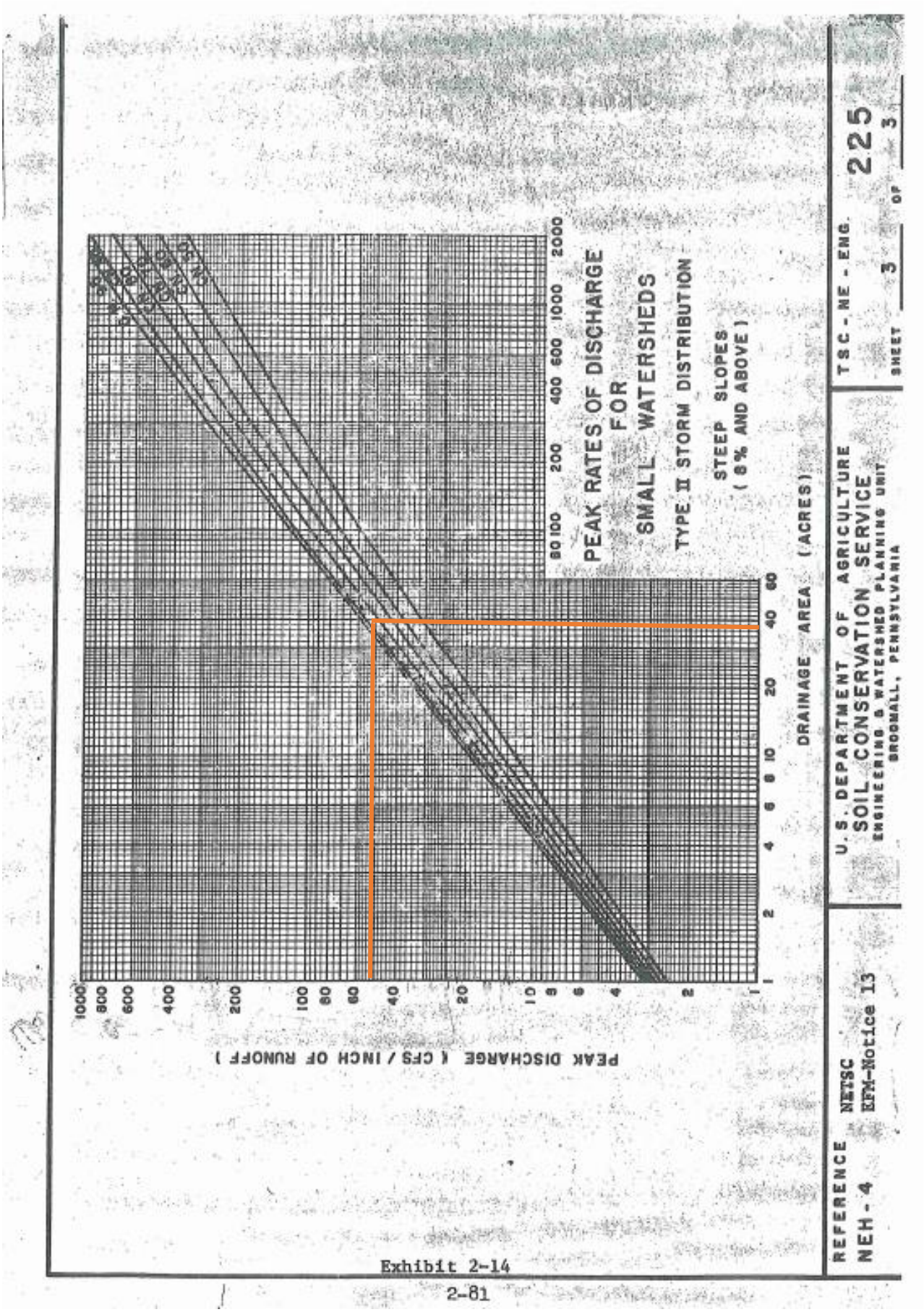


Exhibit 2-14

2-81

5D
2-85.9

RAINFALL-RUNOFF DEPTHS FOR SELECTED RUNOFF CURVE NUMBERS

Inches \ Tenths	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.06	0.09
1	0.13	0.17	0.22	0.27	0.32	0.38	0.44	0.50	0.56	0.63
2	0.70	0.76	0.83	0.91	0.98	1.06	1.13	1.21	1.29	1.37
3	1.45	1.53	1.61	1.69	1.77	1.86	1.94	2.03	2.11	2.20
4	2.29	2.37	2.46	2.55	2.64	2.73	2.82	2.91	3.00	3.08
5	3.17	3.26	3.35	3.45	3.54	3.63	3.72	3.81	3.90	4.00
6	4.09	4.18	4.28	4.37	4.46	4.55	4.65	4.74	4.84	4.93
7	5.02	5.12	5.21	5.31	5.40	5.50	5.60	5.69	5.78	5.88
8	5.98	6.07	6.17	6.26	6.36	6.45	6.55	6.65	6.74	6.84
9	6.93	7.03	7.13	7.22	7.32	7.42	7.51	7.61	7.71	7.80
10	7.90	8.00	8.09	8.19	8.29	8.39	8.48	8.58	8.68	8.77
11	8.87	8.97	9.07	9.16	9.26	9.36	9.46	9.56	9.65	9.75
12	9.85	9.94	10.04	10.14	10.24	10.34	10.44	10.53	10.63	10.73
0	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.05	0.08	0.11
1	0.15	0.20	0.25	0.30	0.35	0.41	0.48	0.54	0.61	0.68
2	0.74	0.82	0.89	0.97	1.04	1.12	1.20	1.28	1.36	1.44
3	1.52	1.60	1.68	1.77	1.85	1.94	2.03	2.11	2.20	2.29
4	2.37	2.46	2.55	2.64	2.73	2.82	2.91	3.00	3.09	3.18
5	3.27	3.37	3.46	3.55	3.64	3.73	3.82	3.92	4.01	4.11
6	4.20	4.29	4.39	4.48	4.58	4.67	4.76	4.86	4.95	5.05
7	5.14	5.24	5.33	5.43	5.52	5.62	5.71	5.81	5.91	6.00
8	6.10	6.20	6.30	6.39	6.48	6.58	6.68	6.77	6.87	6.97
9	7.06	7.16	7.26	7.35	7.45	7.55	7.65	7.74	7.84	7.94
10	8.03	8.13	8.23	8.33	8.42	8.52	8.61	8.71	8.81	8.91
11	9.01	9.10	9.20	9.30	9.40	9.50	9.60	9.69	9.79	9.89
12	9.99	10.09	10.19	10.28	10.38	10.48	10.57	10.67	10.77	10.87
0	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.06	0.09	0.13
1	0.18	0.22	0.28	0.33	0.39	0.45	0.52	0.59	0.65	0.73
2	0.80	0.87	0.95	1.02	1.10	1.18	1.26	1.34	1.42	1.51
3	1.59	1.68	1.76	1.85	1.93	2.02	2.11	2.20	2.28	2.37
4	2.46	2.55	2.64	2.73	2.82	2.91	3.00	3.09	3.19	3.28
5	3.37	3.47	3.56	3.65	3.74	3.84	3.93	4.03	4.12	4.21
6	4.31	4.40	4.50	4.59	4.69	4.78	4.87	4.97	5.06	5.16
7	5.26	5.35	5.45	5.55	5.64	5.74	5.84	5.93	6.03	6.12
8	6.22	6.32	6.41	6.50	6.60	6.70	6.80	6.90	6.99	7.09
9	7.19	7.28	7.38	7.48	7.57	7.67	7.77	7.87	7.97	8.06
10	8.16	8.26	8.35	8.45	8.55	8.65	8.75	8.84	8.94	9.04
11	9.14	9.24	9.33	9.43	9.53	9.63	9.73	9.82	9.92	10.02
12	10.12	10.22	10.32	10.42	10.51	10.61	10.71	10.81	10.91	11.01

CURVE 83 24

CURVE 84 25

CURVE 85 26

Exhibit 2-7A

REFERENCE
SCS TR-16

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ENGINEERING & WATERSHED PLANNING UNIT
UPPER DARBY, PENNSYLVANIA

RTSC-NE-ENG.
220
SHEET 9 OF 14

2/70

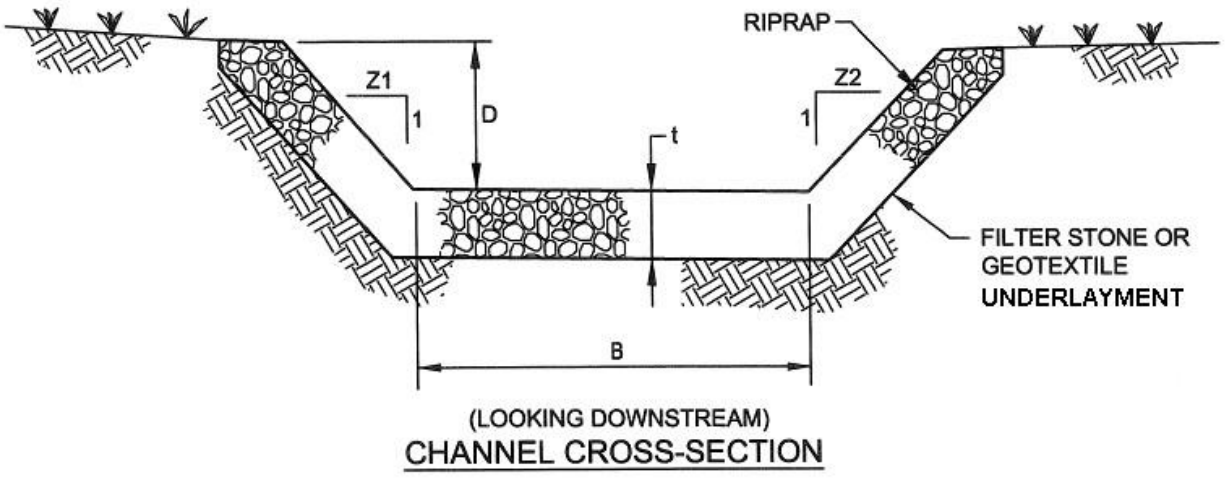
WORKSHEET # 11
CHANNEL DESIGN DATA

CHANNEL OR CHANNEL SECTION	CD-1a	CD-1b	CD-2	DD-1
Temporary or Permanent	Perm	Perm	Perm	Perm
Design Storm	10-year	10-year	10-year	10-Year
Acres	19.3	36.9	22.6	4.7
Multiplier (1.6, 2.25, or 2.75)	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY) CFS	56.70	90.70	64.30	18.00
Q (CALCULATED AT FLOW DEPTH d) CFS	62.10	97.40	72.60	25.40
PROTECTIVE LINING	R-3	R-4	R-4	Grass
V_a (ALLOWABLE VELOCITY) FPS	6.0	9.0	9.0	4.0
V (CALCULATED AT FLOW DEPTH d) FPS	4.9	7.6	7.1	2.2
τ_a (MAX ALLOWABLE SHEAR STRESS) LB/FT^2	N/A	N/A	N/A	N/A
τ_d (SHEAR STRESS @ FLOW DEPTH d) LB/FT^2 τ	1.31	5.05	4.42	1.12
CHANNEL BOTTOM WIDTH (FT)	4.0	4.0	4.0	0.0
CHANNEL SIDE SLOPES (H:V)	3:1	3:1	3:1	5:1, 2:1
D (TOTAL DEPTH) FT	2.1	2.0	1.8	2.3
CHANNEL TOP WIDTH @ D (FT)	16.6	16.0	15.4	16.1
d (CALCULATED FLOW DEPTH) FT	1.5	1.5	1.3	1.8
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)	13.0	13.0	11.8	12.6
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)	2.67	2.67	3.08	0.0
d_{50} STONE SIZE (IN)	3”	6”	6”	N/A
A (CROSS-SECTIONAL AREA IN SQ. FT.)	12.75	12.75	10.27	11.34
n (MANNING’S COEFFICIENT)	0.035	0.044	0.046	.06
R (HYDRAULIC RADIUS)	0.95	0.95	0.84	0.86
S (BED SLOPE, FT/FT)	0.014	0.054	0.059	0.010
S_c (CRITICAL SLOPE)	0.018	0.030	0.035	0.083
$.7S_c$	0.013	0.021	0.025	0.058
$1.3S_c$	0.023	0.039	0.045	0.108
STABLE FLOW? (Y/N)	No	Yes	Yes	Yes
FREEBOARD BASED ON UNSTABLE FLOW FT	0.6	N/A	N/A	N/A
FREEBOARD BASED ON STABLE FLOW FT	N/A	0.43	0.325	0.45
MINIMUM REQUIRED FREEBOARD FT	0.6	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)	V	V	V	V

WORKSHEET # 11
CHANNEL DESIGN DATA

CHANNEL OR CHANNEL SECTION	DD-2	Earthen Berm B-1a	Earthen Berm B-1b	Earthen Berm B-2
Temporary or Permanent	Perm	Perm	Perm	Perm
Design Storm	10-year	10-year	10-year	10-year
Acres	0.7	1.0	1.0	3.5
Multiplier (1.6, 2.25, or 2.75)	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY) CFS	4.73	7.3	7.1	17.0
Q (CALCULATED AT FLOW DEPTH d) CFS	5.4	5.7	5.7	14.2
PROTECTIVE LINING	Grass	R-4	R-4	R-3
V_a (ALLOWABLE VELOCITY) FPS	4.5	9.0	9.0	6.0
V (CALCULATED AT FLOW DEPTH d) FPS	1.3	5.8	8.1	6.0
τ_a (MAX ALLOWABLE SHEAR STRESS) LB/FT^2	1.00	N/A	N/A	N/A
τ_d (SHEAR STRESS @ FLOW DEPTH d) LB/FT^2	0.686	11.79	24.43	5.22
CHANNEL BOTTOM WIDTH (FT)	0.0	0.0	0.0	0.0
CHANNEL SIDE SLOPES (H:V)	5:1,2:1	5:1,2:1	5:1,2:1	5:1, 2:1
D (TOTAL DEPTH) FT	1.6	1.1	1.0	1.4
CHANNEL TOP WIDTH @ D (FT)	11.2	7.7	7.0	9.8
d (CALCULATED FLOW DEPTH) FT	1.1	0.6	0.5	0.9
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)	7.7	4.2	3.5	6.3
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)	0.0	0.0	0.0	0.0
d_{50} STONE SIZE (IN)	N/A	6”	6”	3”
A (CROSS-SECTIONAL AREA IN SQ. FT.)	4.24	1.26	0.88	2.84
n (MANNING’S COEFFICIENT)	0.076	0.063	0.063	.043
R (HYDRAULIC RADIUS)	0.53	0.29	0.24	.43
S (BED SLOPE, FT/FT)	0.01	0.315	0.783	.093
S_c (CRITICAL SLOPE)	0.109	.049	.049	.024
$.7S_c$	.076	.034	.034	.017
$1.3S_c$	.142	.064	.064	.031
STABLE FLOW? (Y/N)	No	Yes	Yes	Yes
FREEBOARD BASED ON UNSTABLE FLOW FT	0.11	N/A	N/A	N/A
FREEBOARD BASED ON STABLE FLOW FT	N/A	.15	.125	.225
MINIMUM REQUIRED FREEBOARD FT	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)	V	V	V	

STANDARD CONSTRUCTION DETAIL # 6-3
RIPRAP CHANNEL



Stackhouse Bensinger, Inc.

NOTE: This table is intentionally blank and should be filled in by the plan preparer.

Channel	Stations	B	D	Z1	Z2	Riprap Gradation	t
CD-1	0+00 to 18+30	4.0’	2.1’	3:1	3:1	R-3	9”
CD-1	18+30 to 21+10	4.0’	2.1’	3:1	3:1	R-4	18”
CD-2	0+00 to 11+00	4.0’	1.7’	3:1	3:1	R-4	18”
DD-1	0+00 to 8+00	0.0’	2.0’	5:1	2:1	N/A	N/A
DD-2	0+00 to 3+00	0.0’	1.6’	5:1	2:1	N/A	N/A

Filter stone underlayment for bed slopes ≥ 0.10 ft/ft shall be used.

Channel dimensions are for the completed channel after rock placement. Channel must be over-excavated a sufficient amount to allow for the volume of rock placed within the channel while providing the specified finished dimensions.

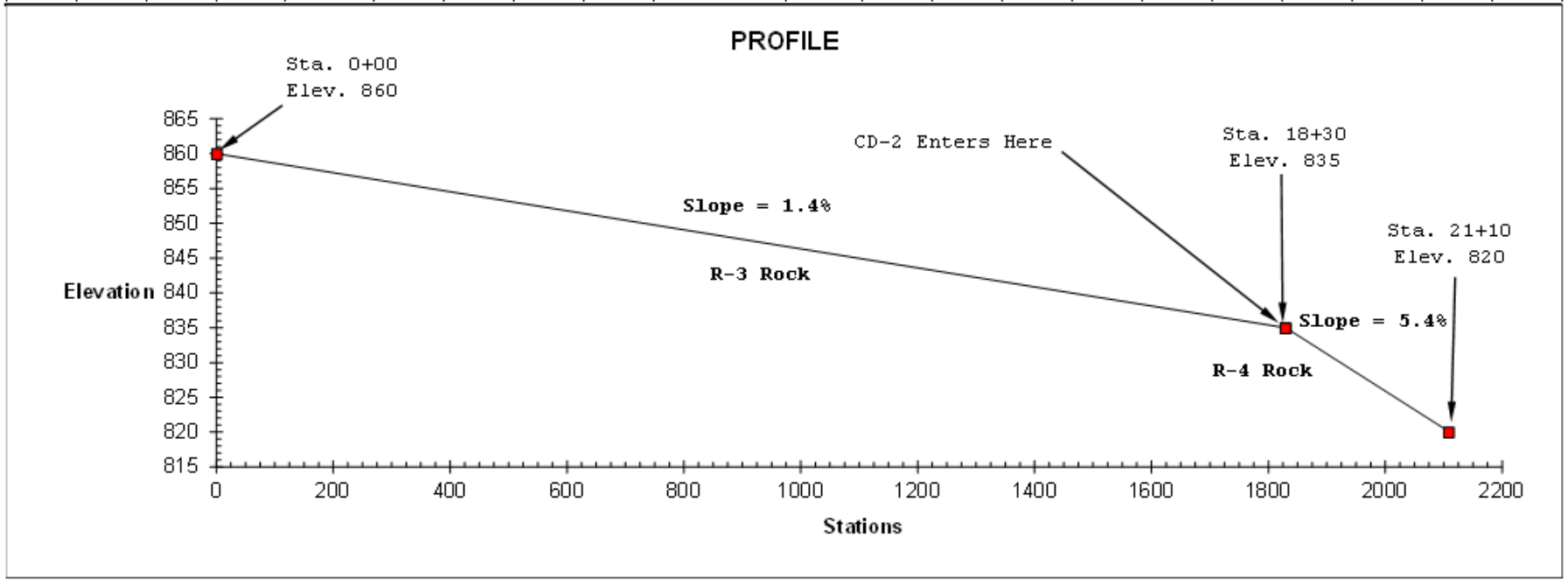
Channel dimensions shall be constantly maintained. Channel shall be cleaned whenever total channel depth is reduced by 25% at any location. Sediment deposits shall be removed within 24 hours of discovery or as soon as soil conditions permit access to channel without further damage.

Damaged lining shall be repaired or replaced within 48 hours of discovery. The minimum rock thickness (t) shall be 1.5 times the max rock size.

MODULE 12.1 DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch:	Mine Operation Name:	Company:	Surface Mine Permit Number:
Collection Ditch CD-1	Maggie Lynn Underground Mine	Neiswonger Construction, Inc.	63192001
Prepared By:	**Telephone Number:**	**Date:**	**Sheet :**
GeoTech Engineering, Inc.	(814) 342-7090	12-2009	
Channel Cross-section Type:			
V-Ditch			

STATION																	WITH FREEBOARD		
START / END	ELEV.	DRAINAGE AREA (acres)	DESIGN STORM (yrs)	AVERAGE WATERSHED SLOPE (%)	CURVE NO.	PEAK DISC. Q (cfs)	CHANNEL BED SLOPE (%)	FREE-BOARD (ft)	CHANNEL LINING	MANNING'S COEFF. (n)	CHANNEL BOTTOM WIDTH (ft)	CHANNEL SIDE SLOPES (ft,rt)	FLOW AREA (sq ft)	FLOW DEPTH (ft)	TOP FLOW WIDTH (ft)	FLOW VELOCITY (fps)	Q AVAIL. (cfs)	CHANNEL DEPTH (ft)	TOP CHANNEL WIDTH (ft)	Q AVAIL. (cfs)
0	860																			
1830	835	19.3	10	Steep	85	56.7	1.4	0.6	R-3 Rock	0.0345	4	3,3	12.75	1.5	13.0	4.9	62.1	2.1	16.6	126.3
1830	835																			
2110	820	36.9	10	Steep	85	90.7	5.4	0.5	R-4 Rock	0.0435	4	3,3	12.75	1.5	13.0	7.6	97.4	2.0	16.0	178.6



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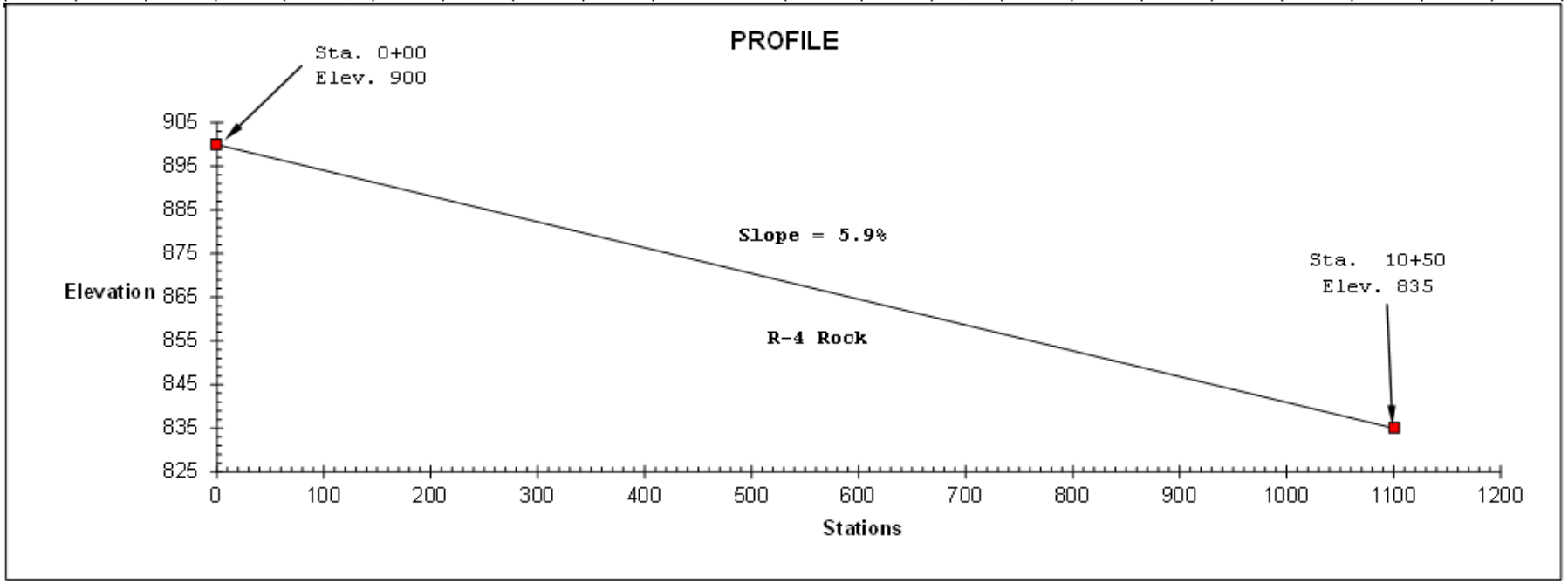
Neiswonger Construction, Inc. - Maggie Lynn Underground Mine

MODULE 12.1 DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch:	Mine Operation Name:	Company:	Surface Mine Permit Number:
Collection Ditch CD-2	Maggie Lynn Underground Mine	Neiswonger Construction, Inc.	63192001
Prepared By:	**Telephone Number:**	**Date:**	**Sheet :**
GeoTech Engineering, Inc.	(814) 342-7090	10-2010	
Channel Cross-section Type:			
V-Ditch			

STATION																	WITH FREEBOARD		
START / END	ELEV.	DRAINAGE AREA (acres)	DESIGN STORM (yrs)	AVERAGE WATERSHED SLOPE (%)	CURVE NO.	PEAK DISCH. Q (cfs)	CHANNEL BED SLOPE (%)	FREE-BOARD (ft)	CHANNEL LINING	MANNING'S COEFF. (n)	CHANNEL BOTTOM WIDTH (ft)	CHANNEL SIDE SLOPES (H,rt)	FLOW AREA (sq ft)	FLOW DEPTH (ft)	TOP FLOW WIDTH (ft)	FLOW VELOCITY (fps)	Q AVAIL. (cfs)	CHANNEL DEPTH (ft)	TOP CHANNEL WIDTH (ft)	Q AVAIL. (cfs)
0	900																			
1100	835	22.6	10	Steep	85	64.3	5.9	0.5	R-4 Rock	0.0455	4	3,3	10.27	1.3	11.8	7.1	72.6	1.8	14.8	143.1



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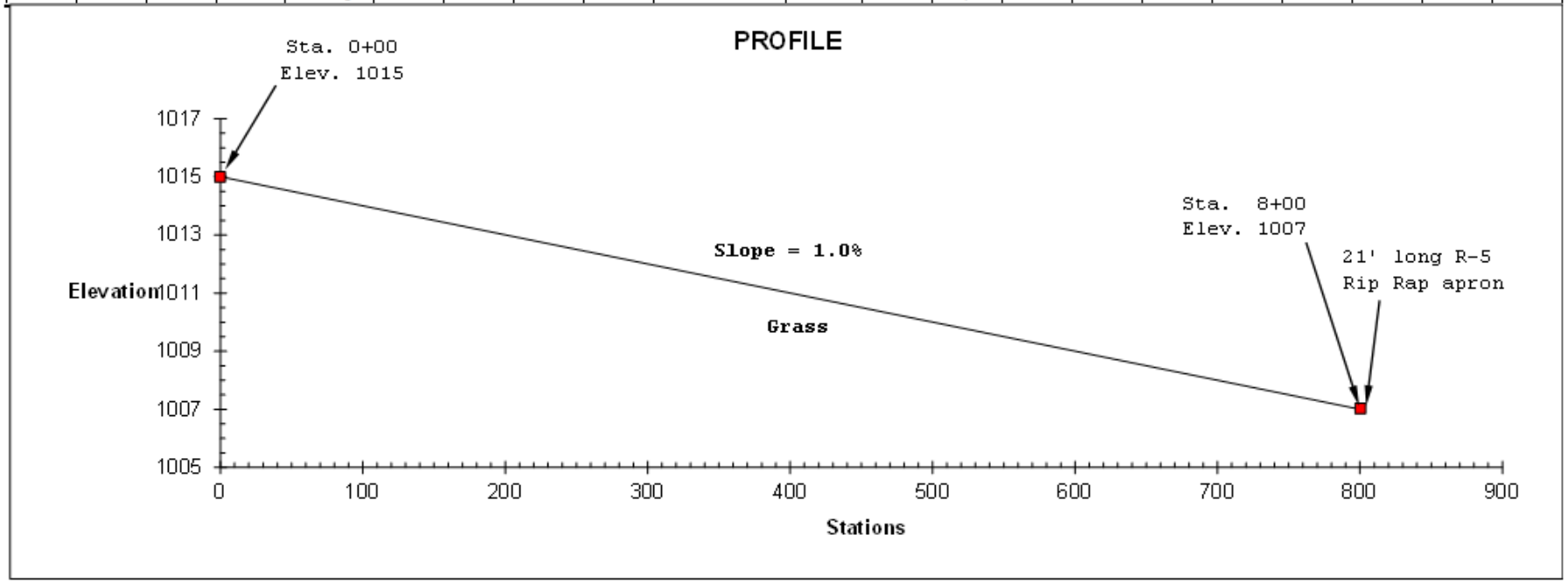
MODULE 12.1 DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch:	Mine Operation Name:	Company:	Surface Mine Permit Number:
Diversion Ditch DD-1	Maggie Lynn Underground Mine	Neiswonger Construction, Inc.	63192001
Prepared By:	**Telephone Number:**	**Date:**	**Sheet :**
GeoTech Engineering, Inc.	(814) 342-7090	May 2020	
Channel Cross-section Type:			
V-Ditch			

STATION START	STATION END	ELEV.	DRAINAGE AREA (acres)	DESIGN STORM (yrs)	AVERAGE WATERSHED SLOPE (%)	CURVE NO.	PEAK DISC. Q (cfs)	CHANNEL BED SLOPE (%)	FREE-BOARD (ft)	CHANNEL LINING	MANNING'S COEFF. (n)	CHANNEL BOTTOM WIDTH (ft)	CHANNEL SIDE SLOPES (ft,rt)	FLOW AREA (sq ft)	FLOW DEPTH (ft)	TOP FLOW WIDTH (ft)	FLOW VELOCITY (fps)	Q AVAIL. (cfs)	WITH FREEBOARD: CHANNEL DEPTH (ft)	WITH FREEBOARD: TOP CHANNEL WIDTH (ft)	WITH FREEBOARD: Q AVAIL. (cfs)
0	800	1015 1007	4.7	10	Steep	85	18.0	1.0	0.5	Grass	0.06	0	5,2	11.34	1.8	12.6	2.2	25.4	2.3	16.1	48.9



5600-PM-BMP0315-12 Rev. 1/2014

Neiswonger Construction, Inc. - Maggie Lynn Underground Mine

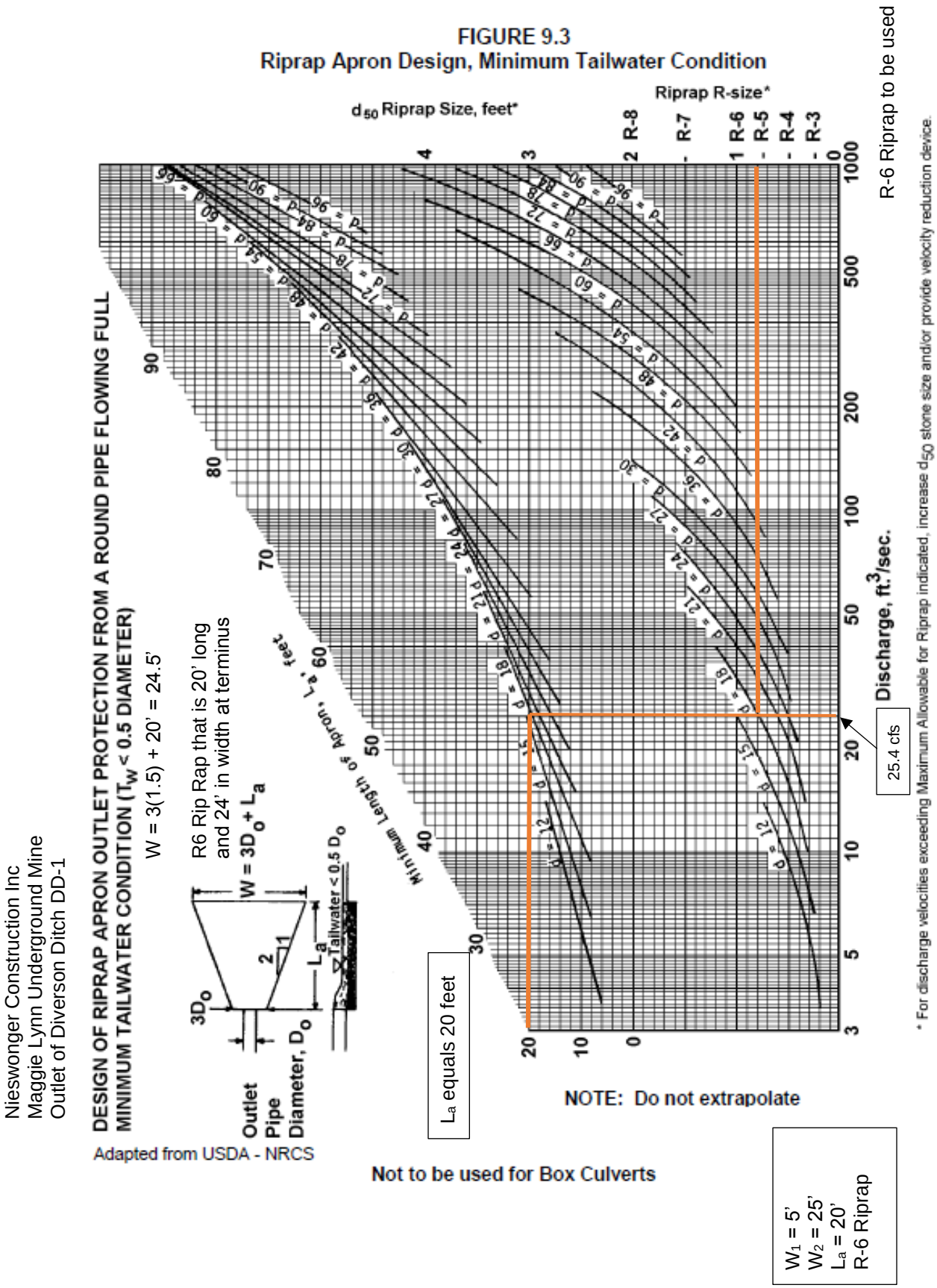


FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition
DESIGN OF RIPRAP APRON OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MINIMUM TAILWATER CONDITION (T_W < 0.5 DIAMETER)
W = 3(1.5) + 20' = 24.5'
R6 Rip Rap that is 20' long and 24' in width at terminus
Niswonger Construction Inc
Maggie Lynn Underground Mine
Outlet of Diverson Ditch DD-1
d_{50} Riprap Size, feet*
Riprap R-size*
R-8
R-7
R-6
R-5
R-4
R-3
R-6 Riprap to be used
Discharge, ft.³/sec.
25.4 cfs
Minimum Length of Apron, L_a, feet
$W = 3D_o + L_a$
$3D_o$
2
1
L_a
Tailwater < 0.5 D_o
Outlet Pipe Diameter, D_o
L_a equals 20 feet
NOTE: Do not extrapolate
* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.
Adapted from USDA - NRCS
Not to be used for Box Culverts
W_1 = 5'
W_2 = 25'
L_a = 20'
R-6 Riprap

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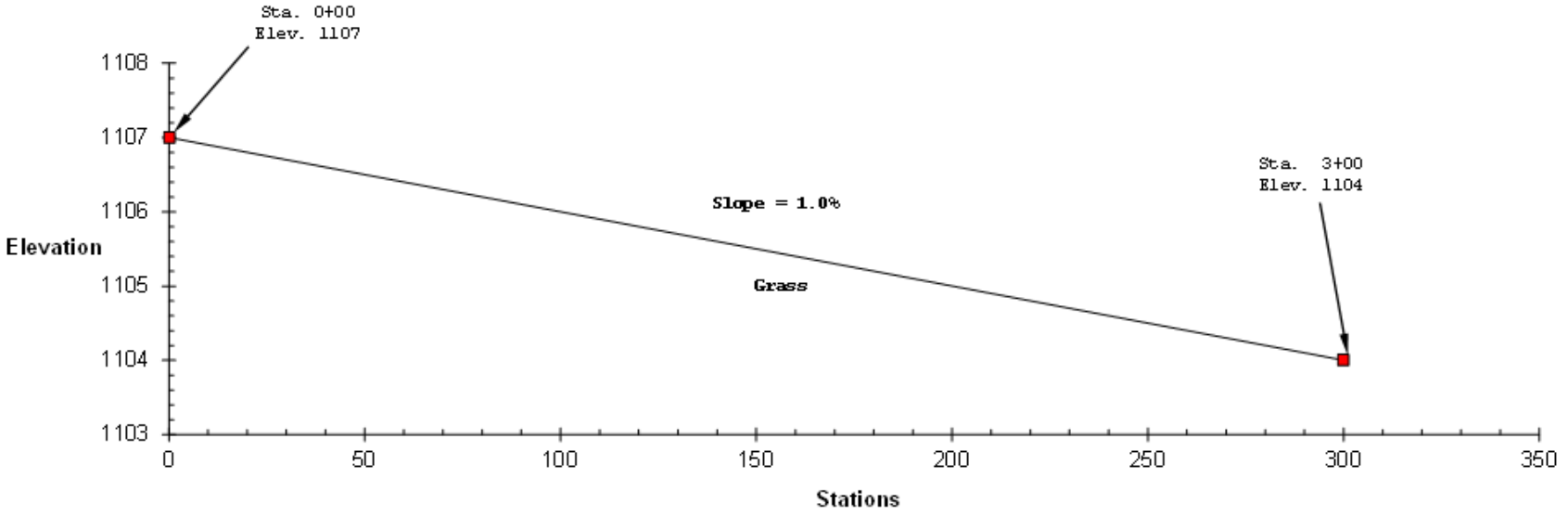
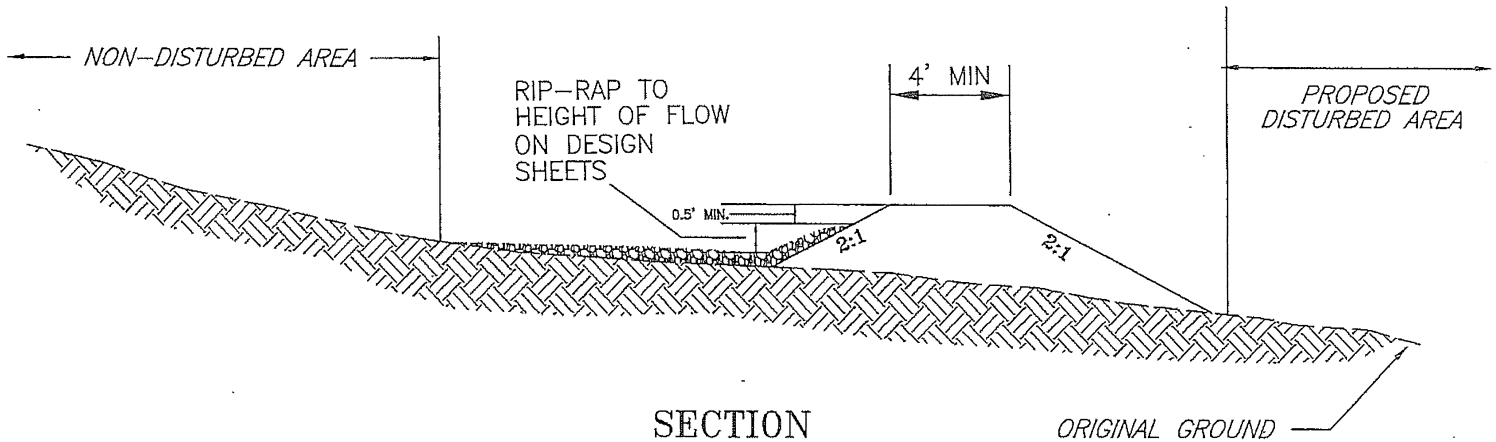
MODULE 12.1 DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch:	Mine Operation Name:	Company:	Surface Mine Permit Number:
Diversion Ditch DD-2	Maggie Lynn Underground Mine	Neiswonger Construction Inc	63192001
Prepared By:	**Telephone Number:**	**Date:**	**Sheet :**
GeoTech Engineering, Inc.	(814) 342-7090	January-21	
Channel Cross-section Type:			
V-Ditch			

STATION																		WITH FREEBOARD		
START / END	ELEV.	DRAINAGE AREA (acres)	DESIGN STORM (yrs)	AVERAGE WATERSHED SLOPE (%)	CURVE NO.	PEAK DISC. Q (cfs)	CHANNEL BED SLOPE (%)	FREE-BOARD (ft)	CHANNEL LINING	MANNING'S COEFF. (n)	CHANNEL BOTTOM WIDTH (ft)	CHANNEL SIDE SLOPES (ft,rt)	FLOW AREA (sq ft)	FLOW DEPTH (ft)	TOP FLOW WIDTH (ft)	FLOW VELOCITY (fps)	Q AVAIL. (cfs)	CHANNEL DEPTH (ft)	TOP CHANNEL WIDTH (ft)	Q AVAIL. (cfs)
0	1107																			
300	1104	0.7	10	Steep	85	4.73	1.0	0.5	Grass	0.076	0	5,2	4.24	1.1	7.7	1.3	5.4	1.6	11.2	14.6

PROFILE





SECTION

PURPOSE

TO CONTROL SHEET RUNOFF FROM ENTERING THE PROPOSED MINING AREA.

NOTE

1. *INSPECT AND RE–PAIR BERM AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.*
2. *THE BERM WILL BE VEGETATED IMMEDIATELY UPON CONSTRUCTTION.*

TYPICAL EARTHEN BERM

NOT TO SCALE

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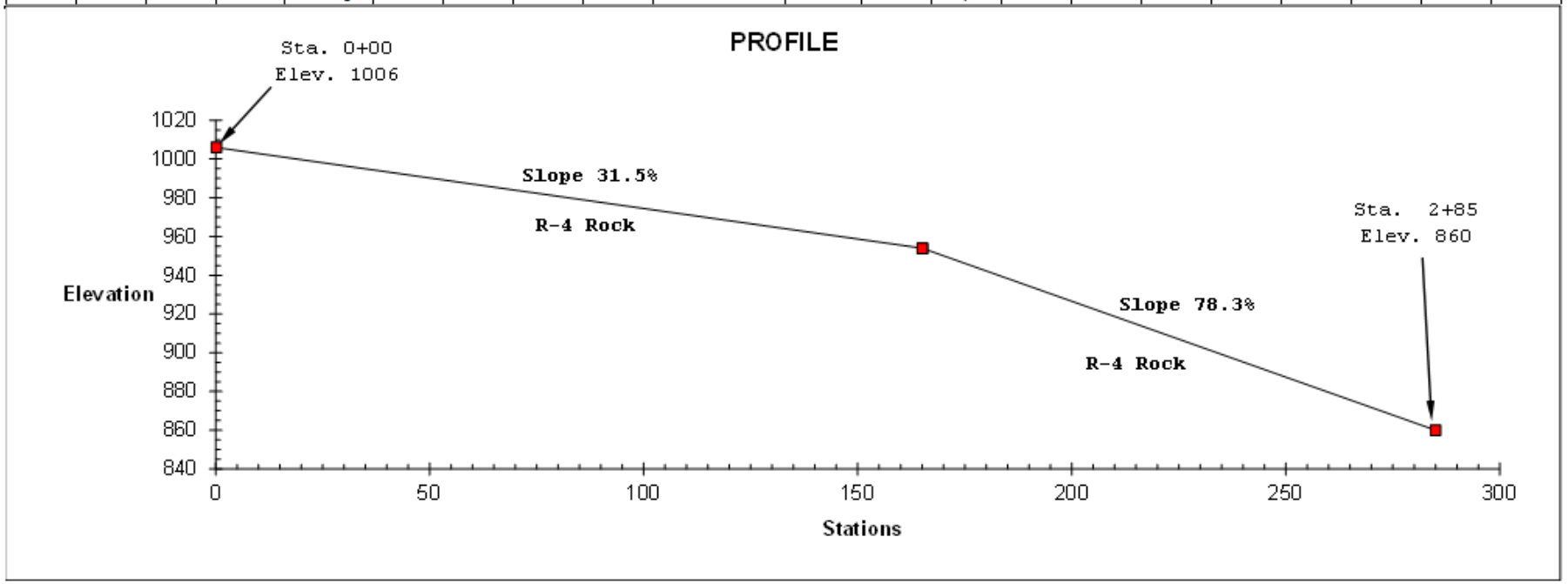
MODULE 12.1 DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch:	Mine Operation Name:	Company:	Surface Mine Permit Number:
Earthen Berm B-1	Maggie Lynn Underground Mine	Neiswonger Construction, Inc.	63192001
Prepared By:	**Telephone Number:**	**Date:**	**Sheet :**
GeoTech Engineering, Inc.	(814) 342-7090	10-2010	
Channel Cross-section Type:			
Triangular			

STATION START	STATION END	ELEV.	DRAINAGE AREA (acres)	DESIGN STORM (yrs)	AVERAGE WATERSHED SLOPE (%)	CURVE NO.	PEAK DISC. Q (cfs)	CHANNEL BED SLOPE (%)	FREE-BOARD (ft)	CHANNEL LINING	MANNING'S COEFF. (n)	CHANNEL BOTTOM WIDTH (ft)	CHANNEL SIDE SLOPES (ft,ft)	FLOW AREA (sq ft)	FLOW DEPTH (ft)	TOP FLOW WIDTH (ft)	FLOW VELOCITY (fps)	Q AVAIL. (cfs)	WITH FREEBOARD: CHANNEL DEPTH (ft)	WITH FREEBOARD: TOP CHANNEL WIDTH (ft)	WITH FREEBOARD: Q AVAIL. (cfs)
0	165	1006 954	1.0	2	Steep	85	5.7	31.5	0.5	R-4 Rock	0.063	0	5,2	1.26	0.6	4.2	5.8	7.3	1.1	7.7	36.8
165	285	954 860	1.0	2	Steep	85	5.7	78.3	0.5	R-4 Rock	0.063	0	5,2	0.88	0.5	3.5	8.1	7.1	1.0	7.0	44.8

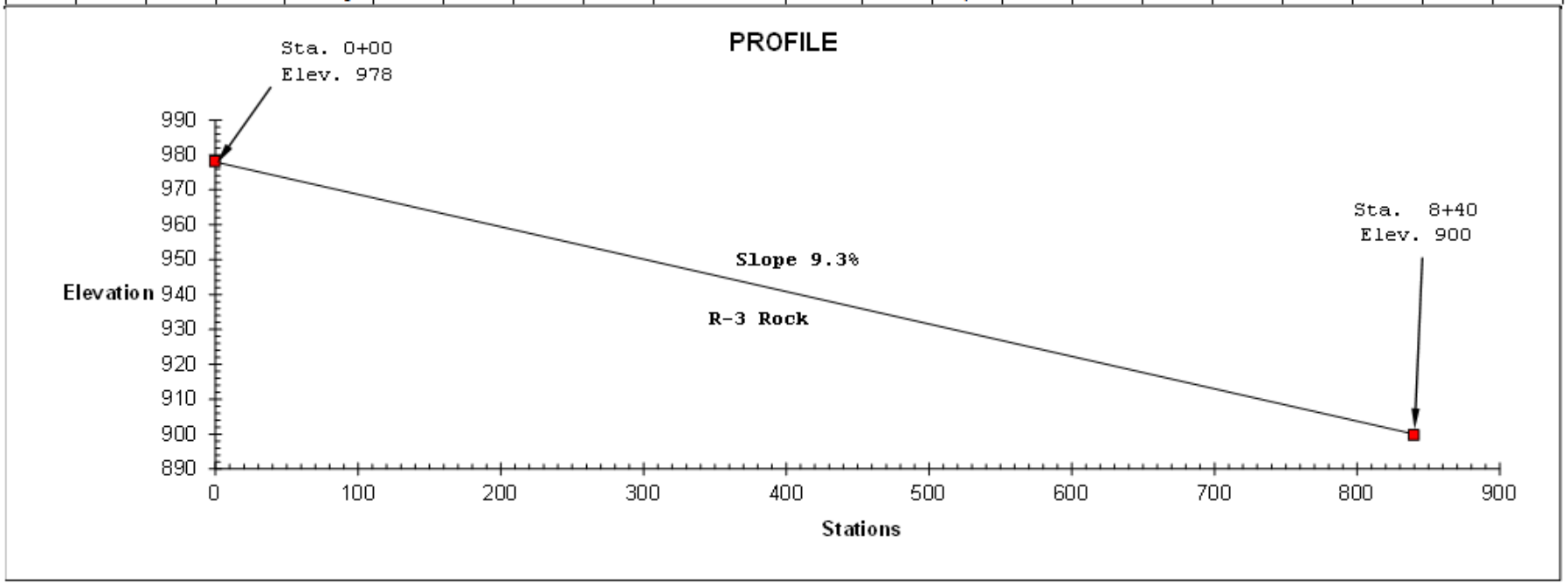


5600-PM-BMP0315-12 Rev. 1/2014

MODULE 12.1 DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch:	Mine Operation Name:	Company:	Surface Mine Permit Number:
Earthen Berm B-2	Maggie Lynn Underground Mine	Neiswonger Construction, Inc.	63192001
Prepared By:	**Telephone Number:**	**Date:**	**Sheet :**
GeoTech Engineering, Inc.	(814) 342-7090	10-2010	
Channel Cross-section Type:			
Triangular			

STATION																		WITH FREEBOARD		
START / END	ELEV.	DRAINAGE AREA (acres)	DESIGN STORM (yrs)	AVERAGE WATERSHED SLOPE (%)	CURVE NO.	PEAK DISC. Q (cfs)	CHANNEL BED SLOPE (%)	FREE-BOARD (ft)	CHANNEL LINING	MANNING'S COEFF. (n)	CHANNEL BOTTOM WIDTH (ft)	CHANNEL SIDE SLOPES (ft,rt)	FLOW AREA (sq ft)	FLOW DEPTH (ft)	TOP FLOW WIDTH (ft)	FLOW VELOCITY (fps)	Q AVAIL. (cfs)	CHANNEL DEPTH (ft)	TOP CHANNEL WIDTH (ft)	Q AVAIL. (cfs)
0	978																			
840	900	3.5	2	Steep	85	14.2	9.3	0.5	R-3 Rock	0.043	0	5,2	2.84	0.9	6.3	6.0	17.0	1.4	9.8	55.3



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Mar 31 2020

Culvert C-4

Invert Elev Dn (ft)	= 100.00
Pipe Length (ft)	= 32.00
Slope (%)	= 1.00
Invert Elev Up (ft)	= 100.32
Rise (in)	= 15.0
Shape	= Circular
Span (in)	= 15.0
No. Barrels	= 1
n-Value	= 0.011
Culvert Type	= Circular Culvert
Culvert Entrance	= Smooth tapered inlet throat
Coeff. K,M,c,Y,k	= 0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

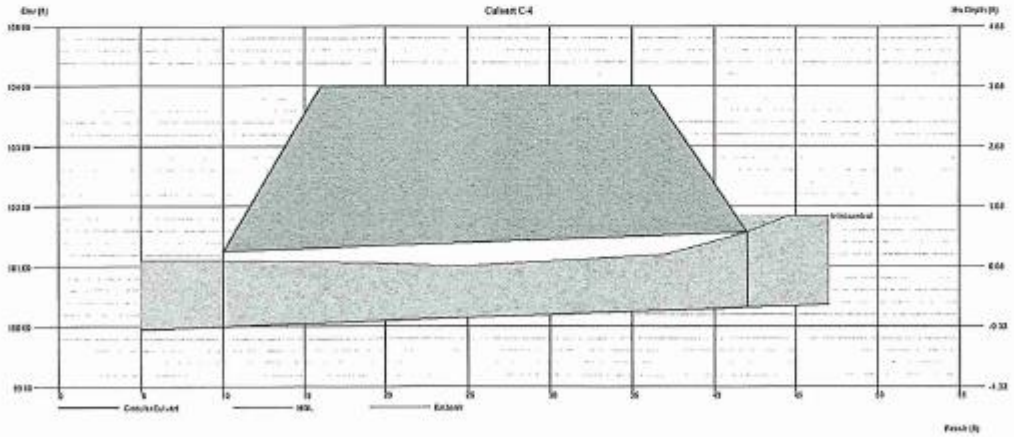
Top Elevation (ft)	= 104.00
Top Width (ft)	= 20.00
Crest Width (ft)	= 50.00

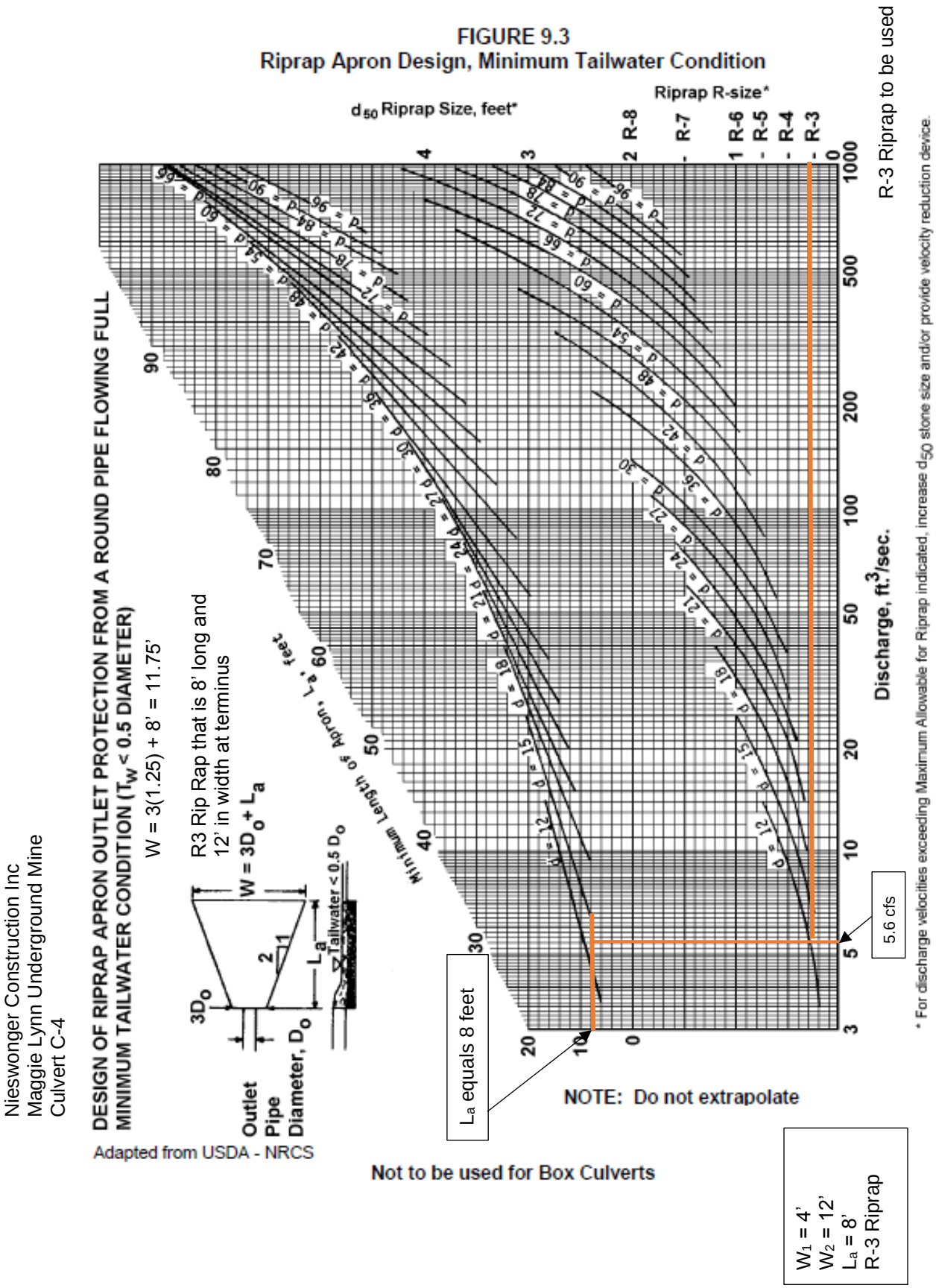
Calculations

Qmin (cfs)	= 5.60
Qmax (cfs)	= 5.60
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 5.60
Qpipe (cfs)	= 5.60
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 4.88
Veloc Up (ft/s)	= 5.55
HGL Dn (ft)	= 101.10
HGL Up (ft)	= 101.28
Hw Elev (ft)	= 101.85
Hw/D (ft)	= 1.22
Flow Regime	= Inlet Control





Nieswonger Construction Inc
Maggie Lynn Underground Mine
Culvert C-4

Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Mar 31 2020

Culvert C-5

Invert Elev Dn (ft)	= 100.00
Pipe Length (ft)	= 60.00
Slope (%)	= 1.00
Invert Elev Up (ft)	= 100.60
Rise (in)	= 15.0
Shape	= Circular
Span (in)	= 15.0
No. Barrels	= 1
n-Value	= 0.011
Culvert Type	= Circular Culvert
Culvert Entrance	= Smooth tapered inlet throat
Coeff. K,M,c,Y,k	= 0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

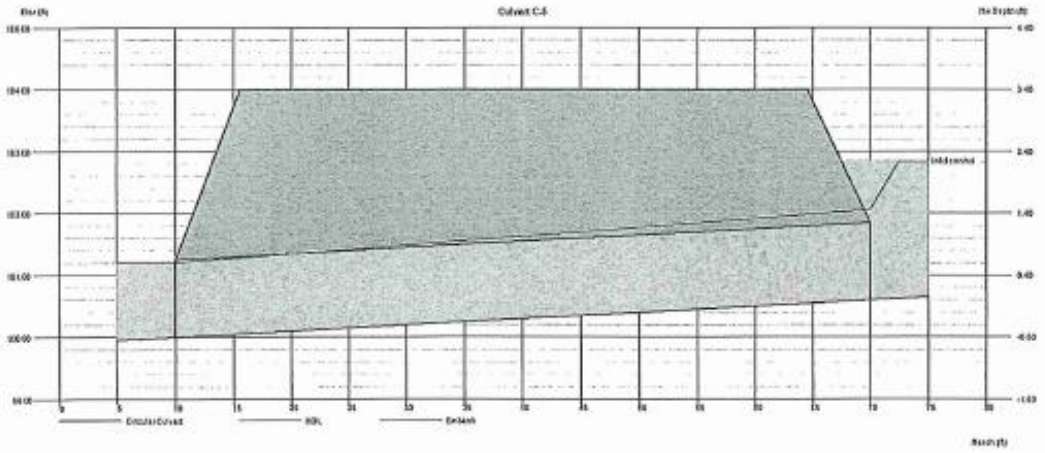
Top Elevation (ft)	= 104.00
Top Width (ft)	= 49.00
Crest Width (ft)	= 50.00

Calculations

Qmin (cfs)	= 9.30
Qmax (cfs)	= 9.30
Tailwater Elev (ft)	= (dc+D)/2

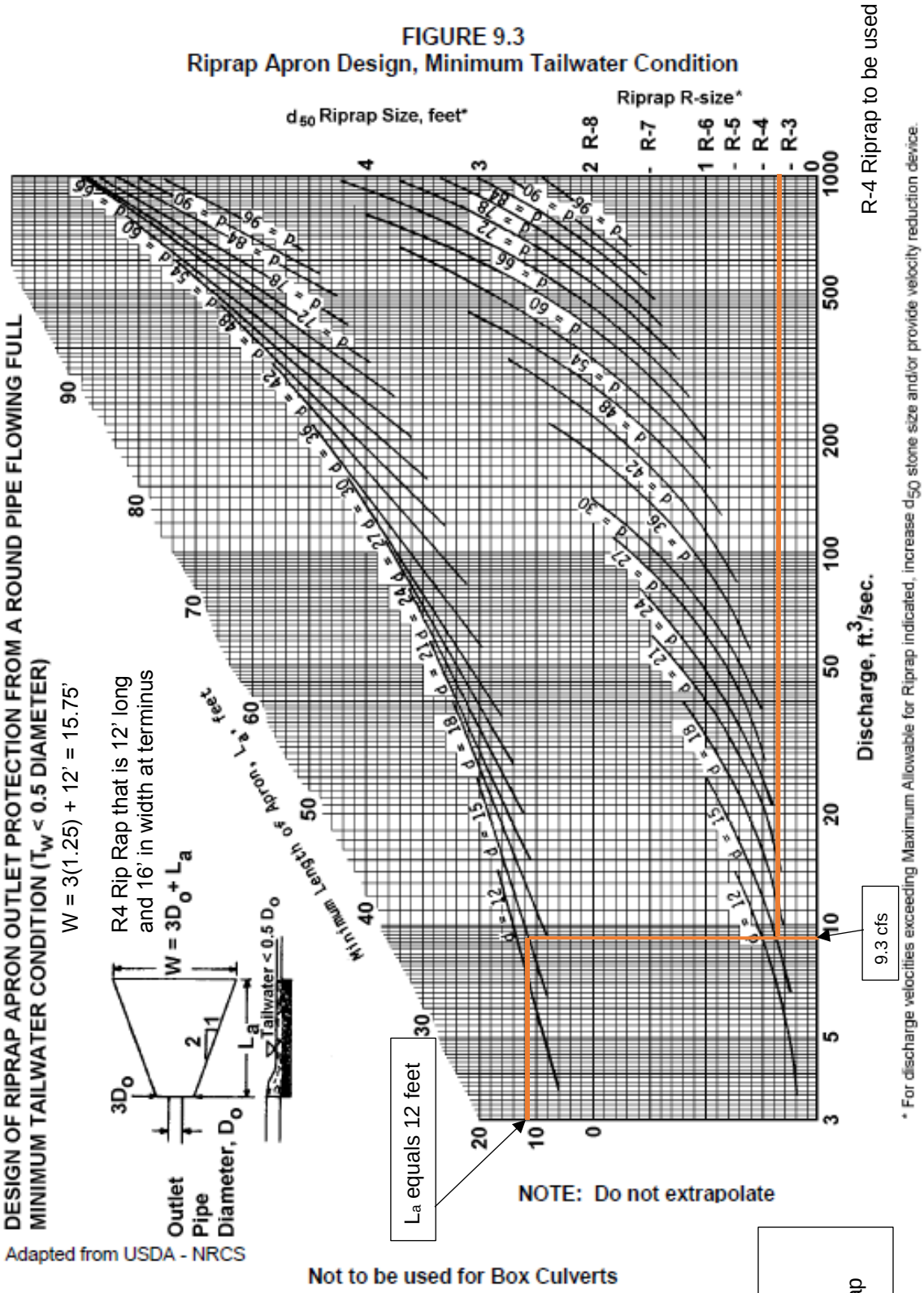
Highlighted

Qtotal (cfs)	= 9.30
Qpipe (cfs)	= 9.30
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 7.66
Veloc Up (ft/s)	= 7.58
HGL Dn (ft)	= 101.21
HGL Up (ft)	= 102.06
Hw Elev (ft)	= 102.84
Hw/D (ft)	= 1.80
Flow Regime	= Inlet Control



Nieswonger Construction Inc
Maggie Lynn Underground Mine
Culvert C-5

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Mar 31 2020

Culvert C-6

Invert Elev Dn (ft)	= 100.00
Pipe Length (ft)	= 30.00
Slope (%)	= 1.00
Invert Elev Up (ft)	= 100.30
Rise (in)	= 18.0
Shape	= Circular
Span (in)	= 18.0
No. Barrels	= 1
n-Value	= 0.011
Culvert Type	= Circular Culvert
Culvert Entrance	= Smooth tapered inlet throat
Coeff. K,M,c,Y,k	= 0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

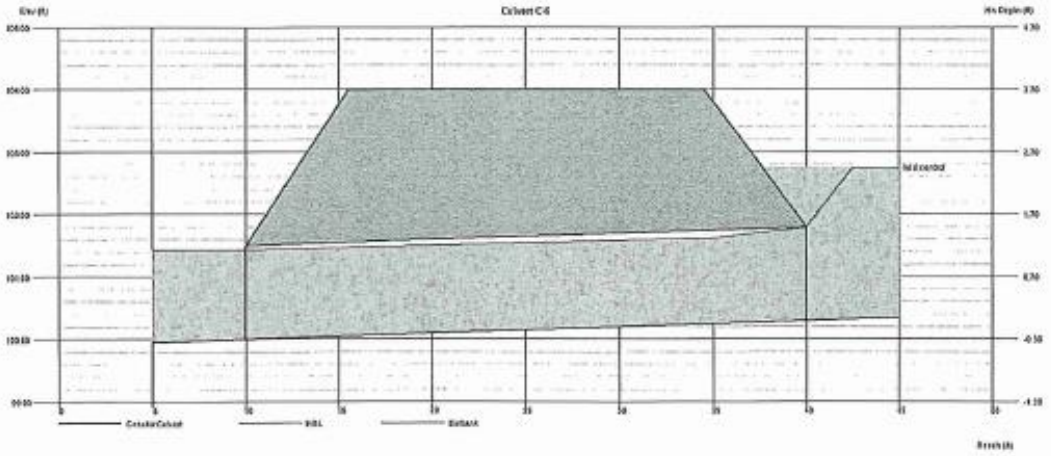
Top Elevation (ft)	= 104.00
Top Width (ft)	= 19.00
Crest Width (ft)	= 50.00

Calculations

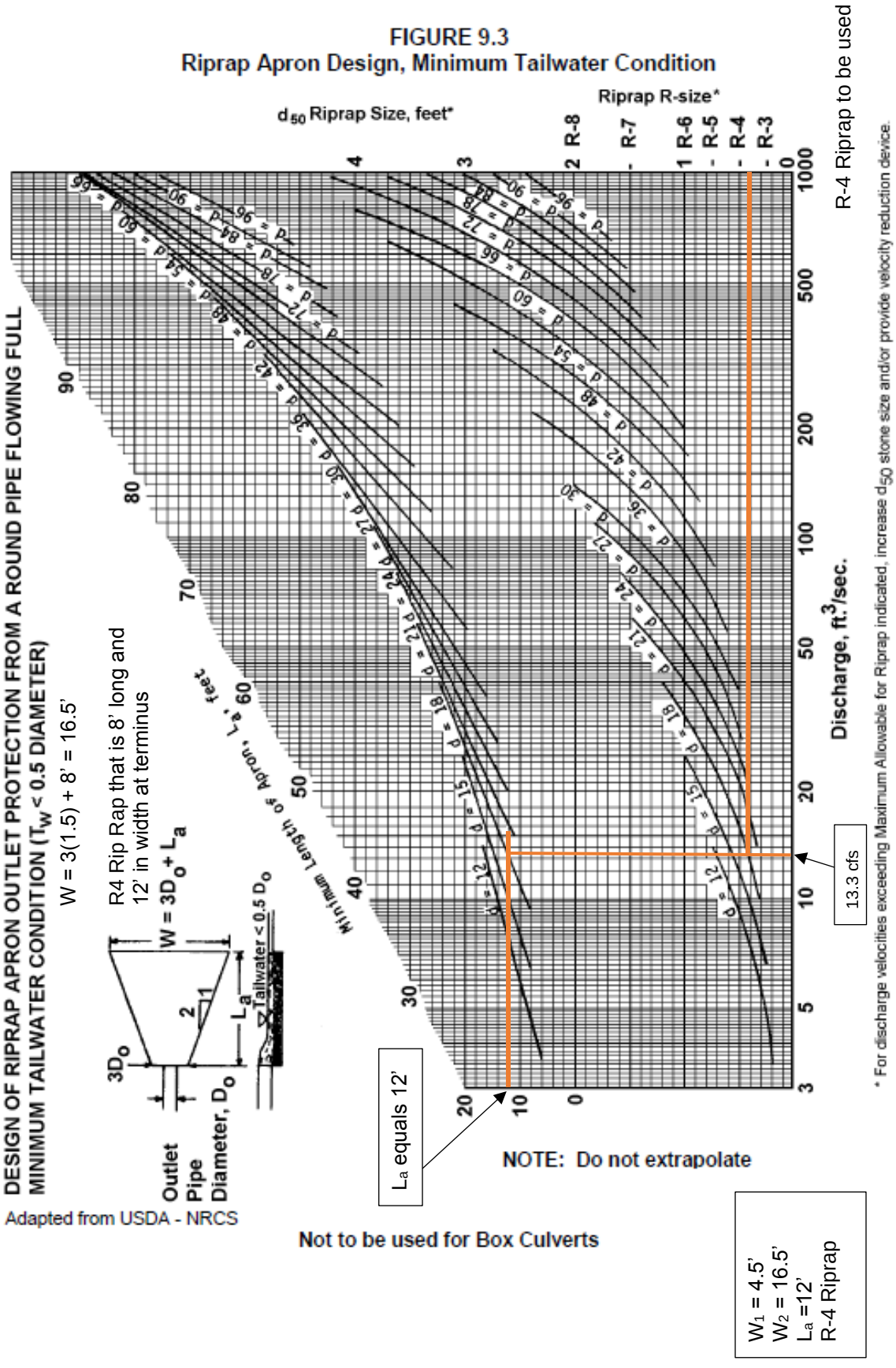
Qmin (cfs)	= 13.30
Qmax (cfs)	= 13.30
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

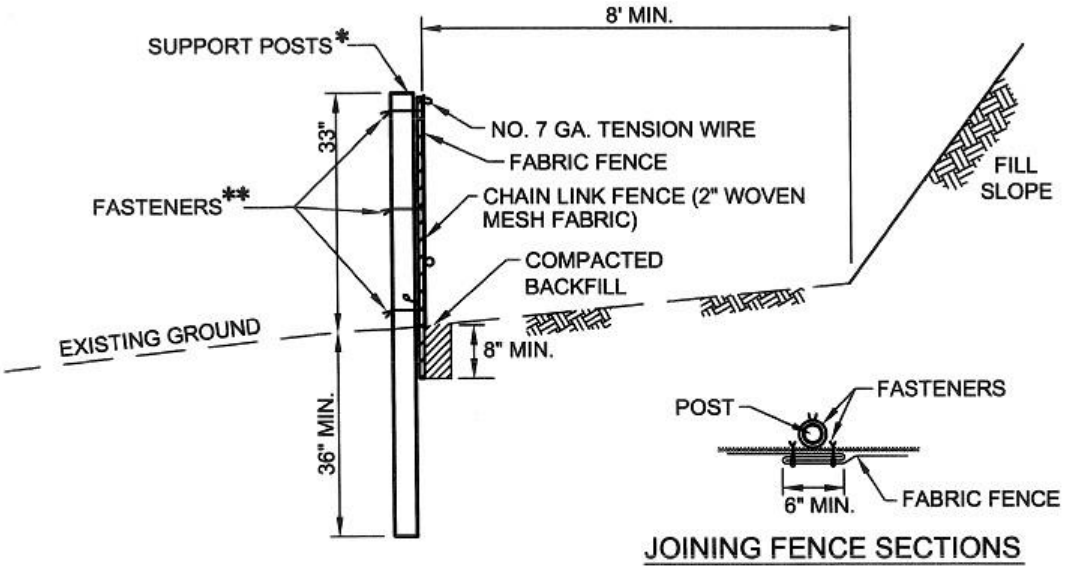
Qtotal (cfs)	= 13.30
Qpipe (cfs)	= 13.30
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 7.66
Veloc Up (ft/s)	= 7.89
HGL Dn (ft)	= 101.43
HGL Up (ft)	= 101.66
Hw Elev (ft)	= 102.75
Hw/D (ft)	= 1.64
Flow Regime	= Inlet Control



Nieswonger Construction Inc
Maggie Lynn Underground Mine
Culvert C-6



STANDARD CONSTRUCTION DETAIL # 4-10
Super Silt Fence



*POSTS SPACED @ 10' MAX. USE 2 1/2" DIA. HEAVY DUTY GALVANIZED OR ALUMINUM POSTS.

**CHAIN LINK TO POST FASTENERS SPACED @ 14" MAX. USE NO. 9 GA. ALUMINUM WIRE OR NO. 9 GALVANIZED STEEL PRE-FORMED CLIPS. CHAIN LINK TO TENSION WIRE FASTENERS SPACED @ 60" MAX. USE NO. 13.5 GA. GALVANIZED STEEL WIRE. FABRIC TO CHAIN FASTENERS SPACED @ 24" MAX C. TO C.

Fabric shall have the minimum properties as shown in Table 4.3. Filter

fabric width shall be 42" minimum.

Posts shall be installed using a posthole drill.

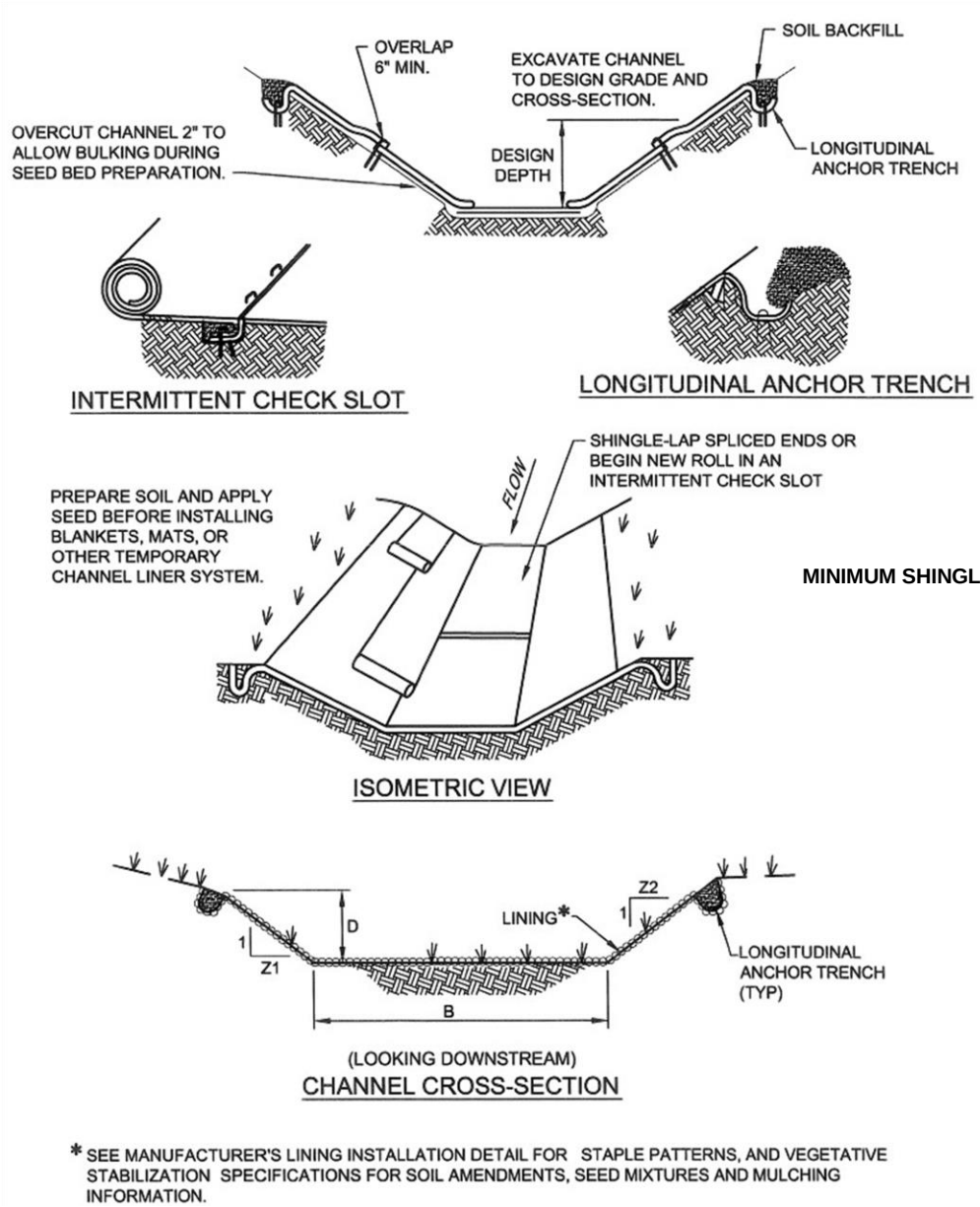
Chain link shall be galvanized No. 11.5 Ga. steel wire with 2 ¼" opening, No. 11 Ga. aluminum coated steel wire in accordance with ASTM-A-491, or galvanized No. 9 Ga. steel wire top and bottom with galvanized No. 11 Ga. steel intermediate wires. No. 7 gage tension wire to be installed horizontally through holes at top and bottom of chain-link fence or attached with hog rings at 5' (max.) centers.

Silt fence shall be placed at existing level grade. Both ends of the fence shall be extended at least 8 feet upslope at 45 degrees to main barrier alignment (Figure 4.1).

Sediment shall be removed when accumulations reach half the aboveground height of the fence.

Fence shall be removed and properly disposed of when tributary area is permanently stabilized

STANDARD CONSTRUCTION DETAIL # 6-1
Vegetated Channel



MINIMUM SHINGLE LAP = 6”

* SEE MANUFACTURER'S LINING INSTALLATION DETAIL FOR STAPLE PATTERNS, AND VEGETATIVE STABILIZATION SPECIFICATIONS FOR SOIL AMENDMENTS, SEED MIXTURES AND MULCHING INFORMATION.

Adapted from Salix Applied Earthcare - Erosion Draw 5.0

CHANNEL NO.	STATIONS	BOTTOM WIDTH B (FT)	DEPTH D (FT)	TOP WIDTH W (FT)	Z1 (FT)	Z2 (FT)	LINING*
DD-1	0+00 - 8+00	0.0	2.0	14.0	5:1	2:1	Grass
DD-2	0+00 – 3+00	0.0	1.6	11.2	5:1	2:1	Grass

Anchor trenches shall be installed at beginning and end of channel in the same manner as longitudinal anchor trenches.

Channel dimensions shall be constantly maintained. Channel shall be cleaned whenever total channel depth is reduced by 25% at any location. Sediment deposits shall be removed within 24 hours of discovery or as soon as soil conditions permit access to channel without further damage. Damaged

lining shall be repaired or replaced within 48 hours of discovery.

TABLE 6.6
Riprap Gradation, Filter Blanket Requirements, Maximum Velocities

Percent Passing (Square Openings)						
Class, Size NO. / **Rock Size (Inches)**	**R-8**	**R-7**	**R-6**	**R-5**	**R-4**	**R-3**
42	100					
30		100				
24	15-50		100			
18		15-50		100		
15	0-15					
12		0-15	15-50		100	
9				15-50		
6			0-15		15-50	100
4				0-15		
3					0-15	15-50
2						0-15
Nominal Placement Thickness (inches)	63	45	36	27	18	9
Filter Stone[1]	AASHTO #1	AASHTO #1	AASHTO #1	AASHTO #3	AASHTO #3	AASHTO #57
V_{max} (ft/sec)	17.0	14.5	13.0	11.5	9.0	6.5

Adapted from PennDOT Pub. 408, Section 703.2(c), Table C

1 This is a general standard. Soil conditions at each site should be analyzed to determine actual filter size. A suitable woven or non-woven geotextile underlayment, used according to the manufacturer's recommendations, may be substituted for the filter stone for gradients < 10%.

TABLE 6.7
Comparison of Various Gradations of Coarse Aggregates

Total Percent Passing															
AASHTO NUMBER	**6 ½**	**4"**	**3 ½"**	**2 ½**	**2"**	**1 ½ "**	**1"**	**3/4 "**	**1/2"**	**3/8"**	**#4**	**#8**	**#16**	**#30**	**#100**
1		100	90-100	25-60		0-15		0-5							
3				100	90-100	35-70	0-15		0-5						
5						100	90-100	20-55	0-10	0-5					
57						100	90-100		25-60		0-10	0-5			
67							100	90-100		20-55	0-10	0-5			
7								100	90-100	40-70	0-15	0-5			
8									100	85-100	10-30	0-10	0-5		
10										100	75-100				10-30

PennDOT Publication 408, Section 703.2(c), Table C

Tables 6.6 and 6.7 should be placed on the plan drawings of all sites where riprap channel linings are proposed.

TABLE 6.3
Manning's "n" for Trapezoidal Channels with Vegetative Stabilization (Retardance C)

Flow Depth (FT)	Channel Bed Slope (FT/FT)									
	0.01	**0.02**	**0.03**	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.09**	**0.10**
0.1	0.15	0.11	0.10	0.09	0.08	0.07	0.07	0.07	0.06	0.06
0.2	0.12	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.05	0.05
0.3	0.10	0.08	0.07	0.06	0.05	0.05	0.05	0.04	0.04	0.04
0.4	0.09	0.07	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.04
0.5	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.04	0.04	0.03
0.6	0.08	0.06	0.05	0.05	0.04	0.04	0.04	0.04	0.03	0.03
0.7	0.08	0.06	0.05	0.04	0.04	0.04	0.04	0.03	0.03	0.03
0.8	0.07	0.06	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03
0.9	0.07	0.05	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03
1.0	0.07	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03
2.0	0.06	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02
3.0	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02
4.0	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02
5.0	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
6.0	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
7.0	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01
8.0	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01
9.0	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01
10.0	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01

PA DEP

NOTE: For vegetated channels that are not anticipated to have a retardance C value (e.g. frequently mowed channels), the equation on page 134 and Table 6.3 should not be used. The designer is referred to NRCS publications for guidance on designing vegetative channels with Retardances other than C.

Westmoreland Conservation District

TABLE 6.4
Maximum Permissible Velocities (ft/sec) for Channels Lined with Vegetation

Cover	Slope Range Percent	Erosion Resistant Soil[1]	Easily Eroded Soil [2]
Bermuda Grass	0 - 5%	6.0 [3]	5.0
Kentucky Bluegrass		5.5 [3]	4.5
Tall Fescue (endophyte-free)		5.5 [3]	4.5
Grass Legume Mixture		4.5	3.5
Bermuda Grass	5-10 %	5.5 [3]	4.5
Kentucky Bluegrass		5.0	4.0
Tall Fescue (endophyte-free)		5.0	4.0
Grass Legume Mixture		3.5	3.0

Modified from USDA-NRCS

[1]Cohesive (clayey) fine grain soils and coarse grain soils with a plasticity index OF 10 TO 40 (CL, CH, SC and GC). **SOILS WITH K VALUES EQUAL TO OR LESS THAN 0.37**.

[2]**SOILS WITH K VALUES GREATER THAN 0.37**.

[3]Use velocities exceeding 5 ft/sec only where good cover and proper maintenance can be obtained.

NOTE: These values subject to the 7 limitations below

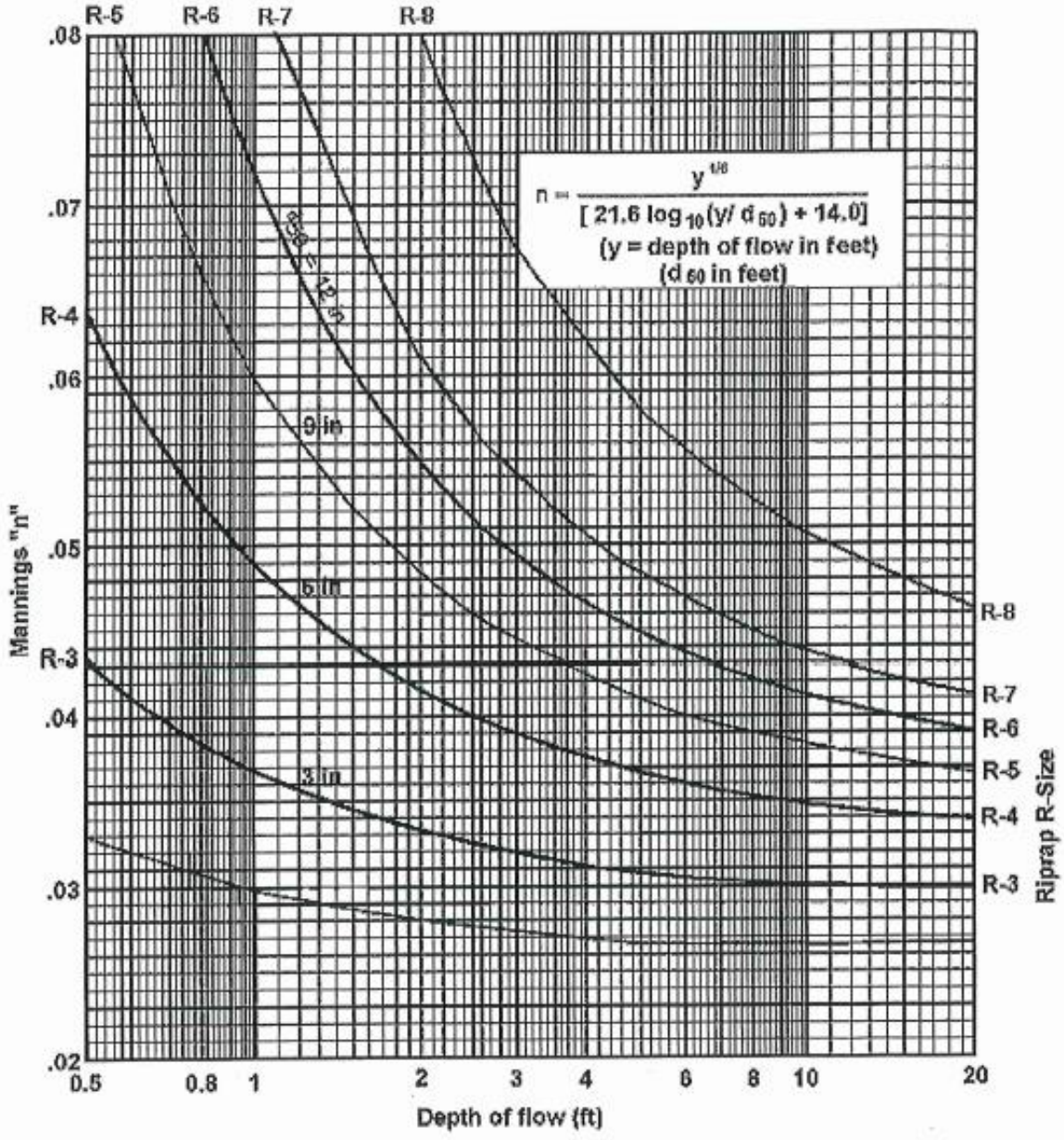
ADDITIONAL NOTES REGARDING THE USE OF TABLE 6.4

1. A velocity of 3.0 ft/sec should be the maximum if because of shade, soils or climate, only a sparse cover can be established or maintained.
2. **A velocity of 3.0 to 4.0 ft/sec should be used under normal conditions if the vegetation is to be established by seeding**.
3. A velocity of 4.0 to 5.0 ft/sec should be used only in areas if a dense, vigorous sod is obtained quickly or if water can be diverted out of the waterway while vegetation is being established.
4. A velocity of 5.0 to 6.0 ft/sec may be used on well established, good quality sod. Special maintenance may be required.
5. A velocity of 6.0 to 7.0 ft/sec may be used only on established, excellent quality sod, and only under special circumstances in which flow cannot be handled at a lower velocity. Under these conditions, special maintenance and appurtenant structures will be required.
6. If stone centers, or other erosion resistant materials supplement the vegetative lining, the velocities in the above table may be increased by 2.0 ft/sec.
7. When base flow exists, a rock lined low flow channel should be designed and incorporated into the vegetative lined channel section.

WHEREVER VEGETATIVE LININGS ARE PROPOSED, A SUITABLE TEMPORARY LINER SHOULD BE PROVIDED UNLESS THE CHANNEL IS SODDED. Separate calculations should be provided showing sufficient capacity and adequate protection both before and after establishment of the vegetation. Maximum shear stress and roughness coefficients for the temporary liners should conform to Table 6.2 or the manufacturer's specifications. Wherever manufacturer's specifications are used, they should be documented in the narrative. Table 6.5 provides roughness coefficients for some commonly used temporary liners. Manufacturer's recommended "n" values may be used if sufficient documentation is provided. Additional information on the design and use of channel linings may be obtained from the Federal Highway

Administration's Hydraulic Engineering Circular No. 15 (April 1988). Copies of this publication may be obtained by contacting:

Figure 6.2
"n" Values for Riprap Channels



Adapted from USDA-NRCS

Remaining pages in this module are copies of relevant pages contained in the approved SMP# 63100401 Module 12. There are no proposed revisions to these previously approved plans.

STANDARD WORKSHEET #18
Required Discharge Capacity For Channels

PROJECT NAME: Deemston
LOCATION: Deemston Borough, Washington County
PREPARED BY: L. Brock DATE: July 2010
CHECKED BY: ______ DATE: ______

Note: List runoff for each identified (#) sub-area that will be used to size a channel

#_______ *Temporary = 1.60 cfs/acre X _______ acres = _______ cfs
RD-1 Permanent = 2.75 cfs/acre X 0.3 acres = 0.83 cfs

#_______ Temporary = 1.60 cfs/acre X _______ acres = _______ cfs
RD-2 Permanent = 2.75 cfs/acre X 0.3 acres = 0.83 cfs

#_______ Temporary = 1.60 cfs/acre X _______ acres = _______ cfs
RD-3 Permanent = 2.75 cfs/acre X 0.4 acres = 1.10 cfs

#_______ Temporary = 1.60 cfs/acre X _______ acres = _______ cfs
RD-4 Permanent = 2.75 cfs/acre X 1.9 acres = 5.25 cfs

#_______ Temporary = 1.60 cfs/acre X _______ acres = _______ cfs
RD-5 Permanent = 2.75 cfs/acre X 1.1 acres = 3.03 cfs

#_______ Temporary = 1.60 cfs/acre X _______ acres = _______ cfs
RD-6 Permanent = 2.75 cfs/acre X 0.8 acres = 2.20 cfs

#_______ Temporary = 1.60 cfs/acre X _______ acres = _______ cfs
#_______ Permanent = 2.75 cfs/acre X _______ acres = _______ cfs

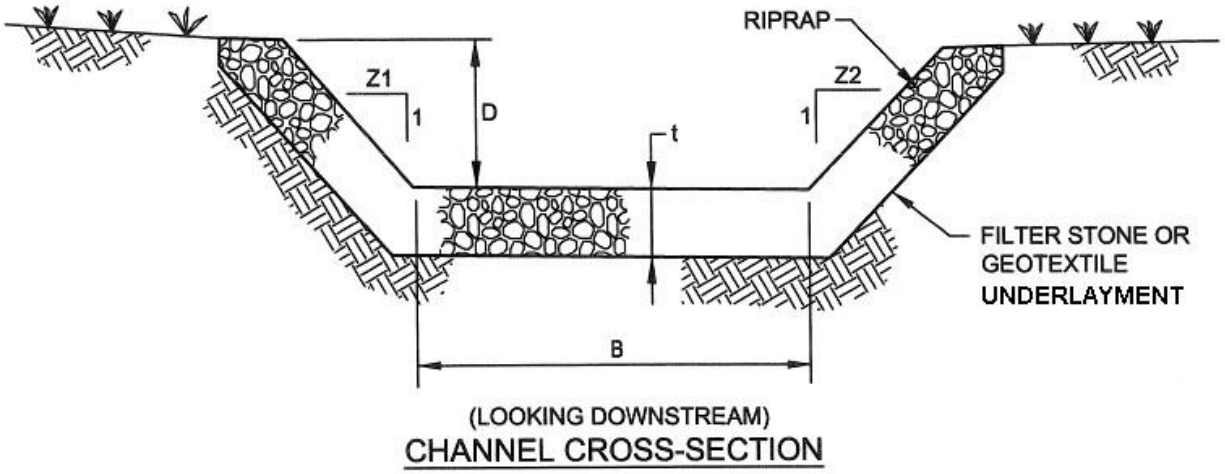
#_______ Temporary = 1.60 cfs/acre X _______ acres = _______ cfs
#_______ Permanent = 2.75 cfs/acre X _______ acres = _______ cfs

#_______ Temporary = 1.60 cfs/acre X _______ acres = _______ cfs
#_______ Permanent = 2.75 cfs/acre X _______ acres = _______ cfs

#_______ Temporary = 1.60 cfs/acre X _______ acres = _______ cfs
#_______ Permanent = 2.75 cfs/acre X _______ acres = _______ cfs

#_______ Temporary = 1.60 cfs/acre X _______ acres = _______ cfs
#_______ Permanent = 2.75 cfs/acre X _______ acres = _______ cfs

STANDARD CONSTRUCTION DETAIL # 6-3
RIPRAP CHANNEL



Stackhouse Bensinger, Inc.

NOTE: This table is intentionally blank and should be filled in by the plan preparer.

Channel	Stations	B	D	Z1	Z2	Riprap Gradation	t
RD-1	0+00 to 0+35	0	0.75	20	2	R-2	0.5
	0+35 to 1+07	0	0.70	20	2	R-3	1.0
	1+07 to 2+50	0	0.73	20	2	R-3	1.0
	2+50 to 3+00	0	1.00	3	3	R-3	1.0
	3+00 to 3+50	0	1.00	3	3	R-3	1.0
RD-2	3+45 to 7+25	0	0.91	3	3	R-3	1.0
RD-3	9+95 to 11+90	0	0.90	3	3	R-3	1.0
RD-4	11+90 to 16+03	0	1.10	3	3	R-3	1.0
	16+03 to 20+90	0	1.10	3	3	R-3	1.0
RD-5	20+20 to 24+63	0	1.05	3	3	R-4	1.25
	24+63 to 29+24	0	1.05	3	3	R-4	1.25
RD-6	32+30 to 40+20	0	0.85	20	2	R-3	1.0

Filter stone underlayment for bed slopes ≥ 0.10 ft/ft shall be used.

Channel dimensions are for the completed channel after rock placement. Channel must be over-excavated a sufficient amount to allow for the volume of rock placed within the channel while providing the specified finished dimensions.

Channel dimensions shall be constantly maintained. Channel shall be cleaned whenever total channel depth is reduced by 25% at any location. Sediment deposits shall be removed within 24 hours of discovery or as soon as soil conditions permit access to channel without further damage.

Damaged lining shall be repaired or replaced within 48 hours of discovery. The minimum rock thickness (t) shall be 1.5 times the max rock size.

STANDARD WORKSHEET #21
Channel Design Data

PROJECT NAME: Deemston
LOCATION: Deemston Borough, Washington County
PREPARED BY: L. Brock DATE: July 2010
CHECKED BY: _____ DATE: _____

	RD-6				
CHANNEL OR CHANNEL SECTION *** 32+30 to	40+20				
PROTECTIVE LINING **	R-3				
CHANNEL TOP WIDTH (FT)@ D	18.70				
CHANNEL TOP WIDTH (FT)@ d	7.70				
CHANNEL SIDE SLOPES (H:V)	20:1/2:1				
CHANNEL BOTTOM WIDTH (FT)	0				
d (FLOW DEPTH IN FT)	0.35				
BOTTOM WIDTH:DEPTH RATIO (12:1 MAX)	--				
A (AREA IN SQ. FT.)	1.35				
R (HYDRAULIC RADIUS)	0.17				
S (BED SLOPE, FT/FT)*	0.033				
VEGETATIVE LINING RETARDANCE	--				
n (MANNING'S COEFFICIENT)**	0.0489				
V (AT FLOW DEPTH d, FS)	1.71				
Q (AT FLOW DEPTH d, CFS)	2.30				
Q_r (REQUIRED CAPACITY) CFS	2.20				
S_c (CRITICAL SLOPE)	0.063				
$.7S_c$	0.044				
$1.3S_c$	0.082				
STABLE FLOW? (Y/N)	N				
FREEBOARD BASED ON UNSTABLE FLOW FT	0.50				
FREEBOARD BASED ON STABLE FLOW FT	0.09				
MINIMUM REQUIRED FREEBOARD FT	0.50				
D (TOTAL DEPTH) FT	0.85				
d_{50} STONE SIZE (IN	6				
DESIGN METHOD FOR PROTECTIVE LINING **** PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)	V				
V_a (ALLOWABLE VELOCITY) FPS	6.5				
τ_d (SHEAR STRESS AT FLOW DEPTH d) LB/FT^2	0.71				
τ_a (MAX ALLOWABLE SHEAR STRESS) LB/FT^2	--				

*** Stationing based on centerline of road

* Slopes may not be averaged.
** For vegetated channels, provide data for temporary linings and vegetated conditions in separate columns.
*** Minimum Freeboard,F, is 0.5 ft.
**** Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is recommended for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

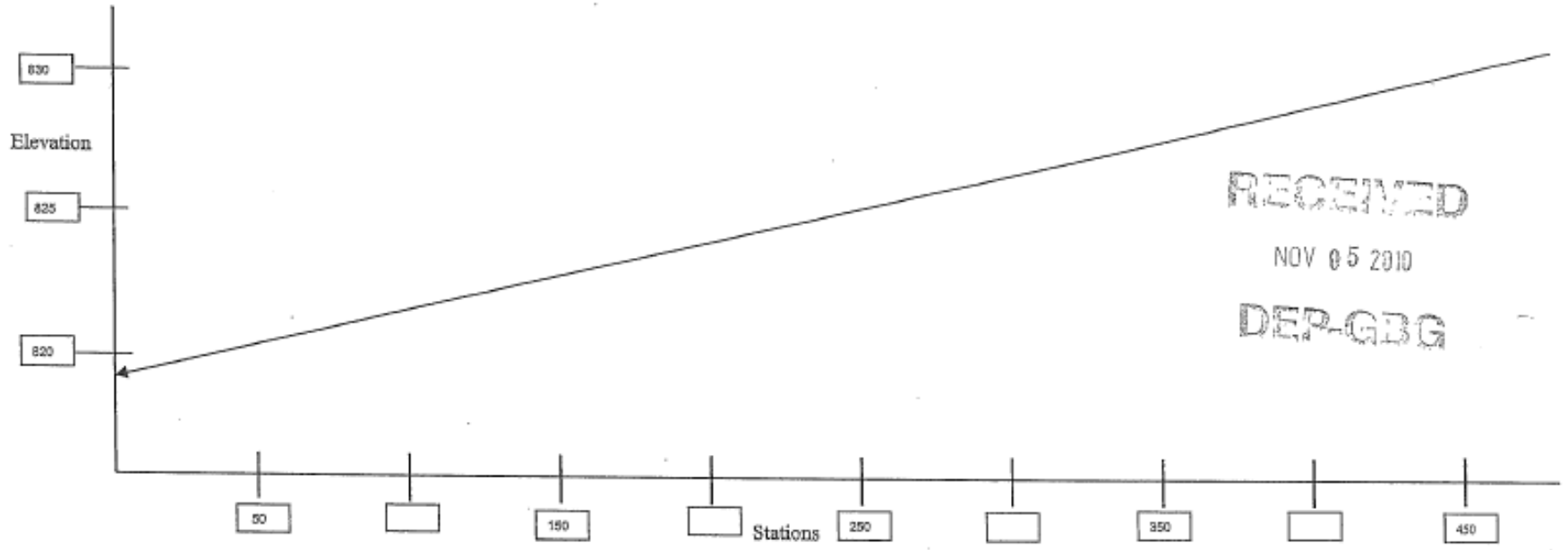
STANDARD WORKSHEET #21

5600-PM-MR0311 Rev. 3/2001

MODULE 12.1
DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch: **Collection Ditch CD-2**	Mine Operation Name: **Maggie Lynn Quarry**	Company: **Pennsylvania Coal Reclamation, Inc.**	Sheet 1 of 1
Channel Cross-Section Type: **Triangular**	Prepared by: **Earthtech, Inc.**	Telephone Number: **724-439-1313**	Date: **10-2010**

Station Start	Station End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope (%)	Curve Number	Peak Discharge Q cfs	Channel Bed Slope (%)	Freeboard (ft)	Channel Lining (specify average rock size)	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes L/R	Flow Area (sq.ft.)	Flow Depth (ft.)	Top Flow Width (ft)	Flow Velocity (ft/sec.)	Q Available cfs	With Freeboard: Channel Depth (ft.)	With Freeboard: Top Channel Width (ft.)	With Freeboard: Q Available cfs
0+00		819																			
5+03		830	5.2	25	5	85	21.85	2.2	0.5	R-3 Rip-Rap	0.045	0	3:1/3:1	5.59	1.41	8.41	3.73	21.92	1.91	11.43	40.64



PROFILE

12-7

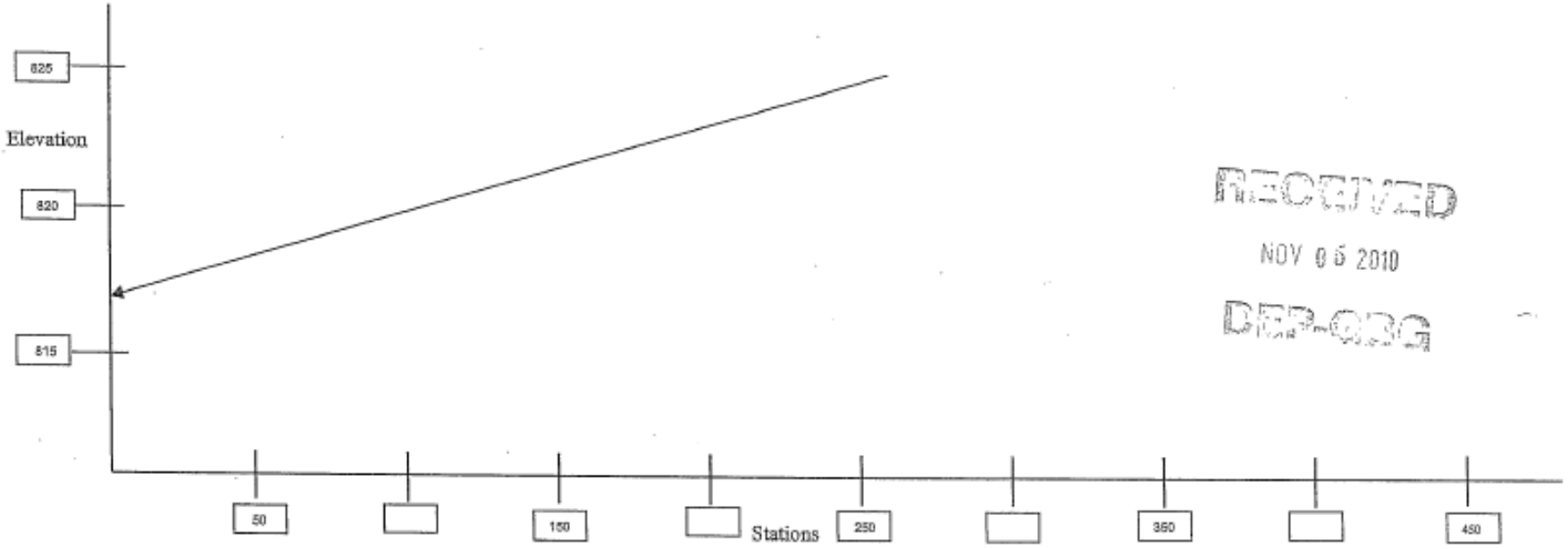
Vertical Scale 1" = 5'
Horizontal Scale 1" = 50'

5600-PM-MR0311 Rev. 3/2001

MODULE 12.1
DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch: **Collection Ditch C-3**	Mine Operation Name: **Maggie Lynn Quarry**	Company: **Pennsylvania Coal Reclamation, Inc.**	Sheet 1 of 1
Channel Cross-Section Type: **Triangular**	Prepared by: **Earthtech, Inc.**	Telephone Number: **724-439-1313**	Date: **10-2010**

Station Start	Station End	Elevation	Drainage Area (acres)	Design Storm (yrs.)	Average Watershed Slope (%)	Curve Number	Peak Discharge Q cfs	Channel Bed Slope (%)	Freeboard (ft)	Channel Lining (specify average rock size)	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes L/R	Flow Area (sq.ft.)	Flow Depth (ft.)	Top Flow Width (ft)	Flow Velocity (ft/sec.)	Q Available cfs	With Freeboard: Channel Depth (ft.)	With Freeboard: Top Channel Width (ft.)	With Freeboard: Q Available cfs
0+00		817																			
2+63		825	1.3	25	5.4	80	5.87	3.0	0.5	R-3 Rip-Rap	0.045	0	3:1/3:1	2.44	0.91	5.41	3.25	7.88	1.41	8.43	19.23



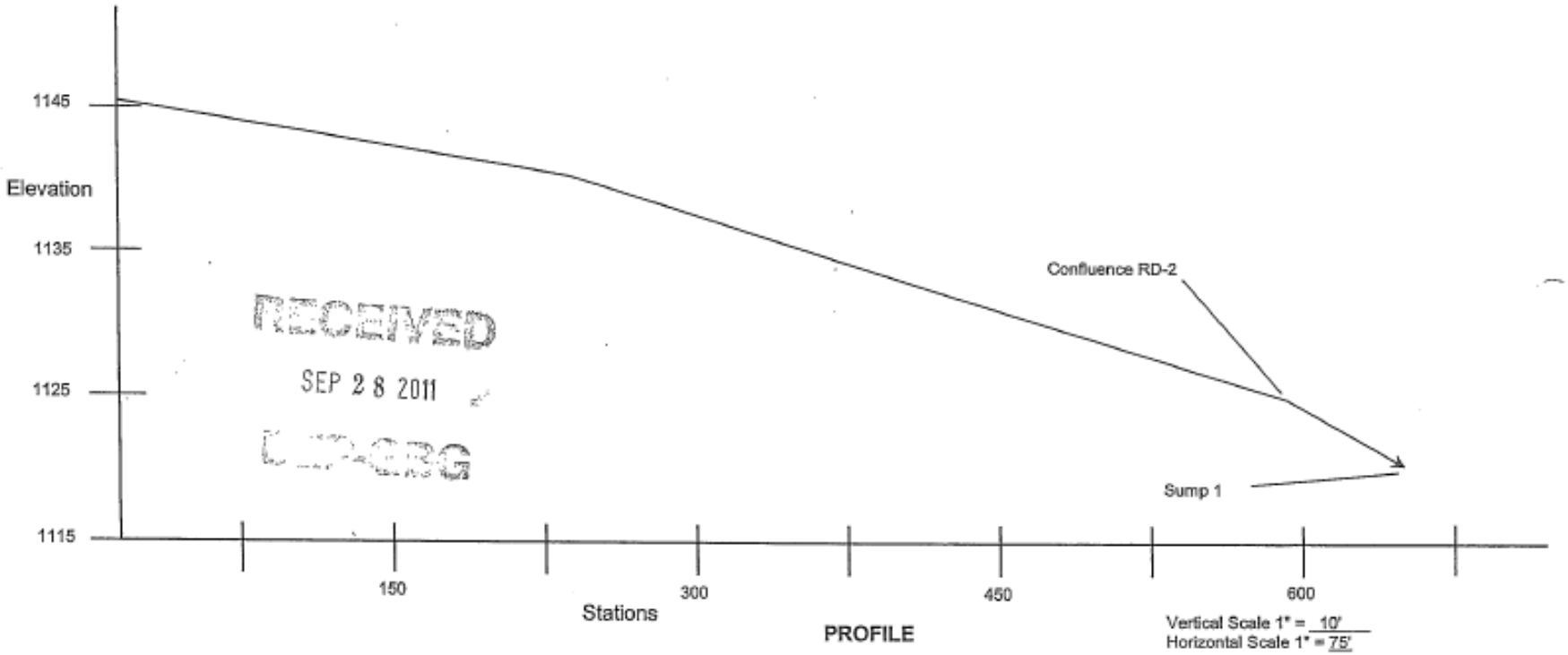
PROFILE

Vertical Scale 1" = 5'
Horizontal Scale 1" = 50'

MODULE 12.1
DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch: Collection (RD-1) Road Ditch	Mine Operation Name: Maggie Lynn	Company: Pennsylvania Coal Reclamation	Sheet ____ of ____
Channel Cross-Section Type: Triangular	Prepared by: Earthtech, Inc.	Telephone Number: 724-439-1313	Date: Sept 2011

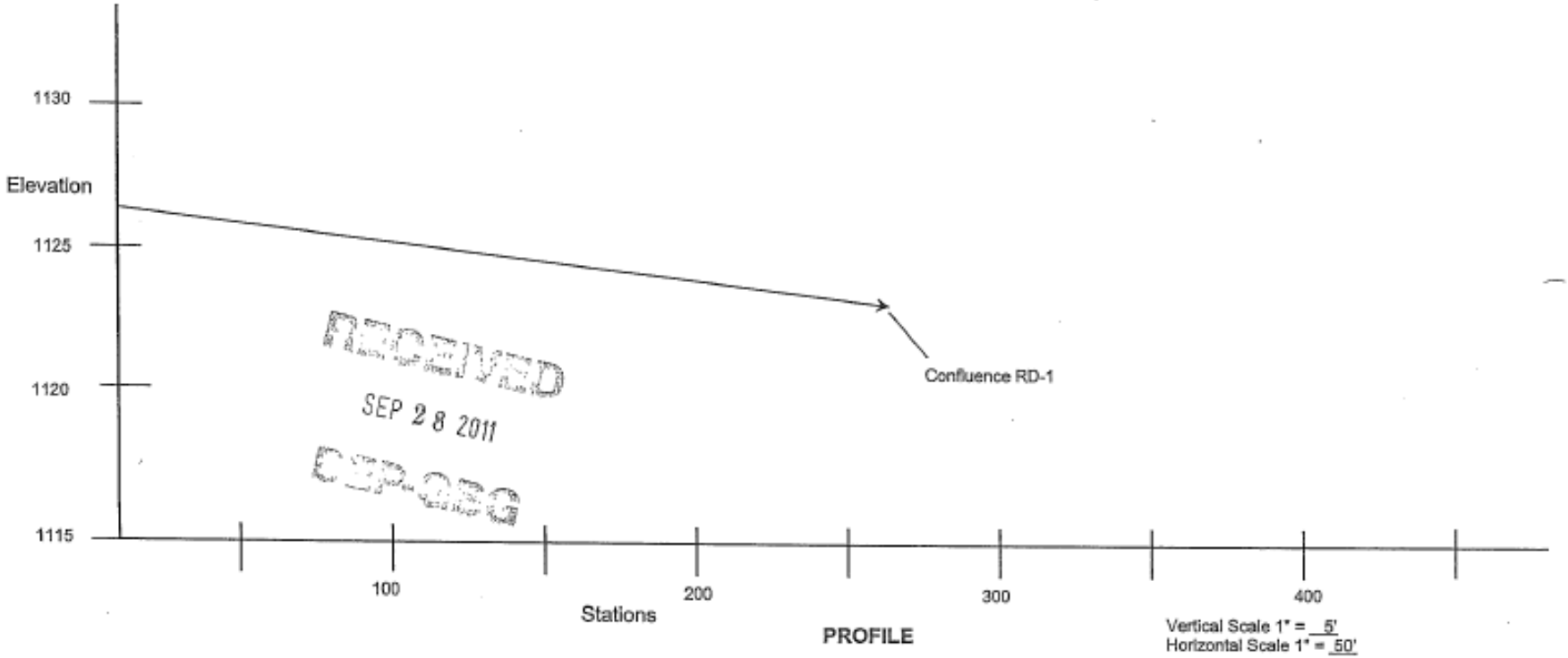
Station		Drainage Area	Design Storm	Average Watershed Slope	Curve Number	Peak Discharge Q	Channel Bed Slope	Freeboard	Channel Lining (specify average rock size)	Manning's Coefficient	Channel Bottom Width	Channel Side Slopes	Flow Area	Flow Depth	Top Flow Width	Flow Velocity	Q Available	With Freeboard		
Start End	Elevation	acres	(yrs.)	(%)		cfs	(%)	(ft)		(n)	(ft.)	L/R	(sq.ft.)	(ft.)	(ft)	(ft/sec.)	cfs	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available cfs
0+00	1145.8																			
2+40	1140.8	0.65	10	2.1	90	2.4	2.08	0.5	R-3 (3")	0.0466	0	3:1/20:1	1.84	0.40	9.20	1.57	2.88	0.9	20.70	25.0
5+90	1126.5	0.85	10	4.0	90	2.4	4.39	0.5	R-3 (3")	0.0466	0	3:1/20:1	1.84	0.40	9.20	2.27	4.16	0.9	20.70	36.3
6+50	1121.5	1.02	10	4.6	90	3.76	6.58	0.5	R-3 (3")	0.0466	0.0	3:1/20:1	1.84	0.40	9.20	2.78	5.12	0.9	20.70	44.5



MODULE 12.1
DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch: Collection (RD-2) Road Ditch	Mine Operation Name: Maggie Lynn	Company: Pennsylvania Coal Reclamation	Sheet _____ of _____
Channel Cross-Section Type: Triangular	Prepared by: Earthtech, Inc.	Telephone Number: 724-439-1313	Date: Sept 2011

Station		Drainage Area	Design Storm	Average Watershed Slope	Curve Number	Peak Discharge Q	Channel Bed Slope	Freeboard	Channel Lining (specify average rock size)	Manning's Coefficient	Channel Bottom Width	Channel Side Slopes	Flow Area	Flow Depth	Top Flow Width	Flow Velocity	Q Available	With Freeboard		
Start	End	Elevation	acres	(yrs.)	(%)		cfs	(%)	(ft)		(n)	(ft.)	L/R	(sq.ft.)	(ft.)	(ft)	(ft/sec.)	cfs	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available cfs
0+00		1128.2																			
2+60		1124.2	0.3	10	1	90	1.11	0.8	0.5	R-3 (3")	0.047	0	3:1/20:1	1.84	0.4	9.20	0.95	1.75	0.40	9.20	15.2



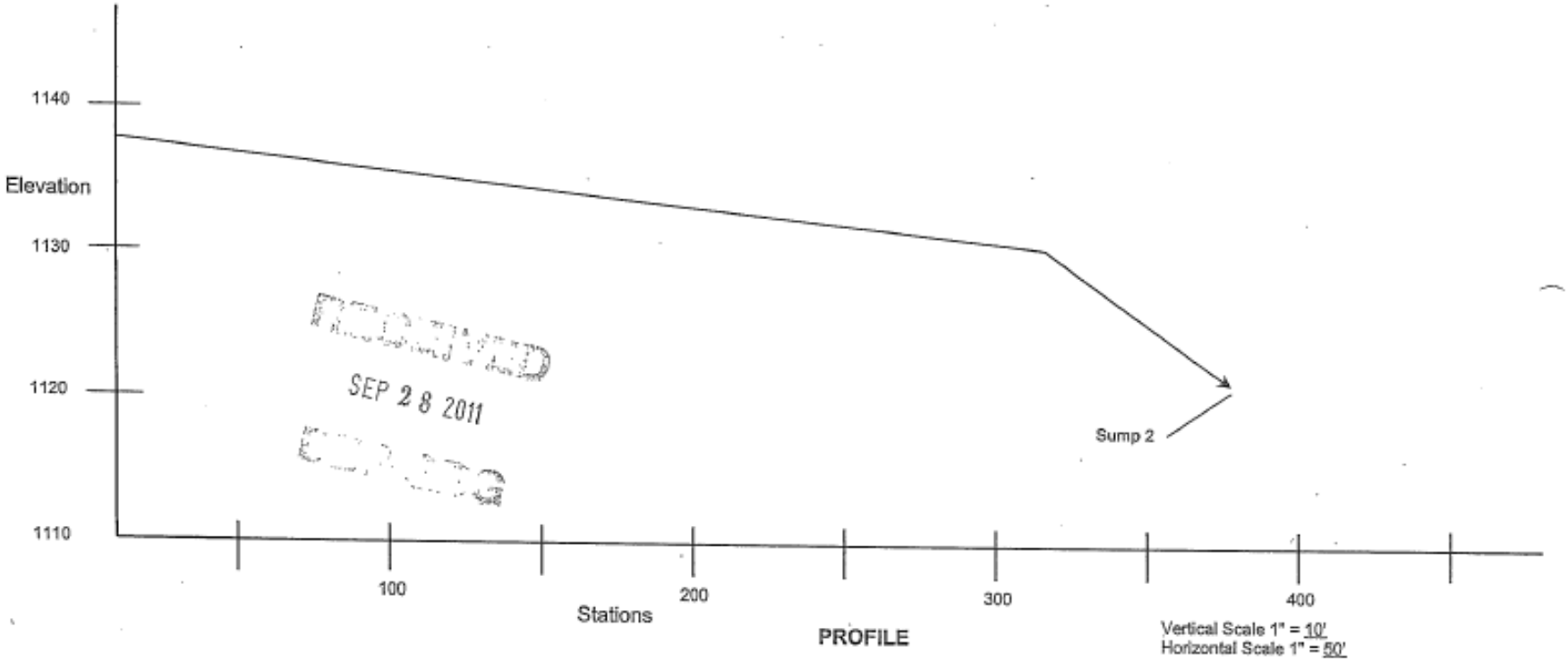
PROFILE

Vertical Scale 1" = 5'
Horizontal Scale 1" = 50'

MODULE 12.1
DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch: Collection (RD-3) Road Ditch	Mine Operation Name: Maggie Lynn	Company: Pennsylvania Coal Reclamation	Sheet _____ of _____
Channel Cross-Section Type: Trapezoidal	Prepared by: Earthtech, Inc.	Telephone Number: 724-439-1313	Date: Sept 2011

Station		Drainage Area	Design Storm	Average Watershed Slope	Curve Number	Peak Discharge Q	Channel Bed Slope	Freeboard	Channel Lining (specify average rock size)	Manning's Coefficient	Channel Bottom Width	Channel Side Slopes	Flow Area	Flow Depth	Top Flow Width	Flow Velocity	Q Available	With Freeboard		
Start End	Elevation	acres	(yrs.)	(%)		cfs	(%)	(ft)		(n)	(ft.)	L/R	(sq.ft.)	(ft.)	(ft)	(ft/sec.)	cfs	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available cfs
0+00	1137.7																			
3+20	1130.6	0.44	10	3	90	1.82	2.22	0.5	R-3 (3")	0.0501	0	3:1/20:1	1.25	0.33	7.59	1.32	1.65	0.83	19.09	19.4
3+80	1122.7	0.44	10	6	90	1.82	13.1	0.5	R-3 (3")	0.0501	0	3:1/20:1	1.25	0.33	7.59	3.21	4.02	0.83	19.09	47.0



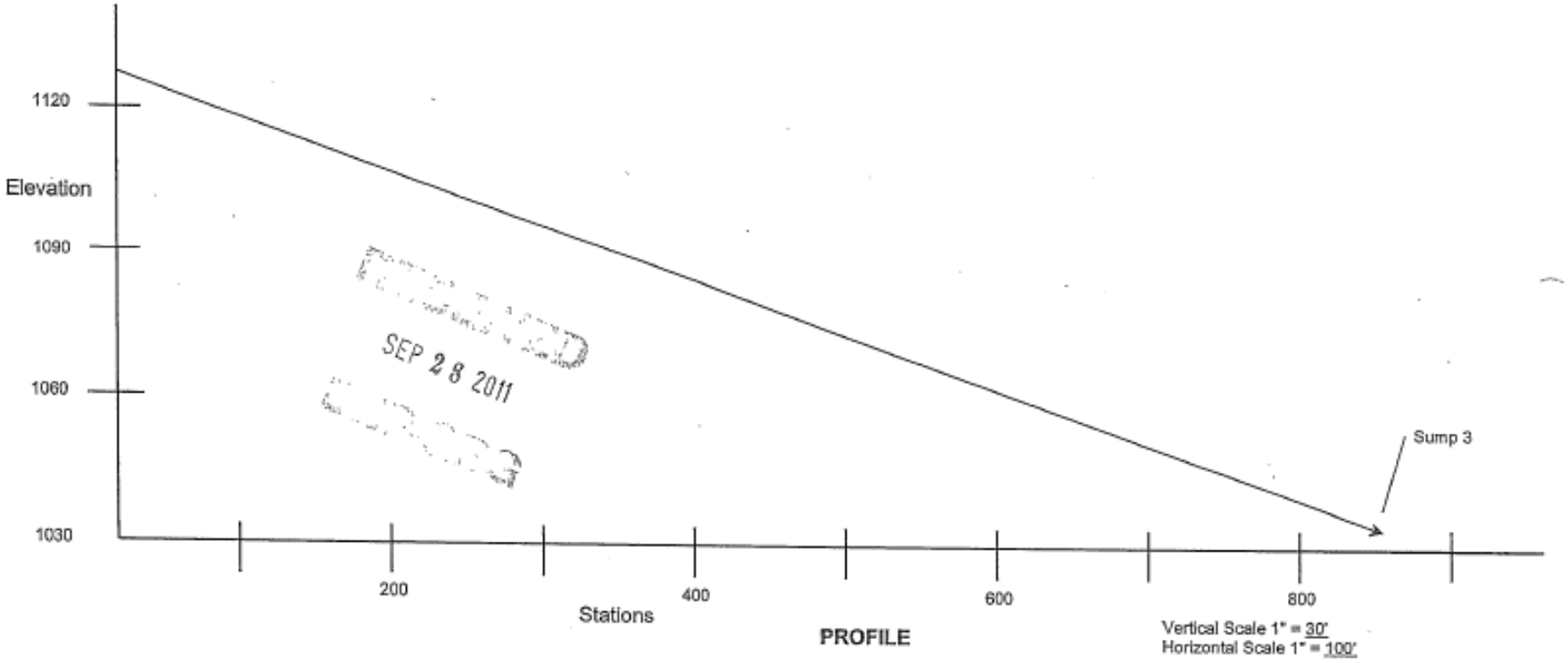
PROFILE

Vertical Scale 1" = 10'
Horizontal Scale 1" = 50'

MODULE 12.1
DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch: Collection (RD-4) Road Ditch	Mine Operation Name: Maggie Lynn	Company: Pennsylvania Coal Reclamation	Sheet _____ of _____
Channel Cross-Section Type: Trapezoidal	Prepared by: Earthtech, Inc.	Telephone Number: 724-439-1313	Date: Sept 2011

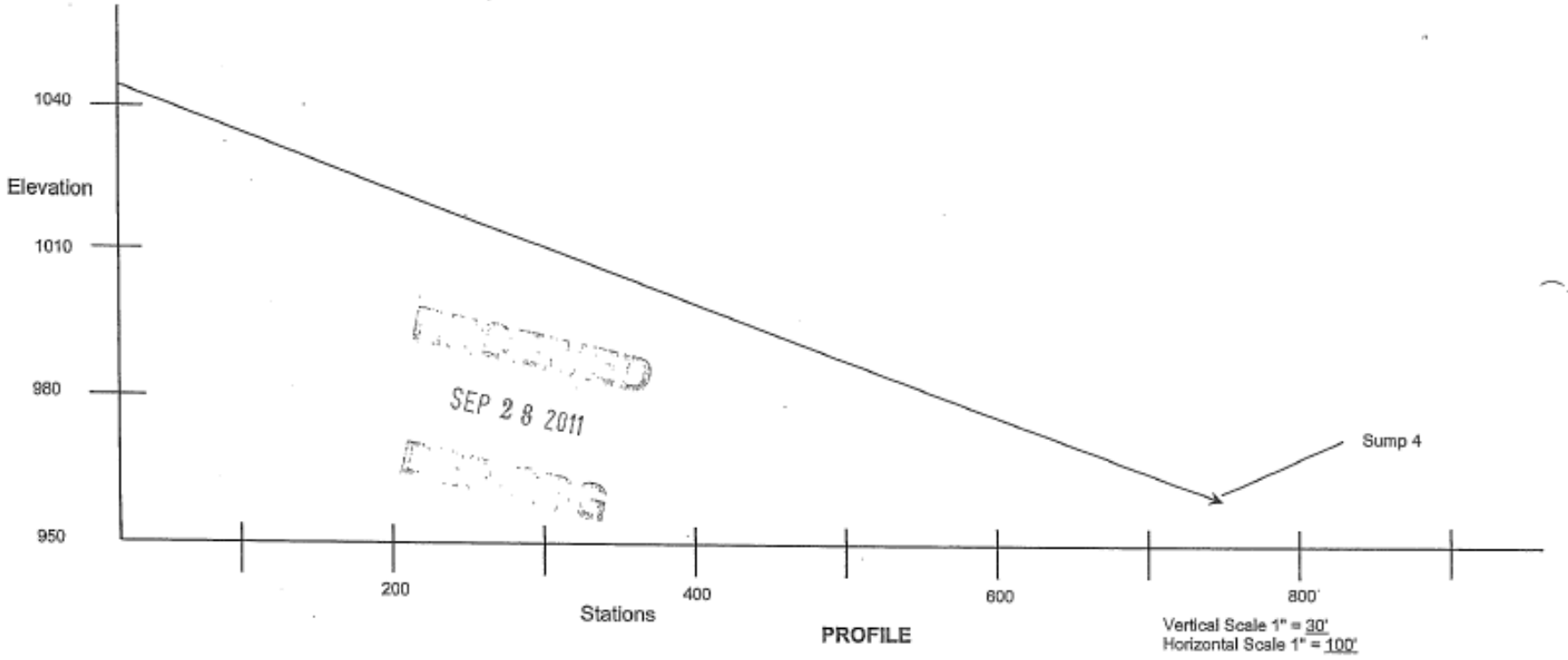
Station		Drainage Area	Design Storm	Average Watershed Slope	Curve Number	Peak Discharge Q	Channel Bed Slope	Freeboard	Channel Lining (specify average rock size)	Manning's Coefficient	Channel Bottom Width	Channel Side Slopes	Flow Area	Flow Depth	Top Flow Width	Flow Velocity	Q Available	With Freeboard		
Start End	Elevation	acres	(yrs.)	(%)		cfs	(%)	(ft)		(n)	(ft.)	L/R	(sq.ft.)	(ft.)	(ft)	(ft/sec.)	cfs	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available cfs
0+00	1.8																			
3+71	1089.7	0.43	10	11	90	1.58	10.8	0.5	R-3 (3")	0.0521	0	3:1/20:1	1.04	0.30	6.90	2.63	2.72	0.80	18.40	37.2
8+54	1034.6	0.98	10	12.5	90	3.61	14.8	0.5	R-3 (3")	0.0501	0	3:1/20:1	1.25	0.33	7.59	3.42	4.28	0.83	19.09	50.1



MODULE 12.1
DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch: Collection (RD-5) Road Ditch	Mine Operation Name: Maggie Lynn	Company: Pennsylvania Coal Reclamation	Sheet ____ of ____
Channel Cross-Section Type: Trapezoidal	Prepared by: Earthtech, Inc.	Telephone Number: 724-439-1313	Date: Sept 2011

Station																		With Freeboard		
Start End	Elevation	Drainage Area acres	Design Storm (yrs.)	Average Watershed Slope (%)	Curve Number	Peak Discharge Q cfs	Channel Bed Slope (%)	Freeboard (ft)	Channel Lining (specify average rock size)	Manning's Coefficient (n)	Channel Bottom Width (ft.)	Channel Side Slopes L/R	Flow Area (sq.ft.)	Flow Depth (ft.)	Top Flow Width (ft)	Flow Velocity (ft/sec.)	Q Available cfs	Channel Depth (ft.)	Top Channel Width (ft.)	Q Available cfs
0+00	1045.8																			
7+51.6	962.1	0.86	10	11	90	3.17	11.1	0.5	R-3 (3")	0.0501	0	3:1/20:1	1.25	0.33	7.59	2.96	3.71	0.83	19.09	43.4



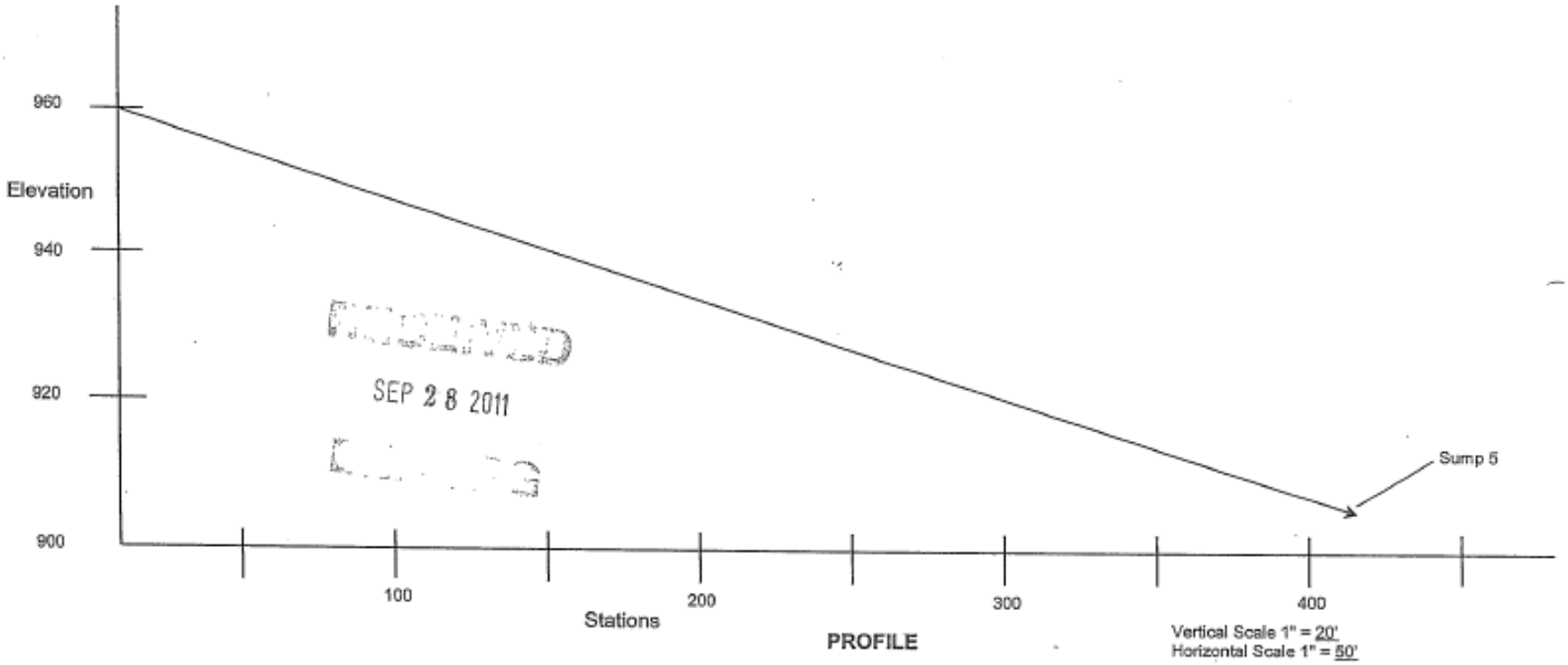
PROFILE

Vertical Scale 1" = 30'
Horizontal Scale 1" = 100'

MODULE 12.1
DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch: Collection (RD-6) Road Ditch	Mine Operation Name: Maggie Lynn	Company: Pennsylvania Coal Reclamation	Sheet _____ of _____
Channel Cross-Section Type: Trapezoidal	Prepared by: Earthtech, Inc.	Telephone Number: 724-439-1313	Date: Sept 2011

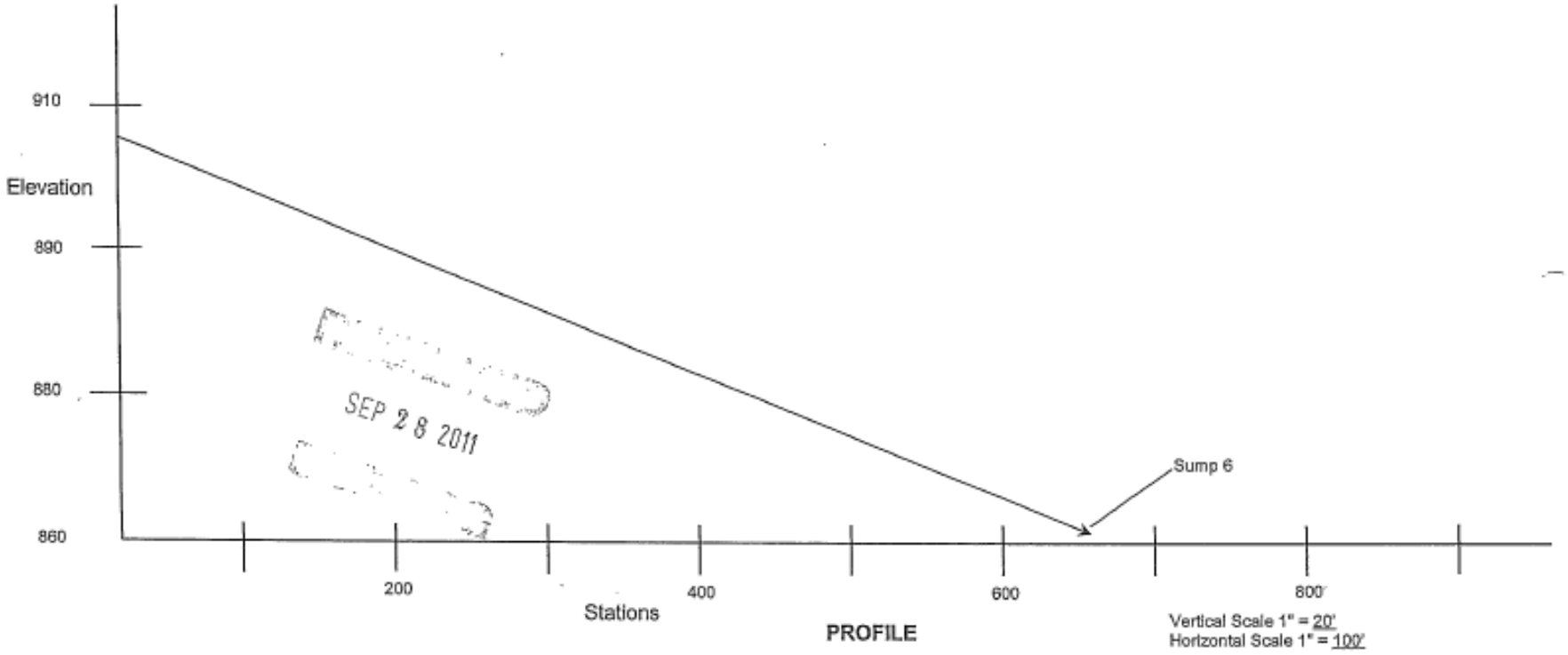
Station		Drainage Area	Design Storm	Average Watershed Slope	Curve Number	Peak Discharge Q	Channel Bed Slope	Freeboard	Channel Lining (specify average rock size)	Manning's Coefficient	Channel Bottom Width	Channel Side Slopes	Flow Area	Flow Depth	Top Flow Width	Flow Velocity	Q Available	With Freeboard		
Start	End	Elevation																Channel Depth	Top Channel Width	Q Available
		acres	(yrs.)	(%)		cfs	(%)	(ft)		(n)	(ft.)	L/R	(sq.ft.)	(ft.)	(ft)	(ft/sec.)	cfs	(ft.)	(ft.)	cfs
0+00	960.1																			
4+15	956.9	.48	10	13	90	1.77	12.8	0.5	R-3 (9")	0.0521	0	3:1/20:1	1.04	0.30	6.90	2.87	2.97	0.80	18.40	40.8



MODULE 12.1
DIVERSION/COLLECTION DITCH DATA SHEET

Type Ditch: Collection (RD-7) Road Ditch	Mine Operation Name: Maggie Lynn	Company: Pennsylvania Coal Reclamation	Sheet _____ of _____
Channel Cross-Section Type: Trapezoidal	Prepared by: Earthtech, Inc.	Telephone Number: 724-439-1313	Date: Sept 2011

Station		Drainage Area	Design Storm	Average Watershed Slope	Curve Number	Peak Discharge Q	Channel Bed Slope	Freeboard	Channel Lining (specify average rock size)	Manning's Coefficient	Channel Bottom Width	Channel Side Slopes	Flow Area	Flow Depth	Top Flow Width	Flow Velocity	Q Available	With Freeboard		
Start	End	Elevation																Channel Depth	Top Channel Width	Q Available
		acres	(yrs.)	(%)		cfs	(%)	(ft)		(n)	(ft.)	L/R	(sq.ft.)	(ft.)	(ft)	(ft/sec.)	cfs	(ft.)	(ft.)	cfs
0+00		906.9																		
6+60		862.3	0.76	10	7	90	2.80	6.76	0.5	R-3 (9")	0.0501	0	3:1/20:1	1.25	0.33	7.59	2.31	2.89	0.83	19.09	33.8



PROJECT NAME: Maggie Lynn
LOCATION: Deemston Borough, Washington County
PREPARED BY: L. Brock DATE: Sept 2011
CHECKED BY: DATE:

SEP 28 2011

Road Sump Storage Volume

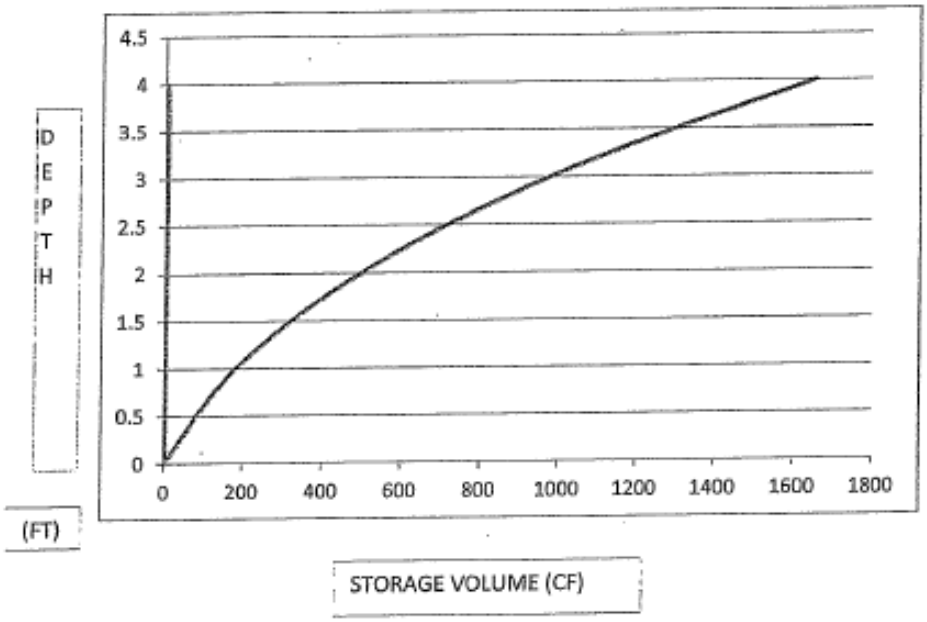
Sump 1 Area Controlled 1.03 Acres

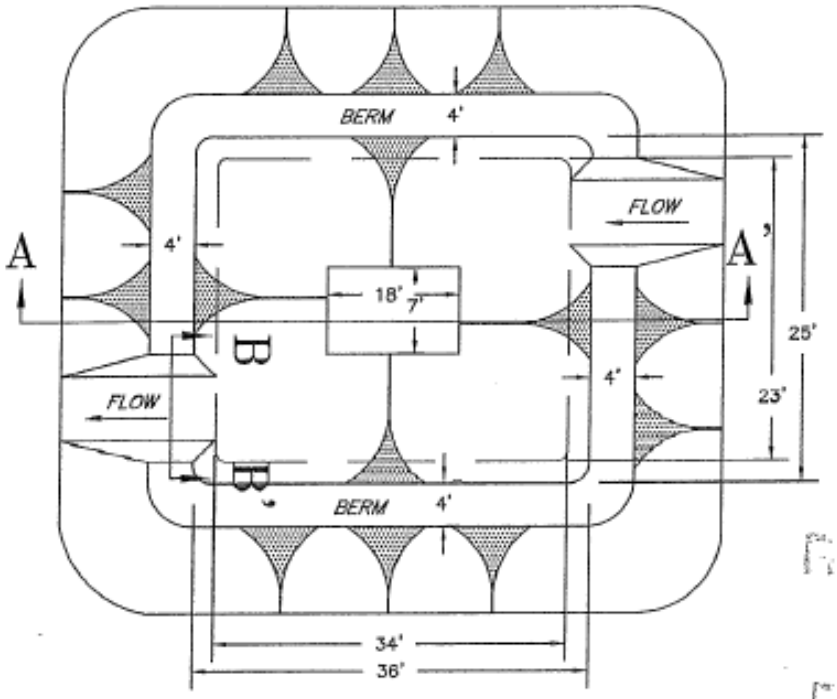
Required Volume 1648 cu. ft.

length at bottom = 18 width at bottom = 7

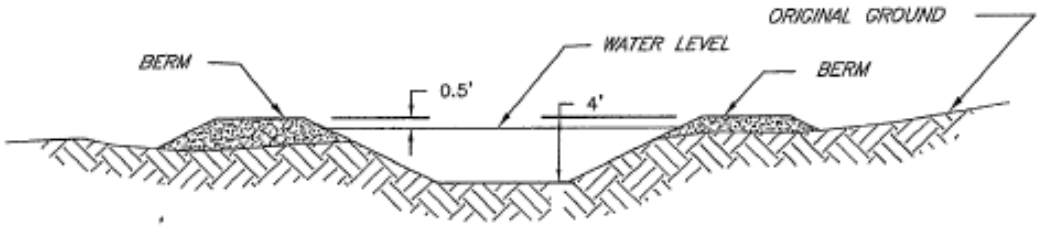
DEPTH (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ. FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET) INCREMENTAL	TOTAL
		0	0	0	
0	126				0
		184	1	184	
1	242				184
		316	1	316	
2	390				500
		480	1	480	
3	570				980
		676	1	676	
4	782				1656

STAGE STORAGE CURVE



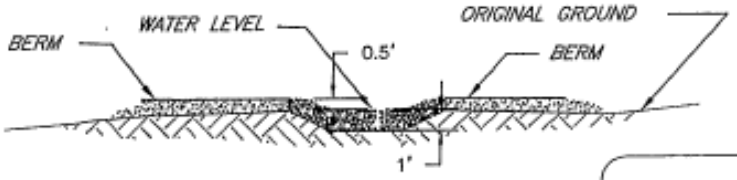


PLAN VIEW



SECTION A–A'

INSPECT AND REPAIR SUMP AFTER EACH STORM AND REMOVE SEDIMENT WHEN NECESSARY.



SECTION B–B'

ROAD SUMP DETAIL

SUMP 1

NOT TO SCALE

FILE: SEDTRAP

PROJECT NAME: Maggie Lynn
LOCATION: Deemston Borough, Washington County
PREPARED BY: L. Brock DATE: Sept 2011
CHECKED BY: DATE:

SEP 28 2011

Road Sump Storage Volume

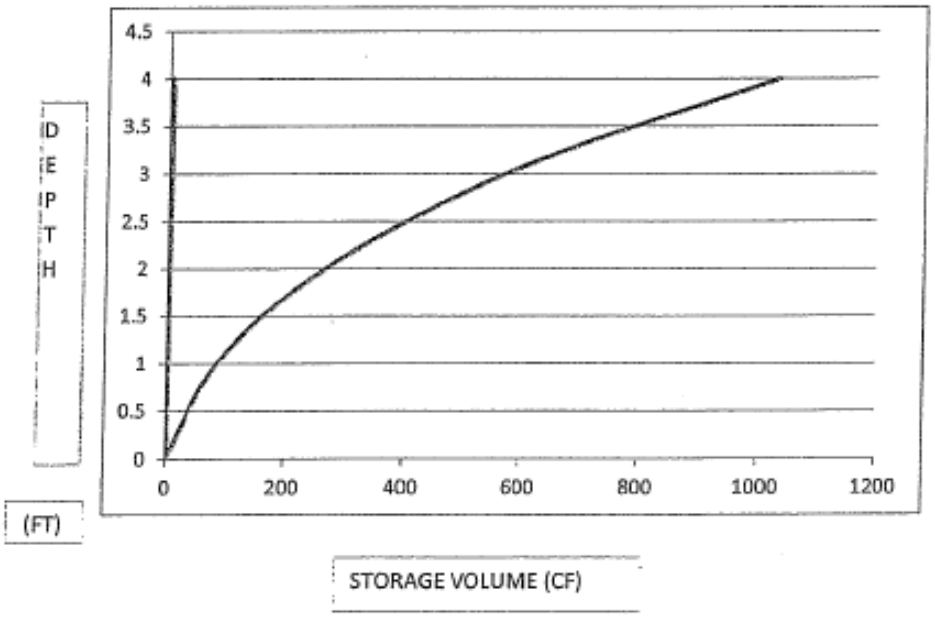
Sump **2** Area Controlled 0.44 Acres

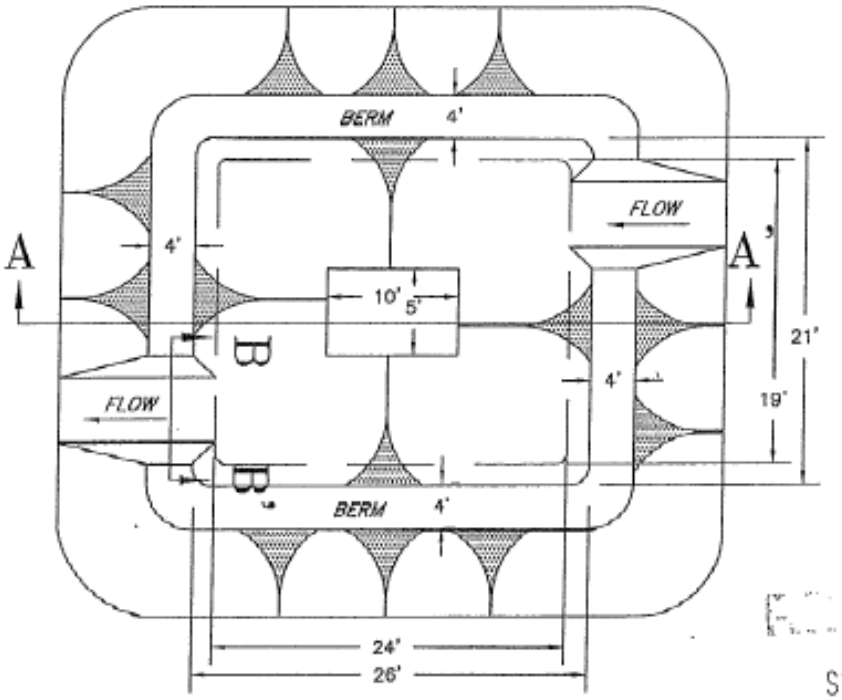
Required Volume 704 cu. ft.

length at bottom = 10 width at bottom = 5

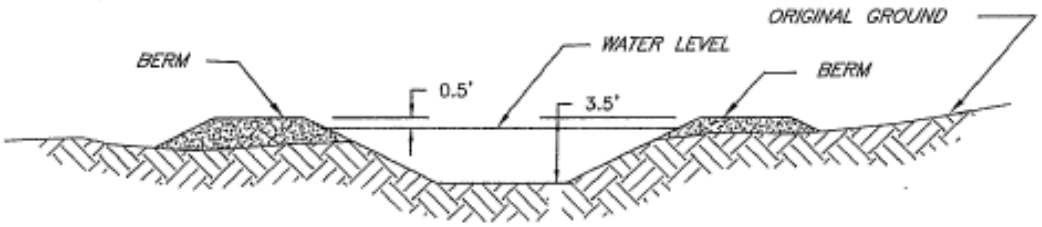
DEPTH (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ. FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET) INCREMENTAL	TOTAL
		0	0	0	
0	50				0
		88	1	88	
1	126				88
		180	1	180	
2	234				268
		304	1	304	
3	374				572
		460	1	460	
4	546				1032

STAGE STORAGE CURVE



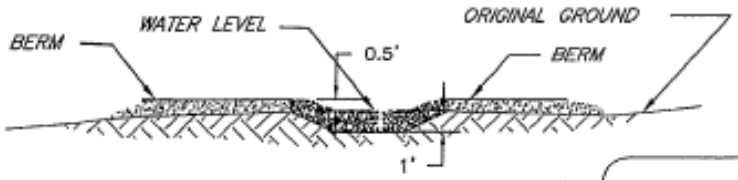


PLAN VIEW



SECTION A–A'

INSPECT AND REPAIR SUMP AFTER EACH STORM AND REMOVE SEDIMENT WHEN NECESSARY.



SECTION B–B'

ROAD SUMP DETAIL

SUMP 2

NOT TO SCALE

FILE: SEDTRAP

PROJECT NAME: Maggie Lynn
LOCATION: Deemston Borough, Washington County
PREPARED BY: L. Brock DATE: Sept 2011
CHECKED BY: DATE:

SEP 28 2011

Road Sump Storage Volume

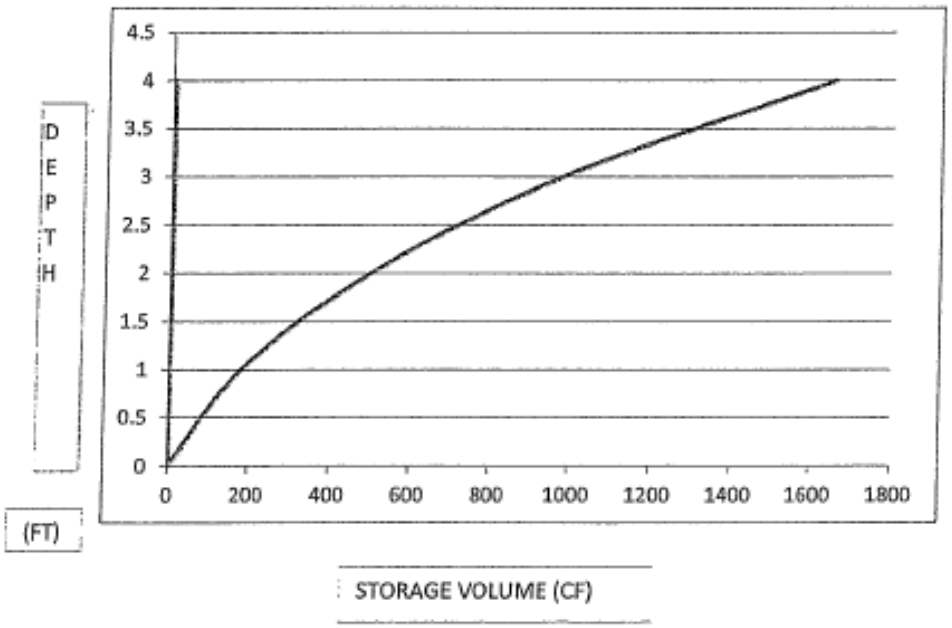
Sump **3** Area Controlled 0.98 Acres

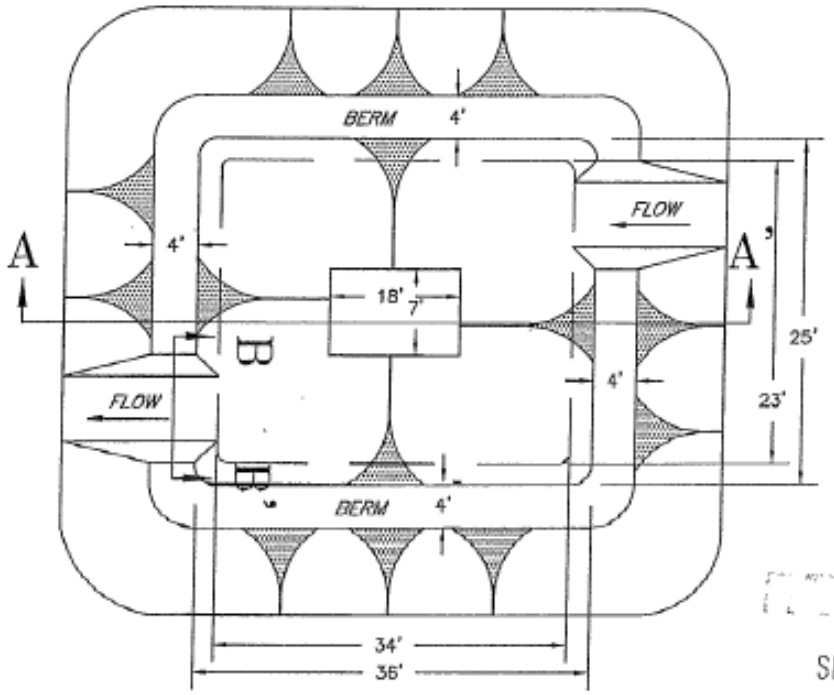
Required Volume 1568 cu. ft.

length at bottom = 18 width at bottom = 7

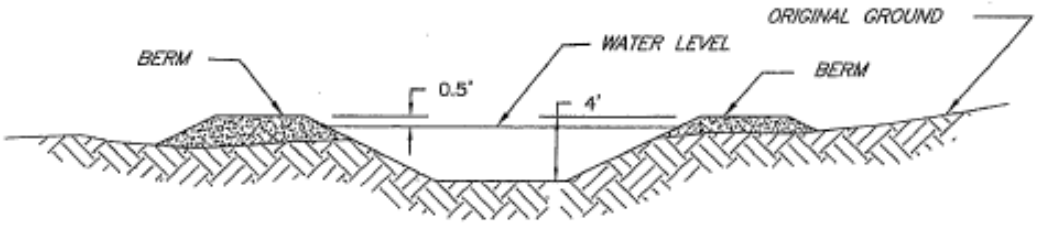
DEPTH (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ. FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET) INCREMENTAL	TOTAL
		0	0	0	
0	126				0
		184	1	184	
1	242				184
		316	1	316	
2	390				500
		480	1	480	
3	570				980
		676	1	676	
4	782				1656

STAGE STORAGE CURVE



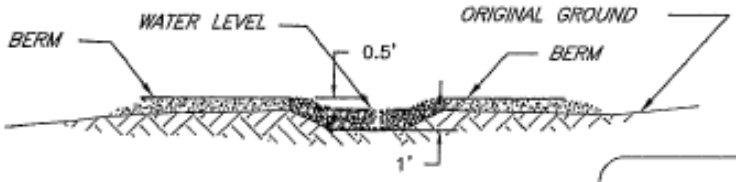


PLAN VIEW



SECTION A–A'

INSPECT AND REPAIR SUMP AFTER EACH STORM AND REMOVE SEDIMENT WHEN NECESSARY.



SECTION B–B'

ROAD SUMP DETAIL

SUMP 3

NOT TO SCALE

FILE: SEDTRAP

PROJECT NAME: Maggie Lynn
LOCATION: Deemston Borough, Washington County
PREPARED BY: L. Brock DATE: Sept 2011
CHECKED BY: DATE:

Road Sump Storage Volume

Sump **4** Area Controlled 0.8 Acres

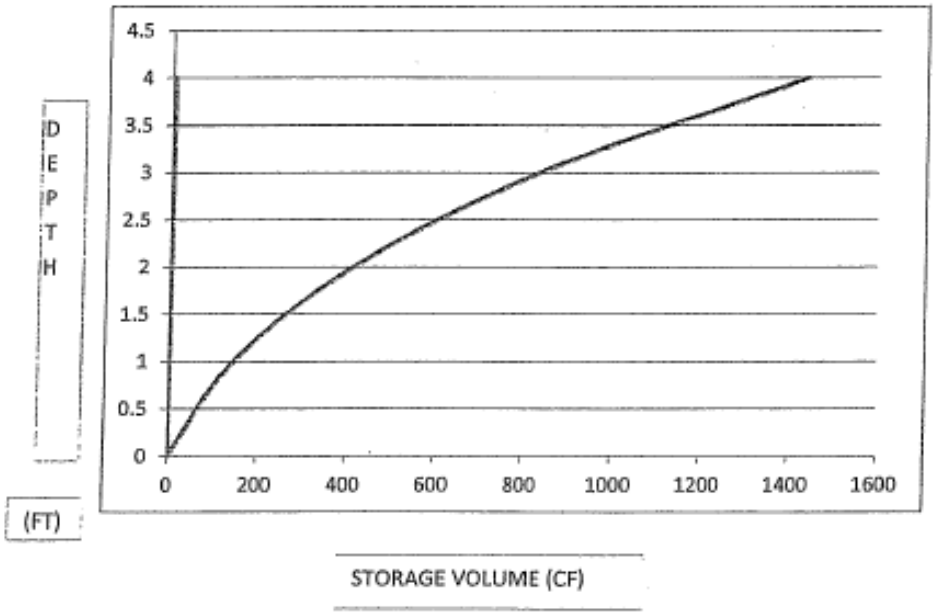
SEP 2 8 2011

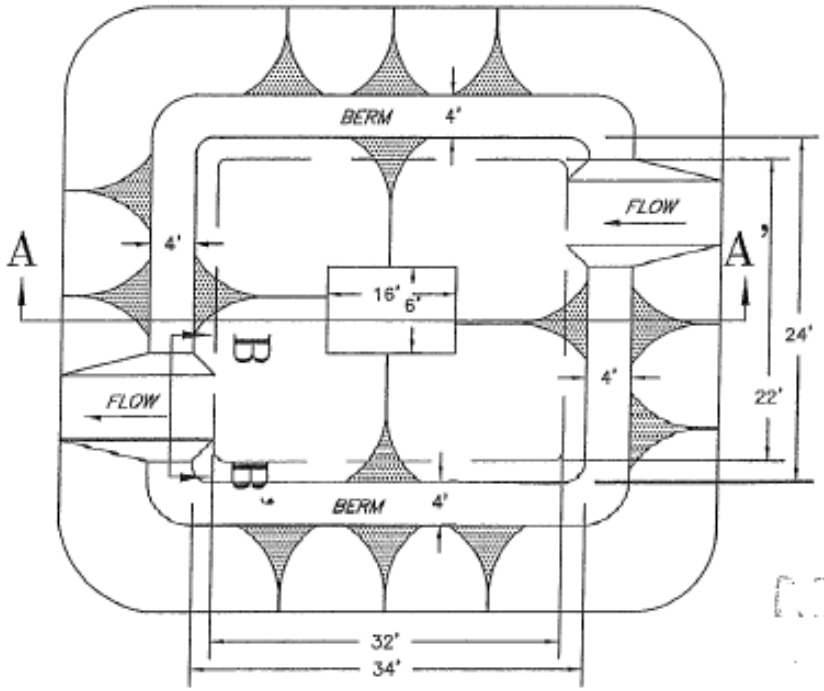
Required Volume 1280 cu. ft.

length at bottom = 16 width at bottom = 6

DEPTH (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ. FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET) INCREMENTAL	TOTAL
		0	0	0	
0	96				0
		148	1	148	
1	200				148
		268	1	268	
2	336				416
		420	1	420	
3	504				836
		604	1	604	
4	704				1440

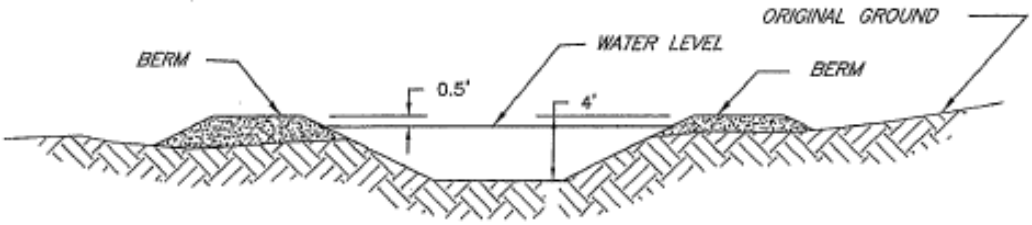
STAGE STORAGE CURVE





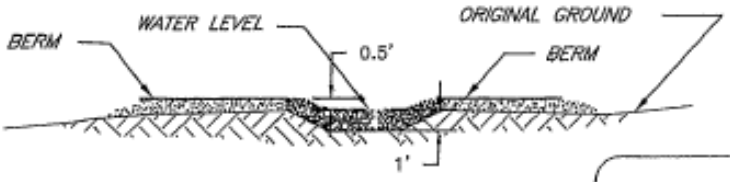
SEP 2 8 2011

PLAN VIEW



SECTION A–A'

INSPECT AND REPAIR SUMP AFTER EACH STORM AND REMOVE SEDIMENT WHEN NECESSARY.



SECTION B–B'

ROAD SUMP DETAIL

SUMP 4

NOT TO SCALE

FILE: SEDTRAP

PROJECT NAME: Maggie Lynn
LOCATION: Deemston Borough, Washington County
PREPARED BY: L. Brock DATE: Sept 2011
CHECKED BY: DATE:

RECEIVED
SEP 28 2011

Road Sump Storage Volume

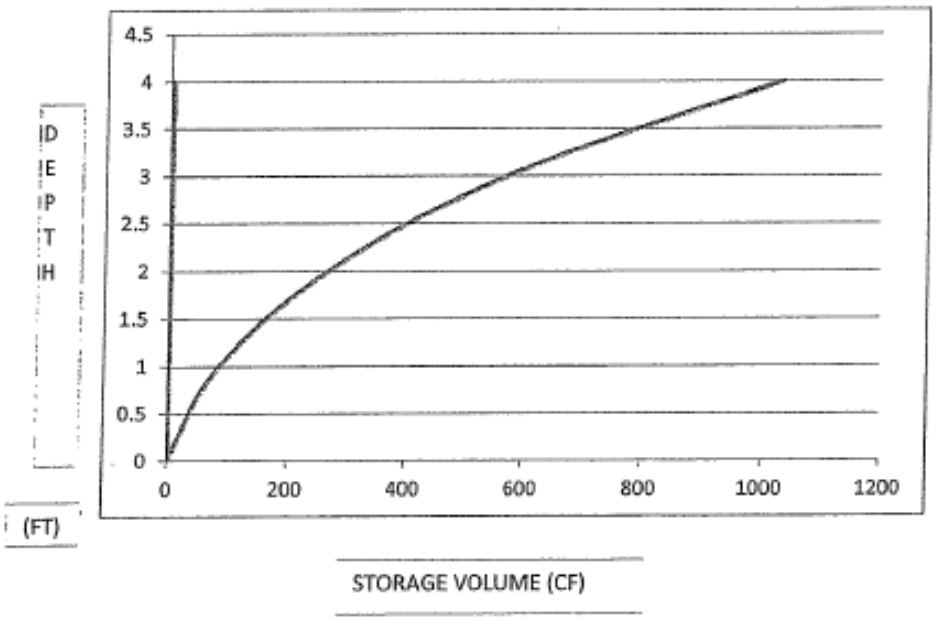
Sump 5 Area Controlled 0.48 Acres

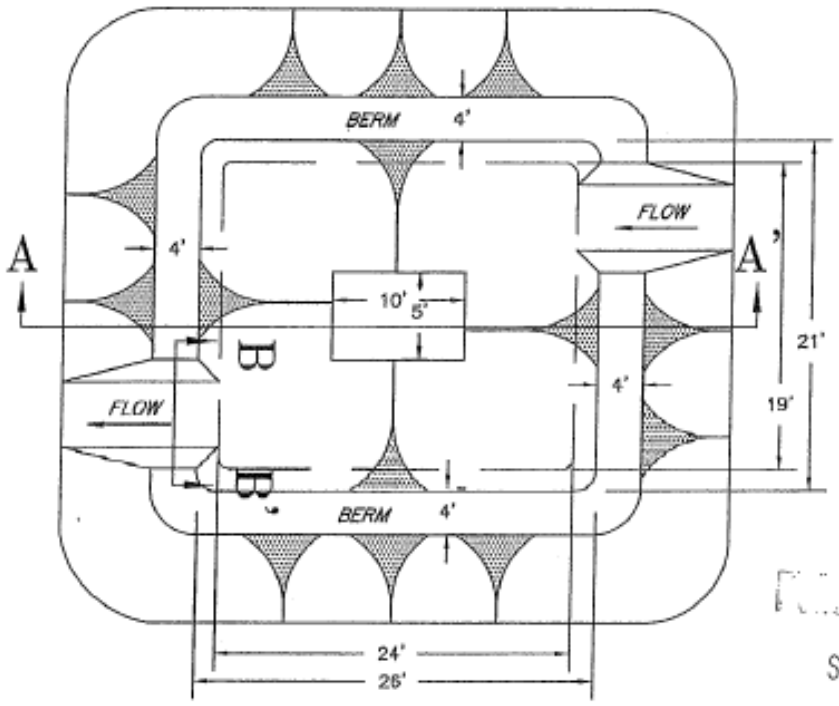
Required Volume 768 cu. ft.

length at bottom = 10 width at bottom = 5

DEPTH (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ. FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET) INCREMENTAL	TOTAL
		0	0	0	
0	50				0
		88	1	88	
1	126				88
		180	1	180	
2	234				268
		304	1	304	
3	374				572
		460	1	460	
4	546				1032

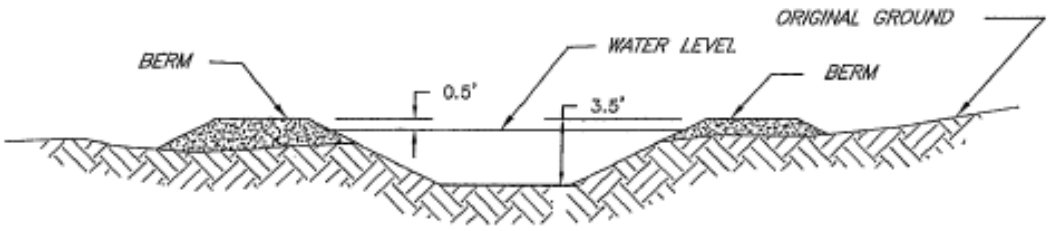
STAGE STORAGE CURVE





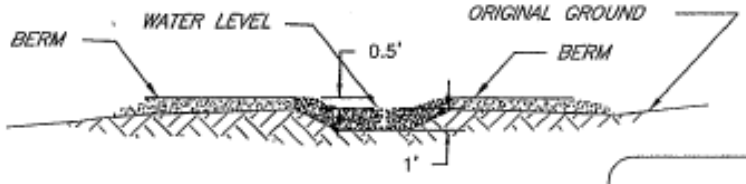
PLAN VIEW

SEP 2 8 2011



SECTION A–A'

INSPECT AND REPAIR SUMP AFTER EACH STORM AND REMOVE SEDIMENT WHEN NECESSARY.



SECTION B–B'

ROAD SUMP DETAIL

SUMP 5

NOT TO SCALE

FILE: SEDTRAP

PROJECT NAME: Maggie Lynn
LOCATION: Deemston Borough, Washington County
PREPARED BY: L. Brock DATE: Sept 2011
CHECKED BY: DATE:

Road Sump Storage Volume

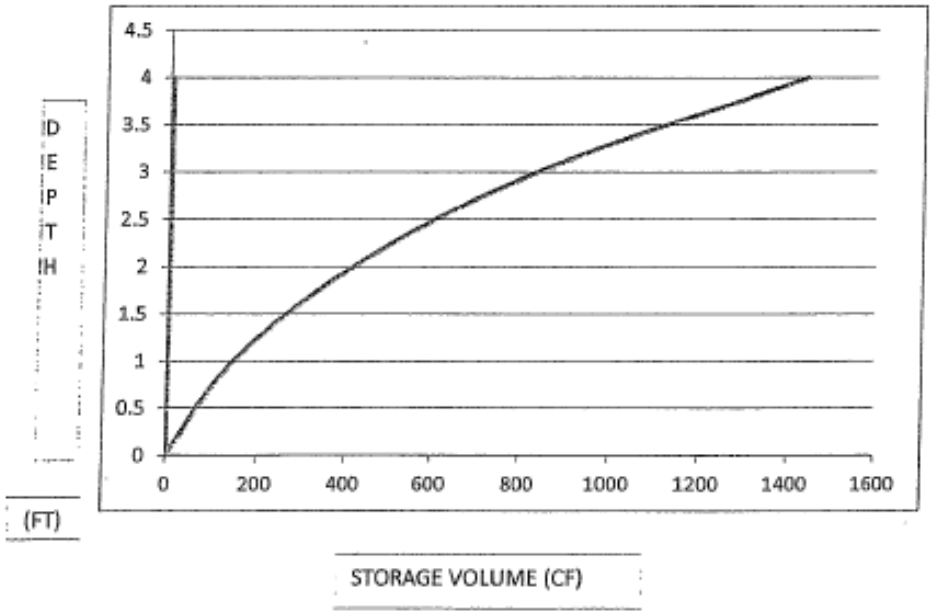
Sump 6 Area Controlled 0.76 Acres

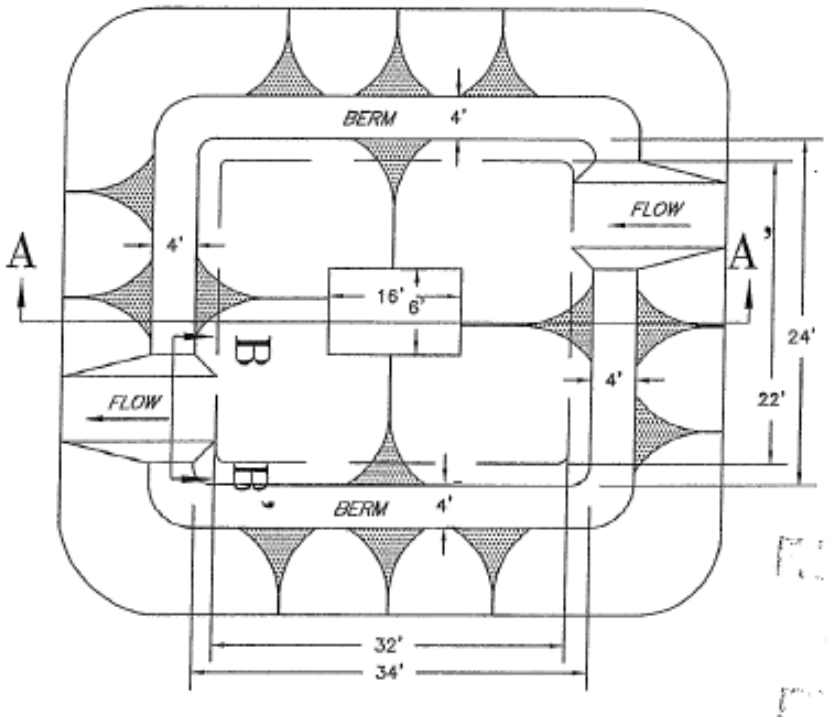
Required Volume 1216 cu. ft.

length at bottom = 16 width at bottom = 6

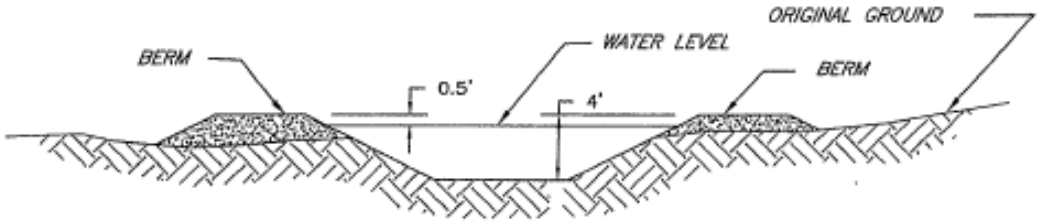
DEPTH (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ. FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET) INCREMENTAL	TOTAL
		0	0	0	
0	96				0
		148	1	148	
1	200				148
		268	1	268	
2	336				416
		420	1	420	
3	504				836
		604	1	604	
4	704				1440

STAGE STORAGE CURVE



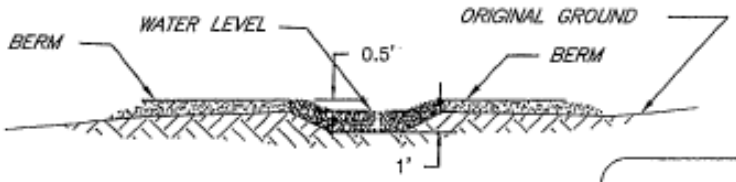


PLAN VIEW



SECTION A–A'

INSPECT AND REPAIR SUMP AFTER EACH STORM AND REMOVE SEDIMENT WHEN NECESSARY.



SECTION B–B'

ROAD SUMP DETAIL

SUMP 6

NOT TO SCALE

FILE: SEDTRAP

STANDARD WORKSHEET #8
Sediment Trap Data

PROJECT NAME: Deemston
LOCATION: Deemston Borough, Washington County
PREPARED BY: L. Brock DATE: July 2010
CHECKED BY: _____ DATE: _____

TRAP NUMBER	ST-1					
DRAINAGE AREA (5 ACRES MAX) AC	5.0					
REQUIRED CAPACITY (2000 CF/AC) CF	10000					
* AVERAGE BOTTOM LENGTH (FT)	70					
* AVERAGE BOTTOM WIDTH (FT)	25					
BOTTOM ELEVATION (FT)	816					
TOP OF EMBANKMENT ELEVATION	821					
CREST OF SPILLWAY ELEVATION	819.85					
CLEAN-OUT ELEVATION (@ 700CF/AC)	817.7					
FLOW LENGTH/WIDTH RATIO (2:1 MIN)	2.8:1					

EMBANKMENT SPILLWAYS

OUTLET WIDTH (FT) (GREATER OF 2 x # AC OR 2 x h)	10					
OUTLET SIDE SLOPES (2:1 MIN.)	2:1					

RISER PIPE SPILLWAYS

Dr (RISER DIAMETER, 8" MIN.)	Dugout					
Db (BARREL DIAMETER, 6" MIN.)	To be					
BARREL OUTLET ELEVATION (FT)	Pumped					
MAX WATER SURFACE ELEVATION (@ 1.5 CFS/AC. DISCHARGE)						

OUTLET BASIN

LENGTH (6 Db) Ft.						
WIDTH (3 Db) Ft.						
RIPRAP PROTECTION (Size)						

* For irregular shaped traps, provide stage storage data.

NOTE: Add data from this worksheet to worksheet #9 or #10 and show information on plan drawings.

STANDARD WORKSHEET #14
Sediment Trap Storage Data

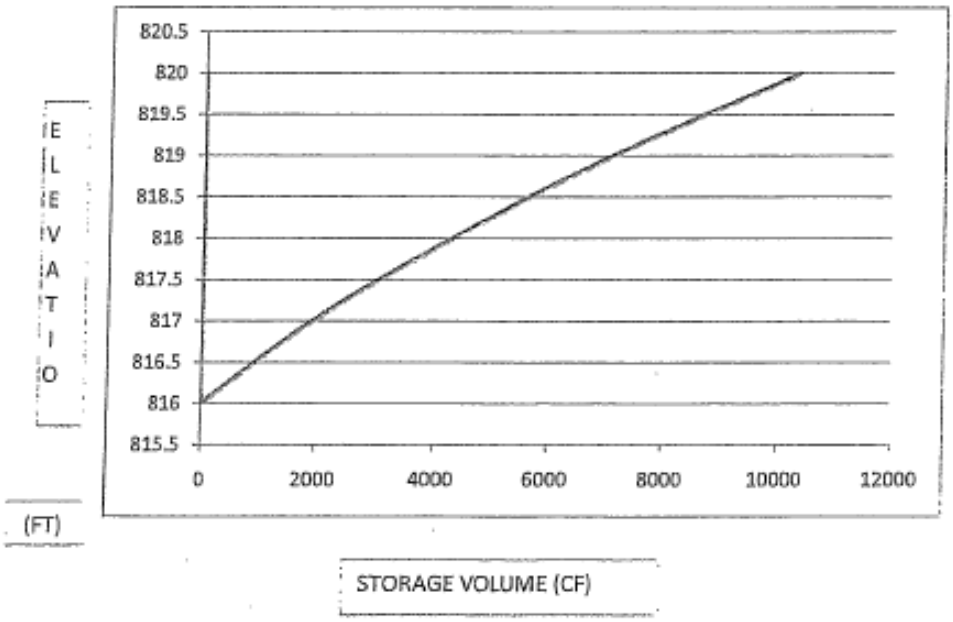
Trap ST-1

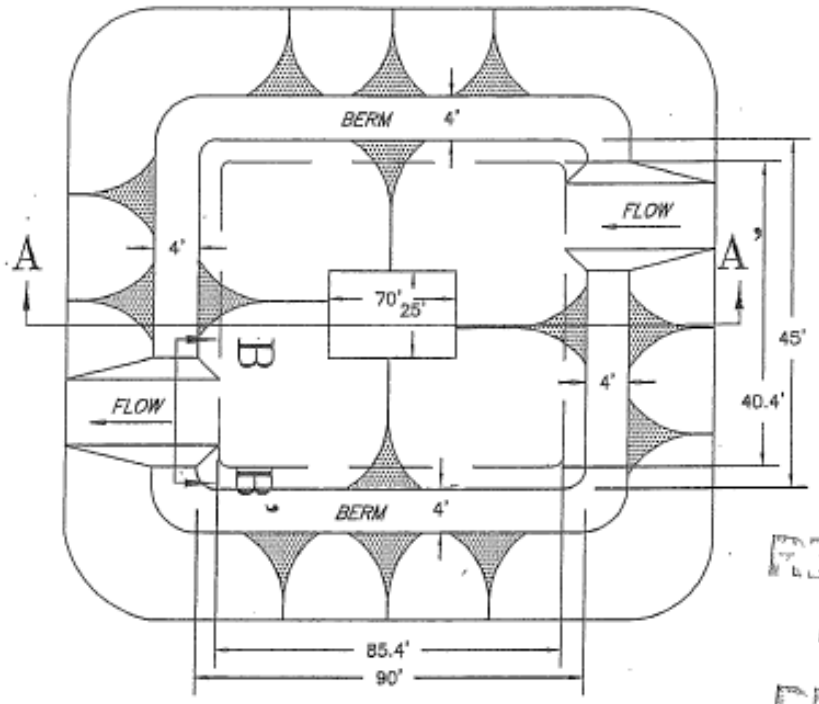
PROJECT NAME: Deemston
LOCATION: Deemston Borough, Washington County
PREPARED BY: L. Brock DATE: JULY 2010
CHECKED BY: DATE:

length at bottom = 70 width at bottom = 25

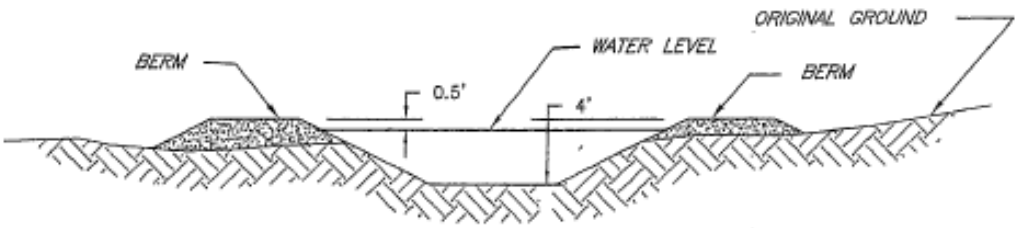
WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ. FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET) INCREMENTAL	TOTAL
		0	0	0	
816	1750				0
		1948	1	1948	
817	2146				1948
		2360	1	2360	
818	2574				4308
		2804	1	2804	
819	3034				7112
		3280	1	3280	
820	3526				10392

STAGE STORAGE CURVE



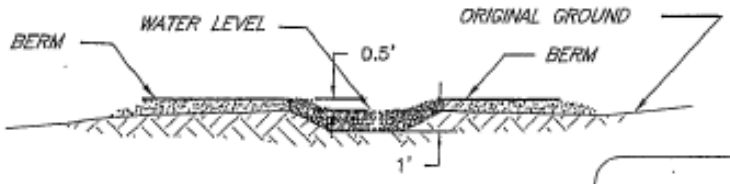


PLAN VIEW



SECTION A–A'

INSPECT AND REPAIR SUMP AFTER EACH STORM AND REMOVE SEDIMENT WHEN NECESSARY.



SECTION B–B'

TRAP DETAIL

ST-1

NOT TO SCALE

FILE: SEDTRAP

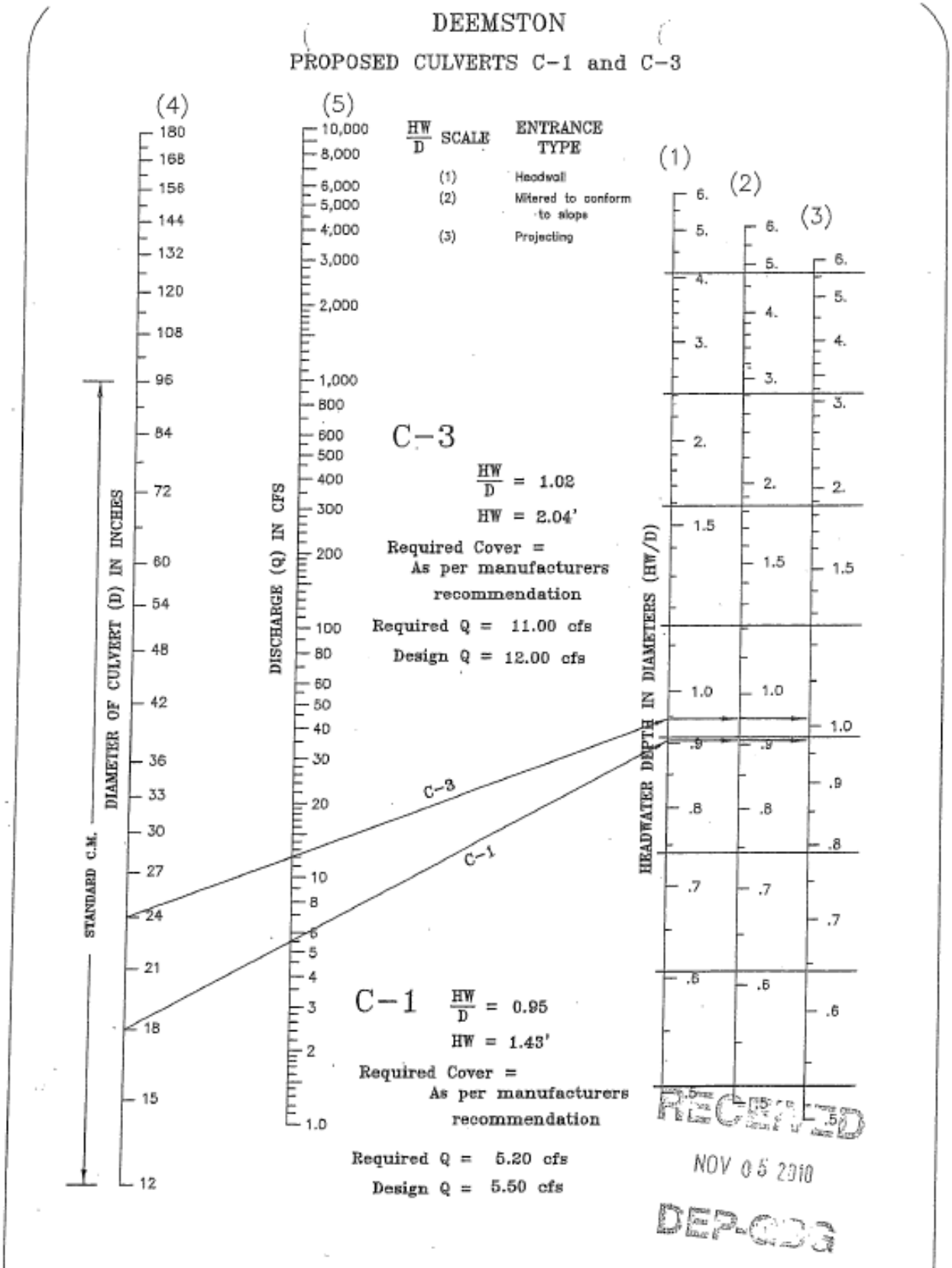


Exhibit 3-10 Headwater depth for CM pipe culverts with inlet control (Ref. Hyd. Eng. Cir. No. 5, USBPR, 1965)

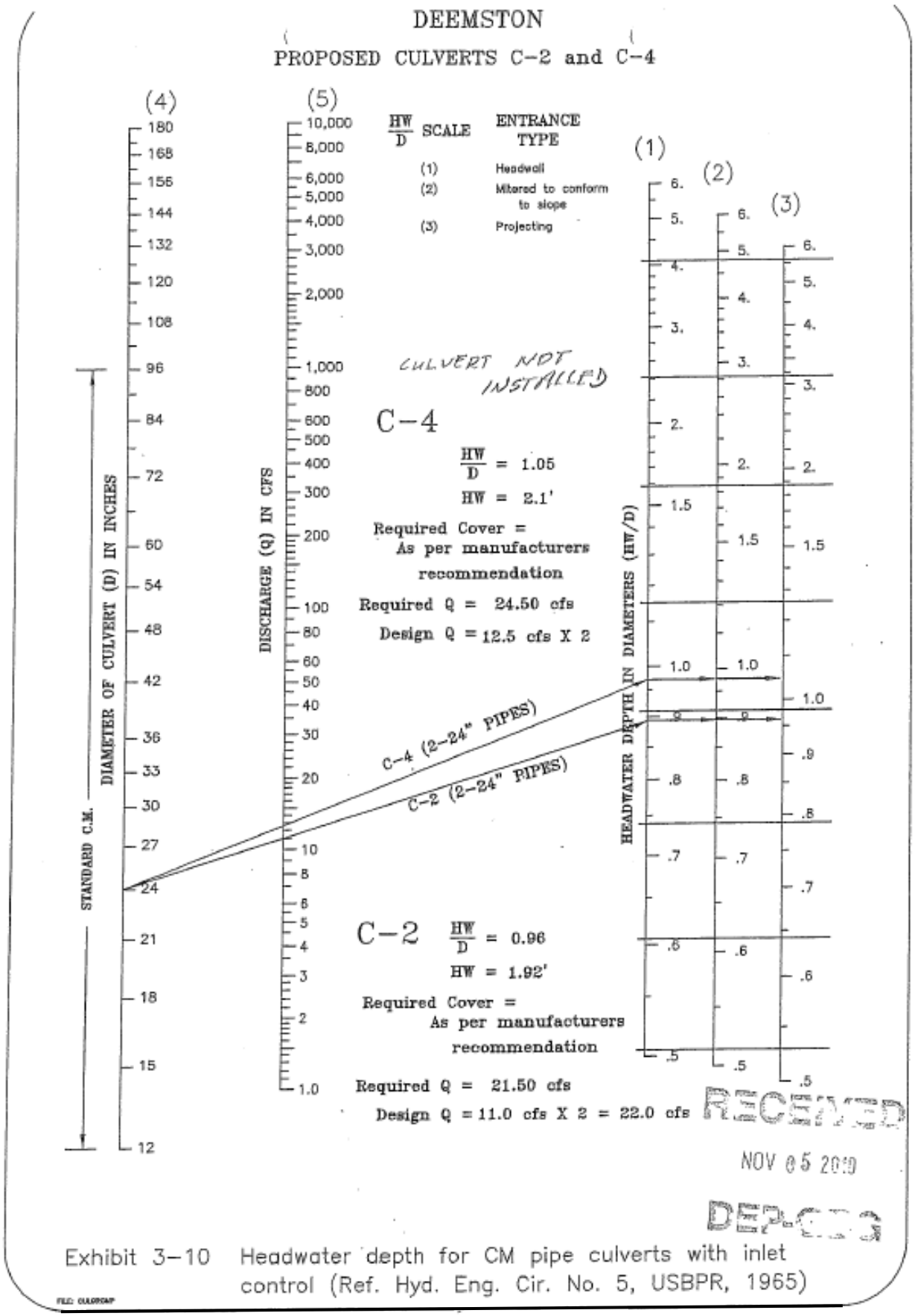


Exhibit 3-10 Headwater depth for CM pipe culverts with inlet control (Ref. Hyd. Eng. Cir. No. 5, USBPR, 1965)

OUTLET PROTECTION FOR PROPOSED CULVERTS

Full Flow Capacity of Culvert

$Q_f = 0.464/n \times D^{8/3} \times S^{1/2}$ Culvert C-1

n=	0.024
D (ft)=	3
S (ft/ft)=	0.01

Q_f = 36.19 cfs Full Flow Capacity

$V_f = Q_f / A$

V_f = 5.12 ft/sec Full Flow Velocity

$d/D = Q_d / Q_f$

Q_d = 3.50 Design Discharge

d/D = 0.10

Velocity Ratio (From velocity ratio chart)

V_r = 0.64

Design Velocity V_d = $V_r \times V_f$ = 3.28

Apron Design (From design of riprap outlet protection)

Riprap R-3
Length = 10 ft.
Width at culvert = 9 ft.
Width downstream = 19 ft.

OUTLET PROTECTION FOR PROPOSED CULVERTS

Full Flow Capacity of Culvert

$Q_f = 0.464/n \times D^{8/3} \times S^{1/2}$ Culvert C-2

n= 0.024
D (ft)= 2.5
S (ft/ft)= 0.012

Q_f = 24.38 cfs Full Flow Capacity

$V_f = Q_f / A$

V_f = 4.97 ft/sec Full Flow Velocity

$d/D = Q_d / Q_f$

Q_d = 16.35 Design Discharge

d/D = 0.67

Velocity Ratio (From velocity ratio chart)

V_r = 1.08

Design Velocity V_d = $V_r \times V_f$ = 5.36

Apron Design (From design of riprap outlet protection)

Riprap R-3
Length = 10 ft.
Width at culvert = 7.5 ft.
Width downstream = 17.5 ft.

OUTLET PROTECTION FOR PROPOSED CULVERTS

Full Flow Capacity of Culvert

$Q_f = 0.464/n \times D^{8/3} \times S^{1/2}$ Culvert C-3

n=	0.024
D (ft)=	3
S (ft/ft)=	0.012

Q_f = 39.65 cfs Full Flow Capacity

$V_f = Q_f / A$

V_f = 5.61 ft/sec Full Flow Velocity

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$d/D = Q_d / Q_f$

Q_d = 13.70 Design Discharge

d/D = 0.35

Velocity Ratio (From velocity ratio chart)

V_r = 0.92

Design Velocity V_d = $V_r \times V_f$ = 5.16

Apron Design (From design of riprap outlet protection)

Riprap R-3
Length = 10 ft.
Width at culvert = 9 ft.
Width downstream = 19 ft.

DITCH CAPACITY CALCULATION

Kosky

Maggie Lynn

36" Culvert

Gabion Design

Channel Bed Slope = ((Elevation (start) - Elevation (finish)) (divided by distance)

2160	Elevation Start →	See Form 11.1A
2140	Elevation Finish →	See Form 11.1A
40	Distance Start →	See Form 11.1A
0	Distance Finish →	See Form 11.1A
50.00	Channel Bed Slope (%)	

4.4

74

INPUT DATA			
Ditch Slope / Channel Bed Slope (So):	0.500	ft/ft	
Bottom Width (b):	6.00	ft.	
Channel Sideslope (left) (z_L):	2.5	to 1	
Channel Sideslope (right) (z_R):	2.5	to 1	
Flow Depth (d):	1.25	ft.	
(IF) RipRap Rock - USE (D_{50}) SIZE - (inches)		→	
Manning's Number (n): **(IF) RR Rock use M# in RED**	0.200	←	
Length of Channel (L)	40.0	ft.	

RipRap Rock

D_{50} Size	Inches	NSA No.
0.75	1.5	R-1 (V_{max} - 2.5 fps)
1.5	3	R-2 (V_{max} - 4.5 fps)
3	6	R-3 (V_{max} - 6.5 fps)
6	12	R-4 (V_{max} - 9.0 fps)
9	18	R-5 (V_{max} - 11.5 fps)
12	24	R-6 (V_{max} - 13.0 fps)
15	30	R-7 (V_{max} - 14.5 fps)
#DIV/0!	Manning' Calculation (n)	

22.7 Acres

52.69 cfs (steep)

Capacity / Quantity of flow (Q):	**55.69**	**ft³ / sec**	
Capacity / Quantity of flow (Q_F) w/Freeboard:	106.3	ft³ / sec	
Flow Area (A):	**11.41**	**sq. ft.**	
Flow Area (A_F) w/Freeboard	18.2	sq. ft	
Flow Velocity (V):	**4.88**	**ft./sec.**	
Flow Velocity (V_F) w/Freeboard	5.86	ft./sec.	
Top Flow Width (T)	**12.25**	**ft**	
Top Flow Width w/ Freeboard (T_F)	14.75	ft	
Freeboard Required (F)	0.50	ft	
Channel Depth w/Freeboard (d_f)	1.75	ft	
Time to travel channel ((L / V) / 60)	0.1	minutes	
Channel length (Left Side)	3.37	ft	
Channel length w/ Freeboard (Left Side)	4.71	ft	
Channel length (Right Side)	3.37	ft	
Channel length w/ Freeboard (Right Side)	4.71	ft	
Wetted Perimeter (P)	12.73	ft	
Wetted Perimeter (P) w/ Freeboard	15.424	ft	
Hydraulic Radius (r)	0.90	ft	
Hydraulic Radius (r) w / Freeboard	1.18	ft	
Channel's Critical Slope (Sc*)	0.628	ft/ft	
*Unstable flow when So between .7Sc & 1.3Sc	0.440	0.816	ft/ft
Channel Bed Slope (So) (From Above)	0.500	ft/ft	
Freeboard required, If Unstable) (F**)	0.50	ft	
Freeboard Required, If Stable) (F**)	0.50	ft	
Actual Freeboard , IF STABLE (F**)	0.31	ft	
**Freeboard Minimum for any Channel	0.5	ft	
Shear Stress (Jc)	39.00	lb/sq ft	

Note: If quantity of flow (Q) w/ Free
work out correctly, check Channel
or amount of Freeboard added.
Plug CD w/ Freeboard number into

Velocities < 2.5 ft./sec. DO NOT

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DITCH CAPACITY CALCULATION

Kosky
Maggie Lynn

30" Culvert
Gabion Design

Channel Bed Slope = ((Elevation (start) - Elevation (finish))
(divided by distance)

2160	Elevation Start →	See Form 11.1A
2140	Elevation Finish →	See Form 11.1A
40	Distance Start →	See Form 11.1A
0	Distance Finish →	See Form 11.1A
50.00	Channel Bed Slope (%)	

4.4
74

INPUT DATA			
Ditch Slope / Channel Bed Slope (So):	0.500	ft/ft	
Bottom Width (b):	6.00	ft.	
Channel Sideslope (left) (z_L):	2.5	to 1	
Channel Sideslope (right) (z_R):	2.5	to 1	
Flow Depth (d):	1.35	ft.	
(IF) RipRap Rock - USE (D_{50}) SIZE - (inches)		→	
Manning's Number (n): **(IF) RR Rock use M# in RED**	0.200	←	
Length of Channel (L)	40.0	ft.	

RipRap Rock

D_{50} Size	Inches	NSA No.
0.75	1.5	R-1 (V_{max} - 2.5 fps)
1.5	3	R-2 (V_{max} - 4.5 fps)
3	6	R-3 (V_{max} - 6.5 fps)
6	12	R-4 (V_{max} - 9.0 fps)
9	18	R-5 (V_{max} - 11.5 fps)
12	24	R-6 (V_{max} - 13.0 fps)
15	30	R-7 (V_{max} - 14.5 fps)
#DIV/0!	Manning' Calculation (n)	

28.6 Acres 63.87 cfs (steep)

Capacity / Quantity of flow (Q):	**64.43**	**ft ^{3} / sec**	
Capacity / Quantity of flow (Q_F) w/Freeboard:	120.6	ft ^{3} / sec	→ Note: If quantity of flow (Q) w/ Free work out correctly, check Channel or amount of Freeboard added. Plug CD w/ Freeboard number into
Flow Area (A):	**12.66**	**sq. ft.**	
Flow Area (A_F) w/Freeboard	19.9	sq. ft	
Flow Velocity (V):	**5.09**	**ft./sec.**	
Flow Velocity (V_F) w/Freeboard	6.06	ft./sec.	→ Velocities < 2.5 ft./sec. DO NOT
Top Flow Width (T)	**12.75**	**ft**	
Top Flow Width w/ Freeboard (T_F)	15.33	ft	
Freeboard Required (F)	0.52	ft	
Channel Depth w/Freeboard (d_1)	1.87	ft	
Time to travel channel ((L / V) / 60)	0.1	minutes	
Channel length (Left Side)	3.63	ft	
Channel length w/ Freeboard (Left Side)	5.02	ft	
Channel length (Right Side)	3.63	ft	
Channel length w/ Freeboard (Right Side)	5.02	ft	
Wetted Perimeter (P)	13.27	ft	
Wetted Perimeter (P) w/ Freeboard	16.046	ft	
Hydraulic Radius (r)	0.95	ft	
Hydraulic Radius (r) w / Freeboard	1.24	ft	
Channel's Critical Slope (Sc*)	0.616	ft/ft	
*Unstable flow when So between .7Sc & 1.3Sc	0.431	0.801	ft/ft
Channel Bed Slope (So) (From Above)	0.500	ft/ft	
Freeboard required, If Unstable) (F**)	0.52	ft	
Freeboard Required, If Stable) (F**)	0.50	ft	
Actual Freeboard , IF STABLE (F**)	0.34	ft	
**Freeboard Minimum for any Channel	0.5	ft	
Shear Stress (Jc)	42.12	lb/sq ft	

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