Large-Scale Channel Erosion Testing (ASTM D 6460 modified)

of

Flexamat Channel Lining over Sandy Loam

February 2009

Submitted to:
Motz Enterprises, Inc.
9415 Montgomery Rd, Ste H
Cincinnati, Ohio 45242

Attn: Mr. Jim Motz

Submitted by:
TRI/Environmental, Inc.
9063 Bee Caves Road
Austin, TX 78733

C. Joel Sprague
Project Manager

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

February 23, 2009

Mr. Jim Motz
Motz Enterprises, Inc.
9415 Montgomery Rd, Ste H
Cincinnati, Ohio 45241

E-mail: mmotz@flexamat.com

Subject: Channel Testing of Flexamat over Sandy Loam (Log #2278-01-34)

Dear Mr. Motz:

This letter report presents the results for large-scale channel erosion tests performed on Flexamat channel lining over Sandy loam. Included are data developed for target hydraulic shears ranging from 4 to 16 psf (0.2 to 0.8 kPa). All testing work was performed in general accordance with the ASTM D 6460, *Standard Test Method for Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Earthen Channels from Stormwater-Induced Erosion,* except, the permissible shear was projected rather than interpolated. Generated results were used to develop the following permissible or limiting shear (τ_{limit}) and limiting velocity (V_{limit}) for the tested material:

$$\tau_{limit\ FLEXAMAT(std)} = 24+ \text{ psf} \qquad V_{limit\ FLEXAMAT(std)} = 19+ \text{ ft/sec}$$

TRI is pleased to present this *final* report. Please feel free to call if we can answer any questions or provide any additional information.

Sincerely,

C. Joel Sprague, P.E.
Senior Engineer
Geosynthetics Services Division

Cc: Sam Allen, Jarrett Nelson - TRI

CHANNEL TESTING REPORT

FLEXAMAT over Sandy loam

TESTING EQUIPMENT AND PROCEDURES

Overview of Test and Apparatus

TRI/Environmental, Inc.'s (TRI's) large-scale channel erosion testing facility is located at the Denver Downs Research Farm in Anderson, SC. Testing oversight is provided by C. Joel Sprague, P.E. The large-scale testing was performed in a rectangular flume having a 30% slope using a loamy soil test section. The concentrated flow is produced by gravity from an adjacent pond. Four sequential, increasing flows are applied to each test section for 30 minutes each to achieve a range of hydraulic shear stresses in order to define the permissible, or limiting, shear stress, τ_{limit}, which is the shear stress necessary to cause an average of 0.5 inch of soil loss over the entire channel bottom. Testing is performed in accordance with ASTM D 6460 protocol, except the permissible shear was projected rather than interpolated. Tables and graphs of shear versus soil loss are generated from the accumulated data.

Erosion Control Product

The following index properties were determined from testing the FLEXAMAT Erosion Control Matting.

Table 1. Tested FLEXAMAT Index Properties

Index Property / Test	Units	Values
Flexamat Product	style	Flex-a-mat Standard
Block size	(length x width)	6.5 in x 5.5 in
Block weight	lbs	3.0
Block Ground Cover	%	75
Reinforcing Grid	style	Fornit 30/30
Underlayment	style	Fortrac 3D-30
Straw coverage rate	oz/sy	12 oz/sy

Test Soil

The test soil used in the test plots had the following characteristics.

Table 2. TRI-Loam Characteristics

Soil Characteristic	Test Method	Value
% Gravel	ASTM D 422	7
% Sand		60
% Silt		25
% Clay		8
Liquid Limit, %	ASTM D 4318	32
Plasticity Index, %		5
Soil Classification	USDA	Sandy Loam
Soil Classification	USCS	Silty Sand (SM)

Preparation of the Test Channels

The test channels undergo a "standard" preparation procedure prior to each test. First, any rills or depressions resulting from previous testing are filled in with test soil. The entire test channel is then tilled to a depth not less than four inches. The test channel is then raked and formed to create a channel bottom that is level side-to-side and at a smooth 30% slope top-to-bottom. Finally, a vibrating plate compactor is run over the channel to achieve 90% standard Proctor compaction. The submitted erosion control product is then installed as directed by the client.

Installation of Erosion Control Product in Test Channel

As noted, the submitted erosion control product is installed as directed by the client. For the tests reported herein, the erosion control product was installed as follows:

- Straw placed uniformly on soil surface;
- Underlayment matting placed overtop the straw;
- FLEXAMAT unrolled over the straw/matting.

Note that anchorage was provided at the top of the flume.

Specific Test Procedure

Immediately prior to testing, the black plastic is removed from the test channel and initial soil surface elevation readings are made at predetermined cross-sections. The channel is then exposed to sequential 30-minute flows having typical target hydraulic shear stresses of 4, 8, 12, and 16 psf. During the testing, flow depth and corresponding flow velocity measurements are taken at the predetermined cross-section locations. Between flow events, the flow is stopped and soil surface elevation measurements are made to facilitate calculation of soil loss. Flows are then increased to achieve the subsequent shear target in an attempt to create more than 0.5 inches of soil loss. ½-inch of soil loss was not accomplished prior to reaching maximum flow capacity. Pictures of channel testing are shown in Figures 1 thru 8.

Figure 1. Rectangular Channel Setup

Figure 4. Low Flow in Channel

Figure 2. Gravity Flow to Flume

Figure 5. Medium Flow in Channel

Figure 3. Channel Flow Velocity Measurement (typical)

Figure 6. High Flow in Channel

Figure 7. Rect. Channel After High Flow

Figure 8. Channel After Matting Removed (no apparent soil surface disruption)

TEST RESULTS

Average soil loss and the associated hydraulic shear calculated from flow and depth measurements made during the testing are the principle data used to determine the performance of the product tested. This data is entered into a spreadsheet that transforms the flow depth and velocity into an hydraulic shear stress and the soil loss measurements into and average Clopper Soil Loss Index (CSLI). A graph of shear versus soil loss for the protected condition is shown in Figure 9. The associated velocities are plotted in Figure 10. The graphs include a polynomial regression line fit to the test data to facilitate a projection of the limiting shear stress, τ_{limit},, and limiting velocity, V_{limit},, since ½-inch of soil loss was not achieved during testing.

Table 3. Summary Data Table – Protected Test Reach

Test # (run # - target shear)	Flow depth (in)	Flow velocity (fps)	Flow (cfs)	Manning's roughness, n	Max Bed Shear Stress (psf)	CSLI (in)	Cumm. CSLI (in)
R1-4	3.79	6.56	4.13	0.058	5.82	-0.06	-0.06
R1-8	5.07	8.88	7.48	0.052	7.79	-0.05	-0.11
R1-12	6.99	11.06	12.87	0.051	10.74	-0.07	-0.18
R1-16	11.03	14.88	27.30	0.052	16.95	-0.11	-0.29
R2-4	3.61	6.38	3.82	0.058	5.55	-0.04	-0.04
R2-8	5.21	8.69	7.53	0.054	8.00	-0.05	-0.09
R2-12	7.10	10.81	12.77	0.053	10.92	-0.05	-0.14
R2-16	10.80	14.56	26.19	0.052	16.60	-0.11	-0.25
R3-4	3.53	6.31	3.70	0.057	5.42	-0.04	-0.04
R3-8	5.31	8.56	7.58	0.055	8.17	-0.07	-0.11
R3-12	6.88	10.63	12.17	0.053	10.57	-0.07	-0.17
R3-16	10.88	14.88	26.95	0.051	16.71	-0.13	-0.30

Using the test procedure and data evaluation technique described herein, the limiting shear stress shown in Table 4 was determined using the following equation:

$$\tau_{limit,} = \gamma \, d \, S$$

where: $\tau_{limit,}$ = limiting shear stress;
γ = unit weight of water, 62.4pcf;
d = depth of water, ft
S = channel slope, 0.30

Table 4. Overall C-Factor

Product	Limiting Shear, τ_{limit}	Limiting Velocity, V_{limit}
FLEXAMAT - standard	24+ psf	19+ ft/sec

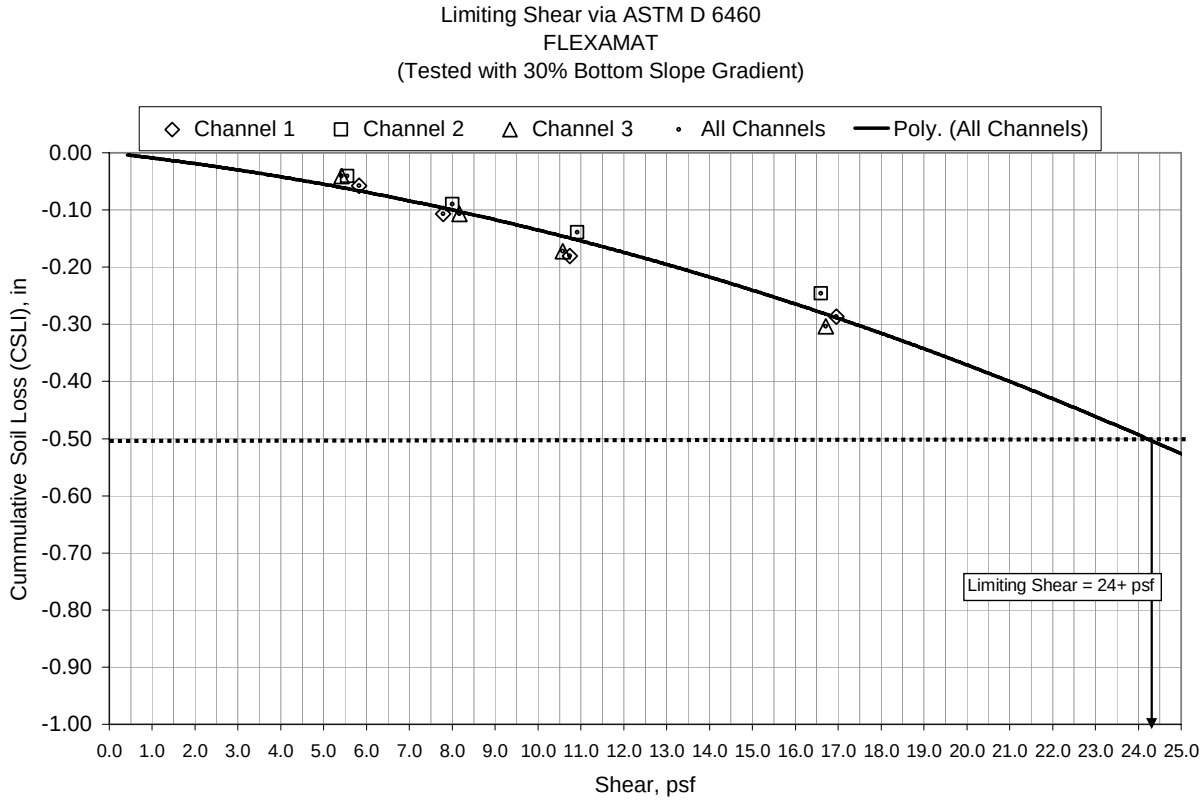


Figure 11. Shear Stress vs. Soil Loss – Tested Product

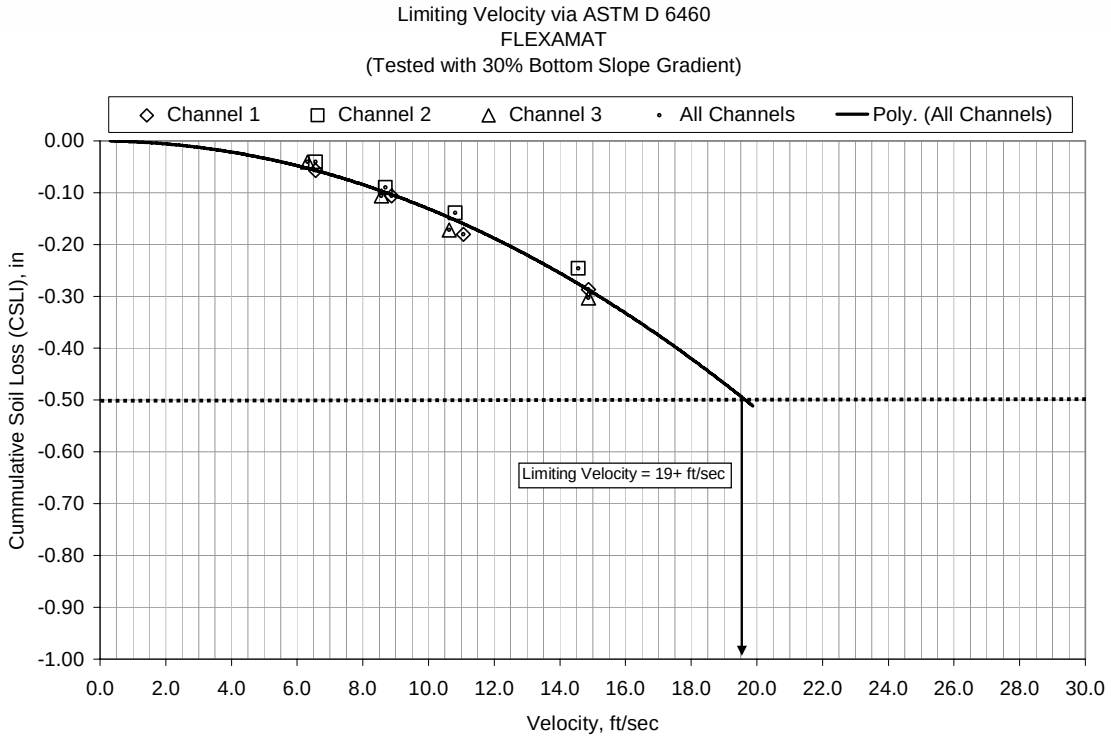


Figure 12. Velocity vs. Soil Loss – Tested Product

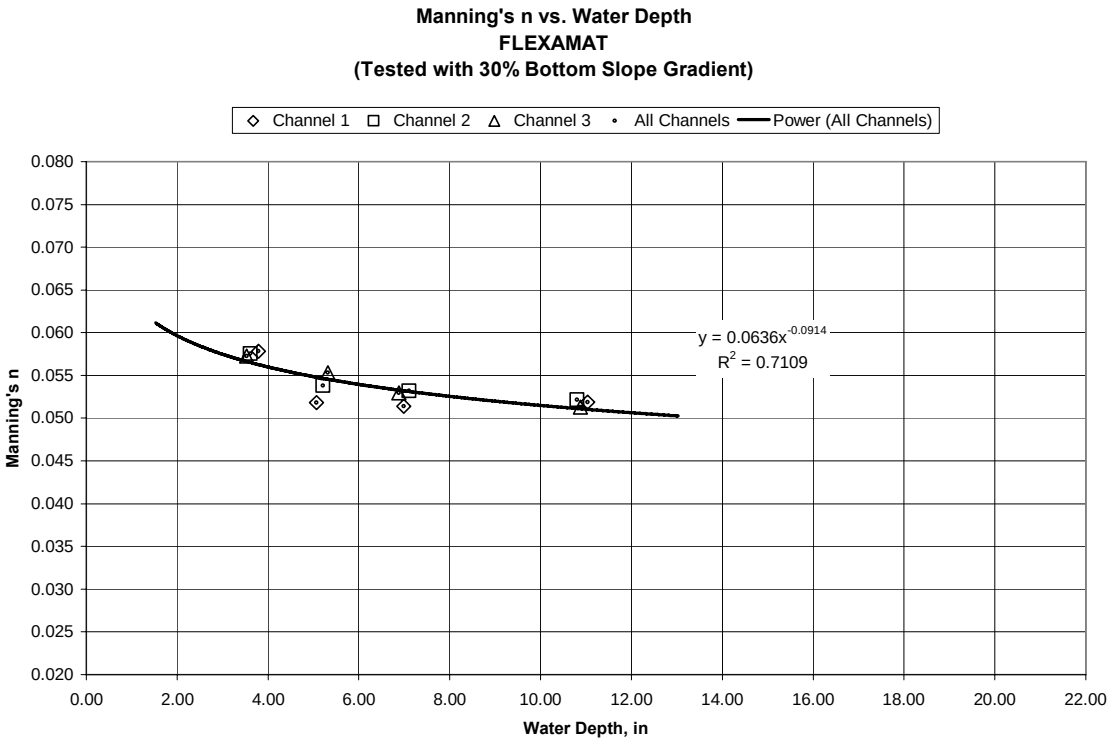


Figure 13. Roughness vs. Flow Depth – Tested Product

CONCLUSIONS

Rectangular (vertical wall) channel (flume) tests were performed in accordance with ASTM D 6460 using sandy loam soil protected with FLEXAMAT. Testing in a rectangular (vertical wall) channel was conducted to achieve increasing shear levels in an attempt to cause at least 0.5-inch of soil loss. In this testing, 0.5-inches of soil loss was not achieved before reaching the maximum available flows (i.e. shear stress and velocity). Figure 11 shows the maximum bottom shear stress and associated soil loss from each flow event along with a projection of the shear stress at which 0.5 inches of accumulated soil loss would be expected to occur. This projection shows an allowable shear stress for the standard FLEXAMAT system to be over 24 psf.

APPENDIX A – RECORDED DATA

Test Record Sheets

CHANNEL 1 - SHEAR STRESS 1

Date: 2/14/09 Start Time: 12:00 PM End Time: 12:30 PM

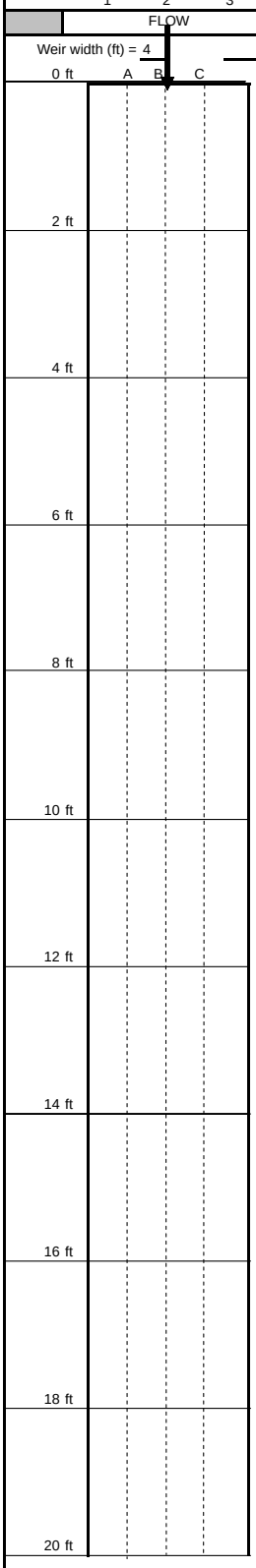
Soil: Loam Target Shear (psf): 6.00 Slope: 30%

40 ft long flume 20 ft test section

rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat

TEST DATA



	1	2	3				
Outlet Weir							
Water Depth, in		12.00					
Water Velocity, ft/s		3.00					
Flow Rate, cfs	0.00	12.00	0.00				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28.5	26.5	28		6		38.0
To eroded Surface Elev, cm	28	26.5	28	Vavg (fps) =	6.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.067		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	4.13	6.35	4.13
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28.5	28	30.5		6		39.0
To eroded Surface Elev, cm	28.5	28	30	Vavg (fps) =	6.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.065		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	4.00	6.15	4.00
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	31		6.5		40.0
To eroded Surface Elev, cm	30	30	31	Vavg (fps) =	6.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.058		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	4.12	5.85	3.81
		25.5	oss/Gain, in	0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	31	32.5		6.5		41.5
To eroded Surface Elev, cm	32	31	32	Vavg (fps) =	6.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.059		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	4.19	5.95	3.87
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	31	32.5		6.5		41.5
To eroded Surface Elev, cm	33	31	32	Vavg (fps) =	6.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.058		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	4.05	5.75	3.74
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	31	32		7		41.5
To eroded Surface Elev, cm	34	31	32	Vavg (fps) =	7.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.052		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	4.21	5.55	3.61
	Avg Bottom Loss/Gain, in			0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	36	35	34.5		7		44.0
To eroded Surface Elev, cm	35.5	34.5	34.5	Vavg (fps) =	7.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	-0.5	0	navg =	0.052		Water Depth (in)
Clopper Soil Loss, cm	-0.5	-0.5	0	Flow (cfs) =	4.21	5.55	3.61
	Avg Bottom Loss/Gain, in			-0.13		Avg Clopper Soil Loss, in	-0.13
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	35	34	35		7		43.5
To eroded Surface Elev, cm	35	33.5	35	Vavg (fps) =	7.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.052		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	4.13	5.45	3.54
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	35	35	36		7.5		44.0
To eroded Surface Elev, cm	35	35	36	Vavg (fps) =	7.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.047		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	4.27	5.24	3.41
	Avg Bottom Loss/Gain, in			0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	32	35		7.5		42.0
To eroded Surface Elev, cm	34	32	34.5	Vavg (fps) =	7.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.046		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	4.18	5.14	3.35
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31.5	30	31		7.5		39.0
To eroded Surface Elev, cm	31.5	30	31	Vavg (fps) =	7.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.045		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	4.02	4.94	3.22
	Avg Bottom Loss/Gain, in			0.00		Avg Clopper Soil Loss, in	0.00
Soil Loss / Gain, in	-0.04	-0.04	-0.07	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.05**
Clopper Soil Loss, in	-0.04	-0.04	-0.07	**Avg Clopper Soil Loss per Cross-Section =**			**-0.05**

CHANNEL 1 - SHEAR STRESS 2

Date: 2/14/09 Start Time: 1:00 PM End Time: 1:30 PM

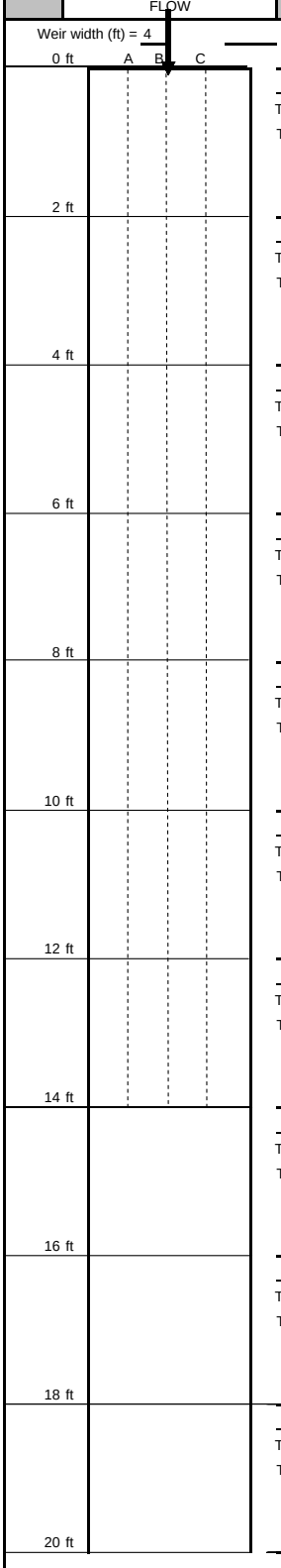
Soil: Loam Target Shear (psf): 10.00 Slope: 30%

40 ft long flume 20 ft test section

1500 rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat

TEST DATA



Inlet Weir	1	2	3				
Water Depth, in		15.00					
Water Velocity, ft/s		4.50					
Flow Rate, cfs	0.00	22.50	0.00				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	26.5	28		8		42.0
To eroded Surface Elev, cm	28	26	28	Vavg (fps) =	8.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.062		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	7.70	8.87	5.77
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28.5	28	30		8.5		42.0
To eroded Surface Elev, cm	28	28	30	Vavg (fps) =	8.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.055		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	7.44	8.07	5.25
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	31		9		43.0
To eroded Surface Elev, cm	30	30	31	Vavg (fps) =	9.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	7.48	7.66	4.99
	Avg Bottom Loss/Gain, in			0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	31	32		9		44.0
To eroded Surface Elev, cm	32	30.5	32	Vavg (fps) =	9.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	7.38	7.56	4.92
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	31	32		9		44.5
To eroded Surface Elev, cm	33	31	32	Vavg (fps) =	9.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	7.38	7.56	4.92
	Avg Bottom Loss/Gain, in			0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	31	32		9		45.0
To eroded Surface Elev, cm	34	31	32	Vavg (fps) =	9.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	7.48	7.66	4.99
	Avg Bottom Loss/Gain, in			0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	35.5	34.5	34.5		9		47.0
To eroded Surface Elev, cm	34.5	34	34.5	Vavg (fps) =	9.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-1	-0.5	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	-1	-0.5	0	Flow (cfs) =	7.48	7.66	4.99
	Avg Bottom Loss/Gain, in			-0.20		Avg Clopper Soil Loss, in	-0.20
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	35	33.5	35		9.5		46.5
To eroded Surface Elev, cm	35	33.5	35	Vavg (fps) =	9.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.046		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	7.48	7.26	4.72
	Avg Bottom Loss/Gain, in			0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	35	35	36		9.5		47.5
To eroded Surface Elev, cm	35	35	36	Vavg (fps) =	9.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.046		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	7.58	7.36	4.79
	Avg Bottom Loss/Gain, in			0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	32	34.5		10		45.0
To eroded Surface Elev, cm	34	32	34.5	Vavg (fps) =	10.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.042		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	7.55	6.96	4.53
	Avg Bottom Loss/Gain, in			0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31.5	30	31		10		42.0
To eroded Surface Elev, cm	31	30	31	Vavg (fps) =	10.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.042		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	7.44	6.86	4.46
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Soil Loss / Gain, in	-0.07	-0.05	0.00	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.04**
Clopper Soil Loss, in	-0.07	-0.05	0.00	**Avg Clopper Soil Loss per Cross-Section =**			**-0.04**

CHANNEL 1 - SHEAR STRESS 3

Date: 2/14/09 Start Time: 2:00 PM End Time: 2:30 PM

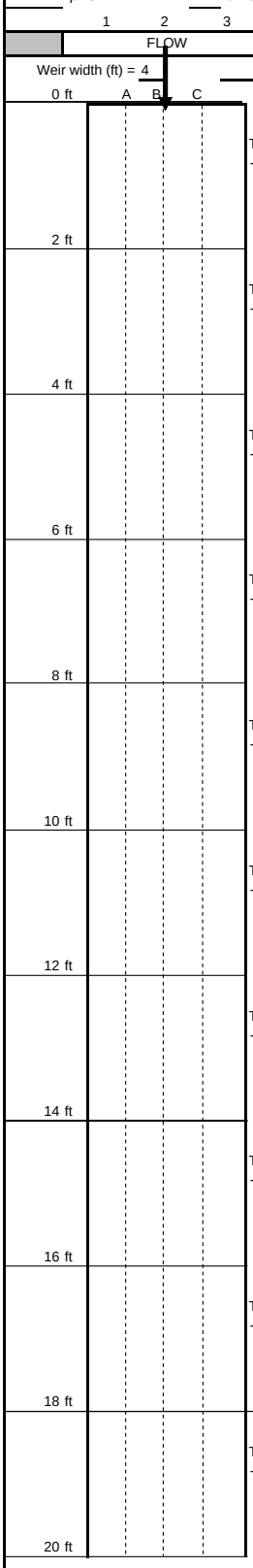
Soil: Loam Target Shear (psf): 14.00 Slope: 30%

40 ft long flume 20 ft test section

rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat

TEST DATA



Inlet Weir	1	2	3				
Water Depth, in		19.00					
Water Velocity, ft/s		6.00					
Flow Rate, cfs	0.00	38.00	0.00				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	26	28		10.5		46.0
To eroded Surface Elev, cm	28	26	28	Vavg (fps) =	10.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.056		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	12.86	11.29	7.35
		Avg Bottom Loss/Gain, in		0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	28	30		10.5		47.5
To eroded Surface Elev, cm	28	28	30	Vavg (fps) =	10.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.056		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	12.98	11.39	7.41
		Avg Bottom Loss/Gain, in		0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	31		11		48.0
To eroded Surface Elev, cm	30	29	31	Vavg (fps) =	11.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-1	0	navg =	0.052		Water Depth (in)
Clopper Soil Loss, cm	0	-1	0	Flow (cfs) =	12.99	10.89	7.09
		Avg Bottom Loss/Gain, in		-0.13		Avg Clopper Soil Loss, in	-0.13
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	30.5	32		11		49.0
To eroded Surface Elev, cm	32	29.5	32	Vavg (fps) =	11.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-1	0	navg =	0.052		Water Depth (in)
Clopper Soil Loss, cm	0	-1	0	Flow (cfs) =	12.87	10.79	7.02
		Avg Bottom Loss/Gain, in		-0.13		Avg Clopper Soil Loss, in	-0.13
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	31	32		11		49.5
To eroded Surface Elev, cm	33	30.5	32	Vavg (fps) =	11.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.051		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	12.75	10.69	6.96
		Avg Bottom Loss/Gain, in		-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	31	32		11.5		49.5
To eroded Surface Elev, cm	34	31	32	Vavg (fps) =	11.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	12.95	10.39	6.76
		Avg Bottom Loss/Gain, in		0.00		Avg Clopper Soil Loss, in	0.00
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34.5	34	34.5		11.5		50.5
To eroded Surface Elev, cm	34	33.5	34	Vavg (fps) =	11.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	-0.5	-0.5	navg =	0.047		Water Depth (in)
Clopper Soil Loss, cm	-0.5	-0.5	-0.5	Flow (cfs) =	12.58	10.08	6.56
		Avg Bottom Loss/Gain, in		-0.20		Avg Clopper Soil Loss, in	-0.20
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	35	33.5	35		11.5		51.5
To eroded Surface Elev, cm	35	33	35	Vavg (fps) =	11.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	12.95	10.39	6.76
		Avg Bottom Loss/Gain, in		-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	35	35	36		11.5		51.5
To eroded Surface Elev, cm	35	34	36	Vavg (fps) =	11.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-1	0	navg =	0.047		Water Depth (in)
Clopper Soil Loss, cm	0	-1	0	Flow (cfs) =	12.45	9.98	6.50
		Avg Bottom Loss/Gain, in		-0.13		Avg Clopper Soil Loss, in	-0.13
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	32	34.5		11.5		50.0
To eroded Surface Elev, cm	34	31.5	34.5	Vavg (fps) =	11.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.047		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	12.58	10.08	6.56
		Avg Bottom Loss/Gain, in		-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	30	31		11.5		47.0
To eroded Surface Elev, cm	30.5	29.5	30.5	Vavg (fps) =	11.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	-0.5	-0.5	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	-0.5	-0.5	-0.5	Flow (cfs) =	12.70	10.18	6.63
		Avg Bottom Loss/Gain, in		-0.20		Avg Clopper Soil Loss, in	-0.20
Soil Loss / Gain, in	-0.04	-0.20	-0.04	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.09**
Clopper Soil Loss, in	-0.04	-0.20	-0.04	**Avg Clopper Soil Loss per Cross-Section =**			**-0.09**

CHANNEL 1 - SHEAR STRESS 4

Date: 2/14/09 Start Time: 3:00 PM End Time: 3:30 PM

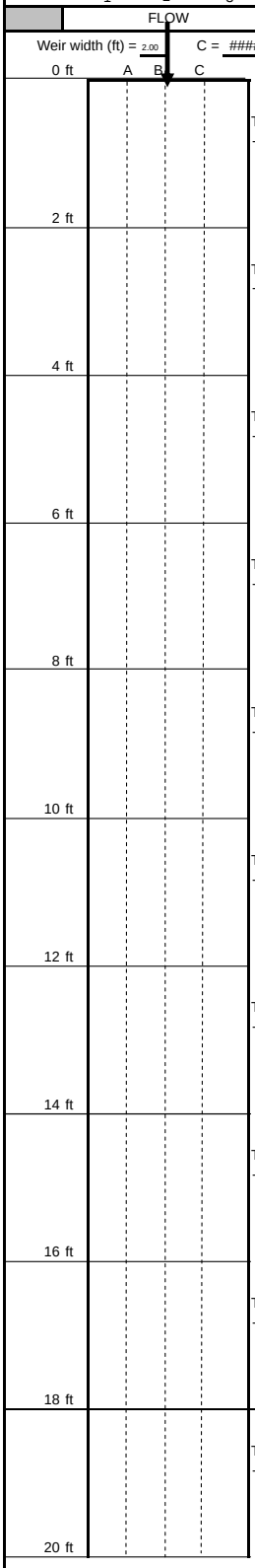
Soil: Loam Target Shear (psf): 18.00 Slope: 30%

40 ft long flume 20 ft test section

1900 rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat

TEST DATA



Inlet Weir	1	2	3				
Water Depth, in							
Water Velocity, ft/s							
Flow Rate, cfs	#DIV/0!	0.00	#DIV/0!				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	26	28		14		57.0
To eroded Surface Elev, cm	28	26	27	Vavg (fps) =	14.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-1	navg =	0.058		Water Depth (in)
Clopper Soil Loss, cm	0	0	-1	Flow (cfs) =	27.56	18.15	11.81
	Avg Bottom Loss/Gain, in			-0.13		Avg Clopper Soil Loss, in	-0.13
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	28	30		14.5		58.0
To eroded Surface Elev, cm	28	27.5	29.5	Vavg (fps) =	14.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	-0.5	navg =	0.055		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	-0.5	Flow (cfs) =	28.23	17.95	11.68
	Avg Bottom Loss/Gain, in			-0.13		Avg Clopper Soil Loss, in	-0.13
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	29	31		14.5		58.0
To eroded Surface Elev, cm	30	28.5	30.5	Vavg (fps) =	14.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	-0.5	navg =	0.053		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	-0.5	Flow (cfs) =	26.96	17.14	11.15
	Avg Bottom Loss/Gain, in			-0.13		Avg Clopper Soil Loss, in	-0.13
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	29.5	32		14.5		60.0
To eroded Surface Elev, cm	31.5	29	32	Vavg (fps) =	14.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	-0.5	0	navg =	0.055		Water Depth (in)
Clopper Soil Loss, cm	-0.5	-0.5	0	Flow (cfs) =	27.75	17.65	11.48
	Avg Bottom Loss/Gain, in			-0.13		Avg Clopper Soil Loss, in	-0.13
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	30.5	32		15		59.0
To eroded Surface Elev, cm	33	30	32	Vavg (fps) =	15.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	26.90	16.54	10.76
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	31	32		15.5		59.0
To eroded Surface Elev, cm	33.5	31	32	Vavg (fps) =	15.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	27.29	16.23	10.56
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	33.5	34		15.5		60.0
To eroded Surface Elev, cm	34	32.5	34	Vavg (fps) =	15.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-1	0	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	0	-1	0	Flow (cfs) =	26.95	16.03	10.43
	Avg Bottom Loss/Gain, in			-0.13		Avg Clopper Soil Loss, in	-0.13
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	35	33	35		15.5		60.5
To eroded Surface Elev, cm	34.5	33	35	Vavg (fps) =	15.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	26.78	15.93	10.37
	Avg Bottom Loss/Gain, in			-0.07		Avg Clopper Soil Loss, in	-0.07
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	35	34	36		15.5		61.0
To eroded Surface Elev, cm	35	34	35	Vavg (fps) =	15.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-1	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	0	0	-1	Flow (cfs) =	26.78	15.93	10.37
	Avg Bottom Loss/Gain, in			-0.13		Avg Clopper Soil Loss, in	-0.13
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	31.5	34.5		15.5		59.5
To eroded Surface Elev, cm	34	31	34	Vavg (fps) =	15.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	-0.5	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	-0.5	Flow (cfs) =	26.95	16.03	10.43
	Avg Bottom Loss/Gain, in			-0.13		Avg Clopper Soil Loss, in	-0.13
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30.5	29.5	30.5		16		55.5
To eroded Surface Elev, cm	30	29.5	30	Vavg (fps) =	16.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	-0.5	navg =	0.045		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	-0.5	Flow (cfs) =	26.95	15.53	10.10
	Avg Bottom Loss/Gain, in			-0.13		Avg Clopper Soil Loss, in	-0.13
Soil Loss / Gain, in	-0.07	-0.13	-0.14	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.11**
Clopper Soil Loss, in	-0.07	-0.13	-0.14	**Avg Clopper Soil Loss per Cross-Section =**			**-0.11**

CHANNEL 2 - SHEAR STRESS 1

Date: 2/14/09 Start Time: 12:00 PM End Time: 12:30 PM

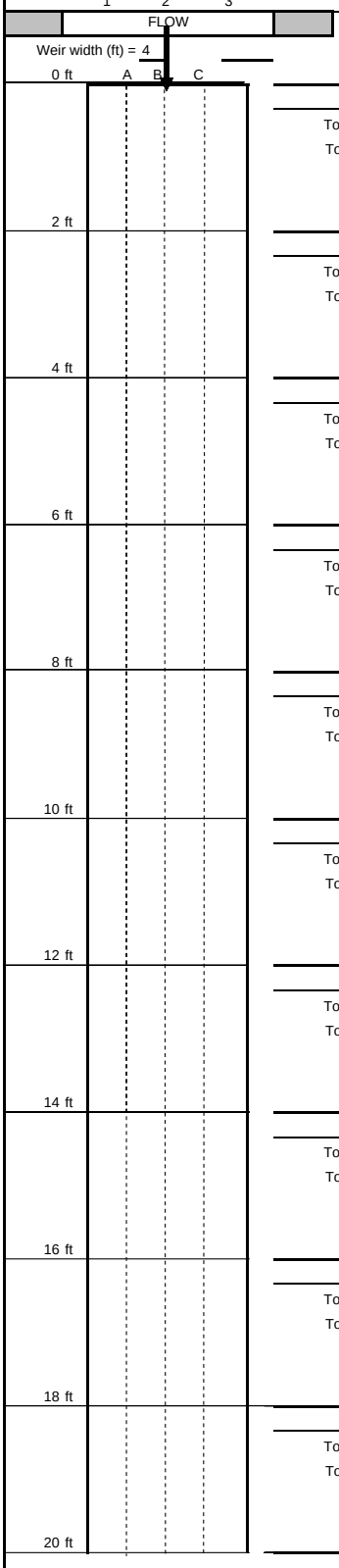
Soil: Loam Target Shear (psf): 6.00 Slope: 30%

40 ft long flume 20 ft test section

900 rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat

TEST DATA



Outlet Weir	1	2	3				
Water Depth, in		12.00					
Water Velocity, ft/s		3.00					
Flow Rate, cfs	0.00	12.00	0.00				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	31	31		6		41.0
To eroded Surface Elev, cm	31	31	30.5	Vavg (fps) =	6.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.065		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	4.00	6.15	4.00
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	30	31		6		40.5
To eroded Surface Elev, cm	31	30	31	Vavg (fps) =	6.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.064		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	3.87	5.95	3.87
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	30	32		6		40.5
To eroded Surface Elev, cm	30.5	30	32	Vavg (fps) =	6.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.063		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	3.81	5.85	3.81
		25.5	Loss/Gain, in	-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	32	33		6.5		41.5
To eroded Surface Elev, cm	32.5	32	33	Vavg (fps) =	6.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.056		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	3.84	5.45	3.54
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	32	33		6.5		41.0
To eroded Surface Elev, cm	32	32	32.5	Vavg (fps) =	6.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.055		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	3.77	5.34	3.48
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32.5	32	33		6.5		41.0
To eroded Surface Elev, cm	32.5	32	33	Vavg (fps) =	6.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.053		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	3.63	5.14	3.35
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	32	32.5		6.5		41.0
To eroded Surface Elev, cm	33	31.5	32.5	Vavg (fps) =	6.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.054		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	3.70	5.24	3.41
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	32	32		7		41.0
To eroded Surface Elev, cm	33	32	32	Vavg (fps) =	7.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	3.98	5.24	3.41
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	31	32		7		40.0
To eroded Surface Elev, cm	32	30.5	32	Vavg (fps) =	7.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	3.90	5.14	3.35
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	30		7		38.5
To eroded Surface Elev, cm	30	30	30	Vavg (fps) =	7.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	3.90	5.14	3.35
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	31	31		7.5		39.0
To eroded Surface Elev, cm	30	31	31	Vavg (fps) =	7.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.046		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	4.10	5.04	3.28
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Soil Loss / Gain, in	-0.04	-0.04	-0.04	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.04**
Clopper Soil Loss, in	-0.04	-0.04	-0.04	**Avg Clopper Soil Loss per Cross-Section =**			**-0.04**

CHANNEL 2 - SHEAR STRESS 2

Date: 2/14/09 Start Time: 1:00 PM End Time: 1:30 PM

Soil: Loam Target Shear (psf): 10.00 Slope: 30%

40 ft long flume 20 ft test section

rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat

1 2 3

FLOW

Weir width (ft) = 4

0 ft A B C

2 ft

4 ft

6 ft

8 ft

10 ft

12 ft

14 ft

16 ft

18 ft

20 ft

TEST DATA

Inlet Weir	1	2	3				
Water Depth, in		15.00					
Water Velocity, ft/s		4.50					
Flow Rate, cfs	0.00	22.50	0.00				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	31	30.5		8		45.0
To eroded Surface Elev, cm	31	31	30.5	Vavg (fps) =	8.00	Bed Max Shear Stress (psf)	Water Depth (in)
Soil Loss / Gain, cm	0	0	0	navg =	0.061		
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	7.44	8.57	5.58
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	30	31		8.5		44.0
To eroded Surface Elev, cm	31	30	31	Vavg (fps) =	8.50	Bed Max Shear Stress (psf)	Water Depth (in)
Soil Loss / Gain, cm	0	0	0	navg =	0.055		
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	7.44	8.07	5.25
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30.5	30	32		8.5		44.0
To eroded Surface Elev, cm	30.5	30	31.5	Vavg (fps) =	8.50	Bed Max Shear Stress (psf)	Water Depth (in)
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.055		
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	7.44	8.07	5.25
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32.5	32	33		8.5		45.5
To eroded Surface Elev, cm	32.5	32	32.5	Vavg (fps) =	8.50	Bed Max Shear Stress (psf)	Water Depth (in)
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.055		
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	7.34	7.97	5.18
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	32	32.5		9		45.0
To eroded Surface Elev, cm	32	32	32	Vavg (fps) =	9.00	Bed Max Shear Stress (psf)	Water Depth (in)
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.051		
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	7.68	7.87	5.12
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32.5	32	33		9		45.5
To eroded Surface Elev, cm	32.5	32	33	Vavg (fps) =	9.00	Bed Max Shear Stress (psf)	Water Depth (in)
Soil Loss / Gain, cm	0	0	0	navg =	0.051		
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	7.68	7.87	5.12
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	31.5	32.5		9		45.0
To eroded Surface Elev, cm	33	31	32	Vavg (fps) =	9.00	Bed Max Shear Stress (psf)	Water Depth (in)
Soil Loss / Gain, cm	0	-0.5	-0.5	navg =	0.051		
Clopper Soil Loss, cm	0	-0.5	-0.5	Flow (cfs) =	7.68	7.87	5.12
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	32	32		9		45.0
To eroded Surface Elev, cm	32.5	32	32	Vavg (fps) =	9.00	Bed Max Shear Stress (psf)	Water Depth (in)
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.051		
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	7.58	7.76	5.05
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	30.5	32		9.5		43.5
To eroded Surface Elev, cm	31.5	30.5	31.5	Vavg (fps) =	9.50	Bed Max Shear Stress (psf)	Water Depth (in)
Soil Loss / Gain, cm	-0.5	0	-0.5	navg =	0.047		
Clopper Soil Loss, cm	-0.5	0	-0.5	Flow (cfs) =	7.69	7.46	4.86
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	30		9.5		42.5
To eroded Surface Elev, cm	30	30	30	Vavg (fps) =	9.50	Bed Max Shear Stress (psf)	Water Depth (in)
Soil Loss / Gain, cm	0	0	0	navg =	0.047		
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	7.79	7.56	4.92
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	31	31		10		43.0
To eroded Surface Elev, cm	30	31	31	Vavg (fps) =	10.00	Bed Max Shear Stress (psf)	Water Depth (in)
Soil Loss / Gain, cm	0	0	0	navg =	0.045		
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	8.09	7.46	4.86
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Soil Loss / Gain, in	-0.04	-0.02	-0.09	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.05**
Clopper Soil Loss, in	-0.04	-0.02	-0.09	**Avg Clopper Soil Loss per Cross-Section =**			**-0.05**

CHANNEL 2 - SHEAR STRESS 3

Date: 2/14/09 Start Time: 2:00 PM End Time: 2:30 PM

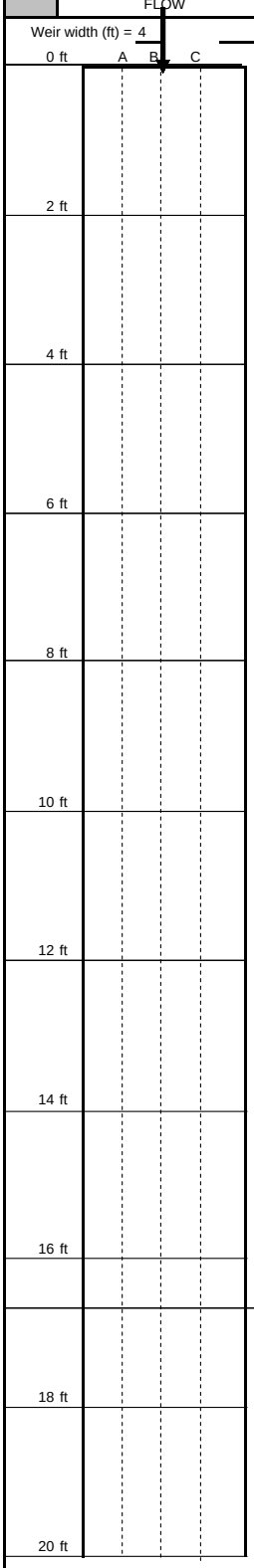
Soil: Loam Target Shear (psf): 14.00 Slope: 30%

40 ft long flume 20 ft test section

rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat

TEST DATA



Inlet Weir	1	2	3				
Water Depth, in		19.00					
Water Velocity, ft/s		6.00					
Flow Rate, cfs	0.00	38.00	0.00				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	31	30.5		10		50.5
To eroded Surface Elev, cm	31	31	30	Vavg (fps) =	10.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.061		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	13.01	12.00	7.81
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	30	31		10.5		49.5
To eroded Surface Elev, cm	31	30	31	Vavg (fps) =	10.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.056		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	12.98	11.39	7.41
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30.5	30	31.5		10.5		49.5
To eroded Surface Elev, cm	30	30	31.5	Vavg (fps) =	10.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.057		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	13.09	11.50	7.48
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32.5	32	32.5		11		50.0
To eroded Surface Elev, cm	32	32	32	Vavg (fps) =	11.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	-0.5	navg =	0.052		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	-0.5	Flow (cfs) =	12.99	10.89	7.09
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	32	32		11		49.5
To eroded Surface Elev, cm	32	32	32	Vavg (fps) =	11.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.051		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	12.63	10.59	6.89
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32.5	32	33		11		50.0
To eroded Surface Elev, cm	32	32	33	Vavg (fps) =	11.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.051		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	12.75	10.69	6.96
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	31	32		11		49.5
To eroded Surface Elev, cm	33	31	32	Vavg (fps) =	11.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.051		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	12.63	10.59	6.89
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32.5	32	32		11.5		48.0
To eroded Surface Elev, cm	32	32	32	Vavg (fps) =	11.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.046		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	12.07	9.68	6.30
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31.5	30.5	31.5		11.5		48.0
To eroded Surface Elev, cm	31	30.5	31.5	Vavg (fps) =	11.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	12.83	10.29	6.69
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	30		11.5		47.0
To eroded Surface Elev, cm	30	30	30	Vavg (fps) =	11.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	12.83	10.29	6.69
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	31	31		11.5		47.5
To eroded Surface Elev, cm	30	31	30.5	Vavg (fps) =	11.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	12.83	10.29	6.69
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Soil Loss / Gain, in	-0.09	0.00	-0.05	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.05**
Clopper Soil Loss, in	-0.09	0.00	-0.05	**Avg Clopper Soil Loss per Cross-Section =**			**-0.05**

CHANNEL 2 - SHEAR STRESS 4

Date: 2/14/09 Start Time: 4:00 PM End Time: 4:30 PM

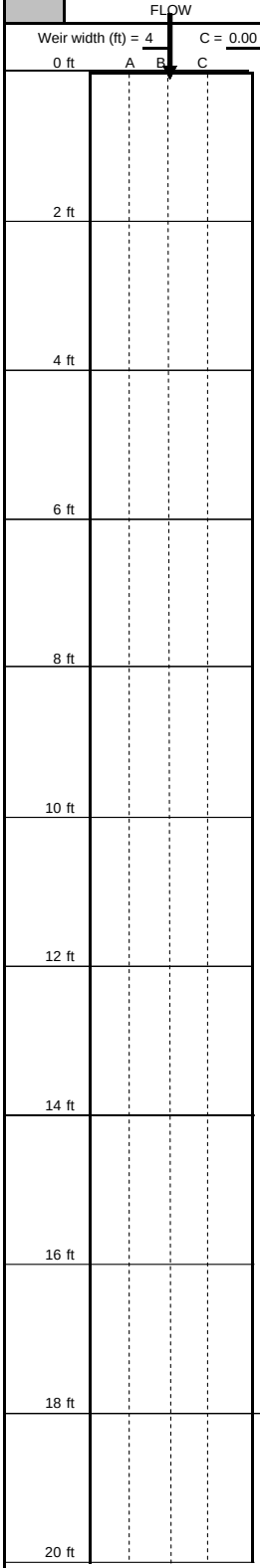
Soil: Loam Target Shear (psf): 18.00 Slope: 30%

40 ft long flume 20 ft test section

rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat

TEST DATA



	1	2	3				
Inlet Weir	1	2	3				
Water Depth, in		18.00					
Water Velocity, ft/s		4.50					
Flow Rate, cfs	0.00	27.00	0.00				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	31	30		14		60.0
To eroded Surface Elev, cm	30.5	31	30	Vavg (fps) =	14.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.057		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	27.10	17.85	11.61
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	30	31		14		59.0
To eroded Surface Elev, cm	30.5	30	30.5	Vavg (fps) =	14.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	-0.5	navg =	0.056		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	-0.5	Flow (cfs) =	26.33	17.34	11.29
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	31.5		14.5		57.5
To eroded Surface Elev, cm	29	29.5	31	Vavg (fps) =	14.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-1	-0.5	-0.5	navg =	0.053		Water Depth (in)
Clopper Soil Loss, cm	-1	-0.5	-0.5	Flow (cfs) =	26.32	16.74	10.89
		Avg Bottom Loss/Gain, in		-0.26	Avg Clopper Soil Loss, in		-0.26
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	32	32		14.5		59.5
To eroded Surface Elev, cm	32	32	32	Vavg (fps) =	14.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.052		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	26.16	16.64	10.83
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	32	32		14.5		59.0
To eroded Surface Elev, cm	32	31.5	32	Vavg (fps) =	14.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.052		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	25.85	16.44	10.70
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	32	33		15		58.0
To eroded Surface Elev, cm	32	31.5	32	Vavg (fps) =	15.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	-1	navg =	0.049		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	-1	Flow (cfs) =	25.75	15.83	10.30
		Avg Bottom Loss/Gain, in		-0.20	Avg Clopper Soil Loss, in		-0.20
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	31	32		15		58.5
To eroded Surface Elev, cm	32	31	32	Vavg (fps) =	15.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-1	0	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	-1	0	0	Flow (cfs) =	26.41	16.23	10.56
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	32	32		15		58.0
To eroded Surface Elev, cm	32	32	32	Vavg (fps) =	15.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.049		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	25.59	15.73	10.24
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	30.5	31.5		15.5		56.5
To eroded Surface Elev, cm	31	30.5	31	Vavg (fps) =	15.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.047		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	26.10	15.53	10.10
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	30		15.5		55.5
To eroded Surface Elev, cm	29	30	30	Vavg (fps) =	15.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-1	0	0	navg =	0.047		Water Depth (in)
Clopper Soil Loss, cm	-1	0	0	Flow (cfs) =	26.27	15.63	10.17
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	31	30.5		15.5		56.0
To eroded Surface Elev, cm	30	31	30.5	Vavg (fps) =	15.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.047		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	25.94	15.43	10.04
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Soil Loss / Gain, in	-0.14	-0.05	-0.09	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.10**
Clopper Soil Loss, in	-0.14	-0.05	-0.09	**Avg Clopper Soil Loss per Cross-Section =**			**-0.10**

CHANNEL 3 - SHEAR STRESS 1

Date: 2/14/09 Start Time: 12:00 PM End Time: 12:30 PM

Soil: Loam Target Shear (psf): 6.00 Slope: 30%

40 ft long flume 20 ft test section

rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat

1 2 3 FLOW

Weir width (ft) = 4

0 ft A B C

2 ft

4 ft

6 ft

8 ft

10 ft

12 ft

14 ft

16 ft

18 ft

20 ft

TEST DATA

Outlet Weir	1	2	3				
Water Depth, in		12.00					
Water Velocity, ft/s		3.50					
Flow Rate, cfs	0.00	14.00	0.00				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	28	28		6		38.0
To eroded Surface Elev, cm	28	28	27.5	Vavg (fps) =	6.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.065		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	4.00	6.15	4.00
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	30		6		39.5
To eroded Surface Elev, cm	30	30	30	Vavg (fps) =	6.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.062		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	3.74	5.75	3.74
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	29	30		6		39.0
To eroded Surface Elev, cm	30	29	29.5	Vavg (fps) =	6.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.062		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	3.74	5.75	3.74
		25.5	Loss/Gain, in	-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	28	29		6		38.0
To eroded Surface Elev, cm	28	28	29	Vavg (fps) =	6.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.063		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	3.81	5.85	3.81
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	30.5	31		6.5		39.0
To eroded Surface Elev, cm	30.5	30.5	31	Vavg (fps) =	6.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.053		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	3.55	5.04	3.28
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	32	33		6.5		40.0
To eroded Surface Elev, cm	31	32	32.5	Vavg (fps) =	6.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.052		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	3.48	4.94	3.22
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	33.5	33		6.5		41.5
To eroded Surface Elev, cm	34	33	33	Vavg (fps) =	6.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.052		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	3.48	4.94	3.22
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	33	34		7		41.5
To eroded Surface Elev, cm	33	33	34	Vavg (fps) =	7.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	3.75	4.94	3.22
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	33	33.5		7		41.0
To eroded Surface Elev, cm	32.5	33	33.5	Vavg (fps) =	7.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.048		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	3.67	4.84	3.15
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33.5	34	35.5		7.5		42.0
To eroded Surface Elev, cm	33	34	35.5	Vavg (fps) =	7.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.044		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	3.85	4.74	3.08
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34.5	34	34		7.5		42.0
To eroded Surface Elev, cm	34	34	34	Vavg (fps) =	7.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.044		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	3.94	4.84	3.15
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Soil Loss / Gain, in	-0.07	-0.02	-0.05	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.05**
Clopper Soil Loss, in	-0.07	-0.02	-0.05	**Avg Clopper Soil Loss per Cross-Section =**			**-0.05**

CHANNEL 3 - SHEAR STRESS 2

Date: 2/14/09 Start Time: 1:00 PM End Time: 1:30 PM

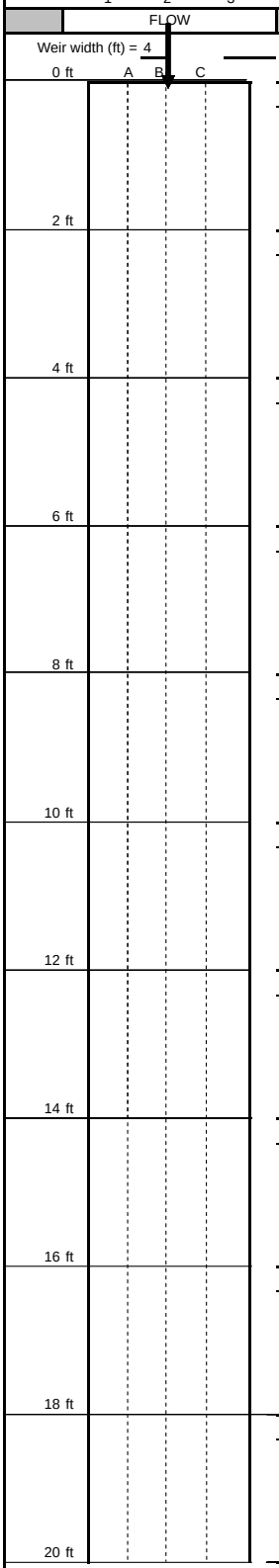
Soil: Loam Target Shear (psf): 10.00 Slope: 30%

40 ft long flume 20 ft test section

rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat

TEST DATA



Inlet Weir	1	2	3				
Water Depth, in		15.00					
Water Velocity, ft/s		4.50					
Flow Rate, cfs	0.00	22.50	0.00				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	28	27.5		8		42.0
To eroded Surface Elev, cm	28	28	27	Vavg (fps) =	8.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.062		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	7.52	8.67	5.64
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	30		8.5		43.5
To eroded Surface Elev, cm	30	30	30	Vavg (fps) =	8.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.056		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	7.53	8.17	5.31
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	29	29.5		8.5		43.0
To eroded Surface Elev, cm	30	29	29	Vavg (fps) =	8.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.056		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	7.62	8.27	5.38
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	28	29		8.5		42.0
To eroded Surface Elev, cm	28	28	28.5	Vavg (fps) =	8.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.057		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	7.72	8.37	5.45
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30.5	30.5	31		8.5		44.0
To eroded Surface Elev, cm	30	30.5	31	Vavg (fps) =	8.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.056		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	7.53	8.17	5.31
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	32	32.5		8.5		45.0
To eroded Surface Elev, cm	31	32	32	Vavg (fps) =	8.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.055		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	7.44	8.07	5.25
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	33	33		9		46.0
To eroded Surface Elev, cm	33.5	33	32.5	Vavg (fps) =	9.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	-0.5	navg =	0.051		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	-0.5	Flow (cfs) =	7.68	7.87	5.12
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	33	34		9		46.0
To eroded Surface Elev, cm	33	33	33.5	Vavg (fps) =	9.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.051		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	7.58	7.76	5.05
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32.5	33	33.5		9.5		45.0
To eroded Surface Elev, cm	32	33	33	Vavg (fps) =	9.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	-0.5	navg =	0.047		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	-0.5	Flow (cfs) =	7.69	7.46	4.86
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	34	35.5		9.5		46.0
To eroded Surface Elev, cm	33	34	35	Vavg (fps) =	9.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.046		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	7.48	7.26	4.72
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	34	34	34		10		45.5
To eroded Surface Elev, cm	33.5	34	34	Vavg (fps) =	10.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.043		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	7.66	7.06	4.59
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Soil Loss / Gain, in	-0.07	0.00	-0.14	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.07**
Clopper Soil Loss, in	-0.07	0.00	-0.14	**Avg Clopper Soil Loss per Cross-Section =**			**-0.07**

CHANNEL 3 - SHEAR STRESS 3

Date: 2/14/09 Start Time: 2:00 PM End Time: 2:30 PM

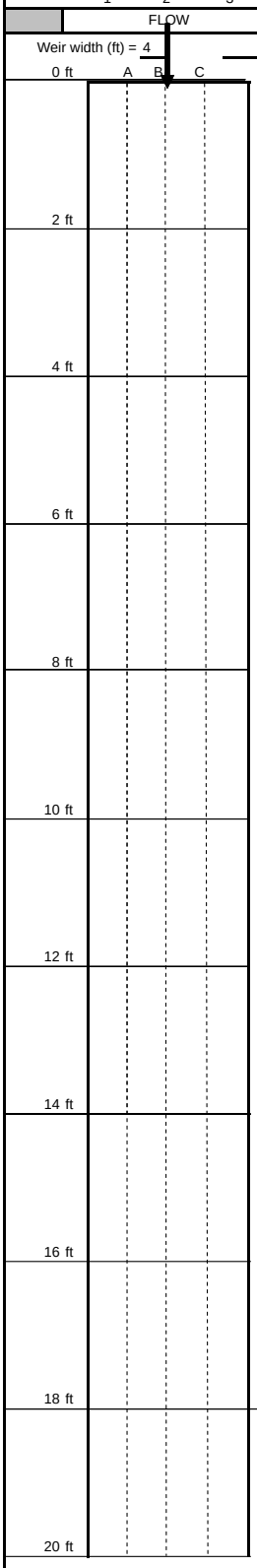
Soil: Loam Target Shear (psf): 14.00 Slope: 30%

40 ft long flume 20 ft test section

rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat

TEST DATA



Inlet Weir	1	2	3				
Water Depth, in		19.00					
Water Velocity, ft/s		6.00					
Flow Rate, cfs	0.00	38.00	0.00				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	28	27		10		46.0
To eroded Surface Elev, cm	27.5	27.5	27	Vavg (fps) =	10.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	-0.5	0	navg =	0.059		Water Depth (in)
Clopper Soil Loss, cm	-0.5	-0.5	0	Flow (cfs) =	12.25	11.29	7.35
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	30		10.5		47.5
To eroded Surface Elev, cm	30	30	30	Vavg (fps) =	10.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.054		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	12.06	10.59	6.89
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	29	29		10.5		47.0
To eroded Surface Elev, cm	30	29	29	Vavg (fps) =	10.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.054		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	12.17	10.69	6.96
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	28	28.5		10.5		45.5
To eroded Surface Elev, cm	28	28	28	Vavg (fps) =	10.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.054		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	12.06	10.59	6.89
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30.5	31		10.5		48.0
To eroded Surface Elev, cm	30	30	31	Vavg (fps) =	10.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.054		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	12.17	10.69	6.96
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	32	32		11		48.5
To eroded Surface Elev, cm	31	31.5	32	Vavg (fps) =	11.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	12.27	10.29	6.69
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33.5	33	32.5		11		49.5
To eroded Surface Elev, cm	33	33	32	Vavg (fps) =	11.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	-0.5	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	-0.5	Flow (cfs) =	12.15	10.18	6.63
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	33	33.5		11		50.0
To eroded Surface Elev, cm	33	33	33	Vavg (fps) =	11.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-0.5	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	0	0	-0.5	Flow (cfs) =	12.27	10.29	6.69
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	33	33		11		49.0
To eroded Surface Elev, cm	32	32	33	Vavg (fps) =	11.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-1	0	navg =	0.049		Water Depth (in)
Clopper Soil Loss, cm	0	-1	0	Flow (cfs) =	12.03	10.08	6.56
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	34	35		11.5		50.0
To eroded Surface Elev, cm	33	33.5	35	Vavg (fps) =	11.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.046		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	12.20	9.78	6.36
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33.5	34	34		12		50.0
To eroded Surface Elev, cm	33	34	34	Vavg (fps) =	12.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	0	0	navg =	0.045		Water Depth (in)
Clopper Soil Loss, cm	-0.5	0	0	Flow (cfs) =	12.86	9.88	6.43
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Soil Loss / Gain, in	-0.05	-0.11	-0.05	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.07**
Clopper Soil Loss, in	-0.05	-0.11	-0.05	**Avg Clopper Soil Loss per Cross-Section =**			**-0.07**

CHANNEL 3 - SHEAR STRESS 4

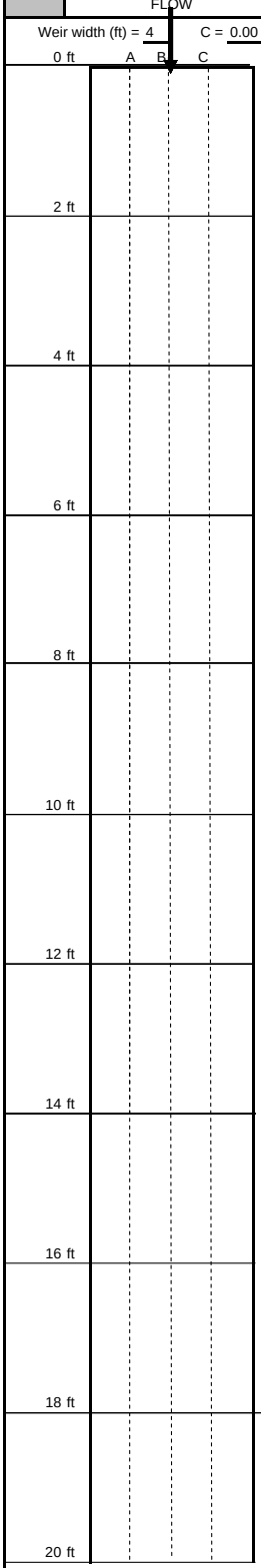
Date: 2/14/09 Start Time: 5:00 PM End Time: 5:30 PM

Soil: Loam Target Shear (psf): 18.00 Slope: 30%

40 ft long flume 20 ft test section

rpms 2 ft wide flume

Flexamat Permanent Channel Lining Mat



TEST DATA

Inlet Weir	1	2	3				
Water Depth, in		18.00					
Water Velocity, ft/s		4.50					
Flow Rate, cfs	0.00	27.00	0.00				
Cross-section 1	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	27.5	27.5	27		14.5		55.5
To eroded Surface Elev, cm	27	27	27	Vavg (fps) =	14.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-0.5	-0.5	0	navg =	0.054		Water Depth (in)
Clopper Soil Loss, cm	-0.5	-0.5	0	Flow (cfs) =	27.12	17.24	11.22
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 2	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	30		14.5		57.5
To eroded Surface Elev, cm	29	29	30	Vavg (fps) =	14.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-1	-1	0	navg =	0.053		Water Depth (in)
Clopper Soil Loss, cm	-1	-1	0	Flow (cfs) =	26.80	17.04	11.09
		Avg Bottom Loss/Gain, in		-0.26	Avg Clopper Soil Loss, in		-0.26
Cross-section 3	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	29	29		14.5		57.0
To eroded Surface Elev, cm	29	29	28	Vavg (fps) =	14.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-1	0	-1	navg =	0.053		Water Depth (in)
Clopper Soil Loss, cm	-1	0	-1	Flow (cfs) =	26.96	17.14	11.15
		Avg Bottom Loss/Gain, in		-0.26	Avg Clopper Soil Loss, in		-0.26
Cross-section 4	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	28	28	28		15		56.0
To eroded Surface Elev, cm	28	28	28	Vavg (fps) =	15.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.051		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	27.56	16.94	11.02
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 5	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	30	30	31		15		57.5
To eroded Surface Elev, cm	30	30	30	Vavg (fps) =	15.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-1	navg =	0.051		Water Depth (in)
Clopper Soil Loss, cm	0	0	-1	Flow (cfs) =	27.07	16.64	10.83
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 6	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	31	31.5	32		15		58.5
To eroded Surface Elev, cm	31	31	31.5	Vavg (fps) =	15.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	-0.5	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	-0.5	Flow (cfs) =	26.90	16.54	10.76
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 7	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	33	32		15		59.5
To eroded Surface Elev, cm	32	33	32	Vavg (fps) =	15.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	-1	0	0	navg =	0.050		Water Depth (in)
Clopper Soil Loss, cm	-1	0	0	Flow (cfs) =	26.74	16.44	10.70
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 8	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	33	33		15.5		59.0
To eroded Surface Elev, cm	33	33	33	Vavg (fps) =	15.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	0	navg =	0.047		Water Depth (in)
Clopper Soil Loss, cm	0	0	0	Flow (cfs) =	26.44	15.73	10.24
		Avg Bottom Loss/Gain, in		0.00	Avg Clopper Soil Loss, in		0.00
Cross-section 9	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	32	32	33		15.5		58.0
To eroded Surface Elev, cm	32	32	32	Vavg (fps) =	15.50	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	0	-1	navg =	0.047		Water Depth (in)
Clopper Soil Loss, cm	0	0	-1	Flow (cfs) =	26.44	15.73	10.24
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Cross-section 10	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	33.5	35		16		59.0
To eroded Surface Elev, cm	33	33	35	Vavg (fps) =	16.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	0	navg =	0.045		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	0	Flow (cfs) =	26.60	15.33	9.97
		Avg Bottom Loss/Gain, in		-0.07	Avg Clopper Soil Loss, in		-0.07
Cross-section 11	A	B	C	V @ 0.2d	V @ 0.6d	V @ 0.8d	To Water Surf, cm
To original Surface Elev, cm	33	34	34		16		59.0
To eroded Surface Elev, cm	33	33.5	33.5	Vavg (fps) =	16.00	Bed Max Shear Stress (psf)	
Soil Loss / Gain, cm	0	-0.5	-0.5	navg =	0.045		Water Depth (in)
Clopper Soil Loss, cm	0	-0.5	-0.5	Flow (cfs) =	26.95	15.53	10.10
		Avg Bottom Loss/Gain, in		-0.13	Avg Clopper Soil Loss, in		-0.13
Soil Loss / Gain, in	-0.13	-0.11	-0.14	**Avg Bottom Loss/Gain per Cross-Section =**			**-0.13**
Clopper Soil Loss, in	-0.13	-0.11	-0.14	**Avg Clopper Soil Loss per Cross-Section =**			**-0.13**

APPENDIX B – TEST SOIL

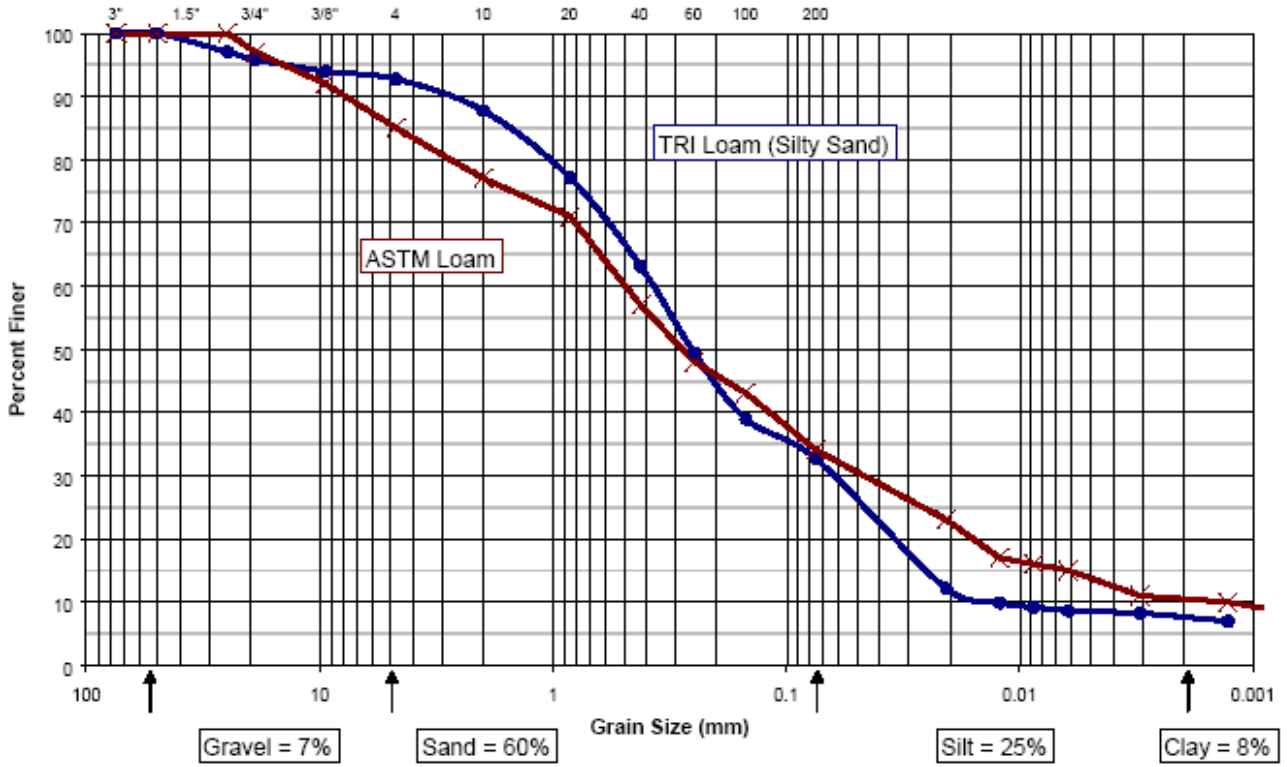
Test Soil Grain Size Distribution Curve

Compaction Curves

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

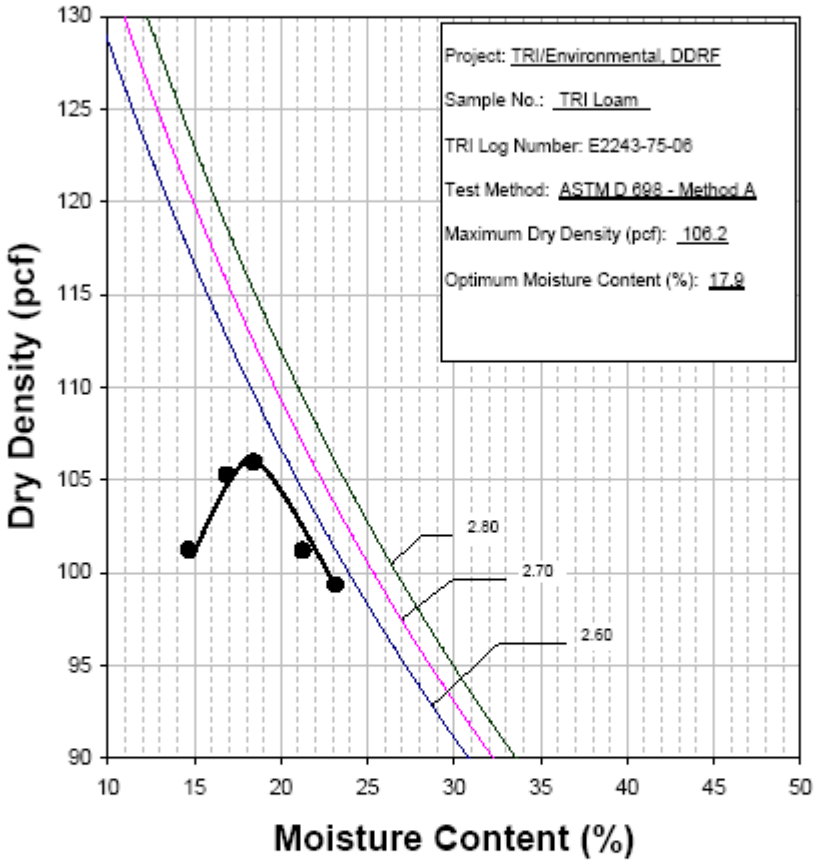
Grain Size Distribution - DDRF (October 2008)

Atterburg Limits
Liquid Limit = 32
Plastic Limit = 27
Plasticity Index = 5



TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

Proctor Compaction Test



John M. Allen, E.I.T 10/12/2006
Quality Review/Date

9063 Bee Caves Road □ Austin, TX 78733-6201 □ (512) 263-2101 □ (512) 263-2558 □ 1-800-880-TEST

APPENDIX C – LABORATORY QUALIFICATIONS

Testing Expertise

TRI/Environmental (TRI) is a leading, accredited geosynthetic, plastic pipe, and erosion and sediment control product testing laboratory. TRI's large-scale erosion and sediment control testing facility in the upstate of South Carolina at the Denver Downs Research Farm (DDRF) is initially focused on the following full-scale erosion and sediment control performance tests:

- ASTM D 6459: Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Hillslopes from Rainfall-Induced Erosion;
- ASTM D 6460: Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Earthen Channels from Stormwater-Induced Erosion;
- ASTM D 7208: Determination of Temporary Ditch Check Performance in Protecting Earthen Channels from Stormwater-Induced Erosion.
- ASTM D 7351: Determination of Sediment Retention Device Effectiveness In Sheet Flow Applications.

Technical Oversight

Joel Sprague, P.E., TRI's Senior Engineer provides technical oversight of all of TRI's erosion and sediment control testing and can be contacted at:

Mr. C. Joel Sprague, Senior Engineer
PO Box 9192, Greenville, SC 29604
Ph: 864/242-2220; Fax 864/242-3107; jsprague@tri-env.com

Mr. Sprague has been involved with the design of erosion and sediment control systems and the research, development, and application of erosion and sediment control products/materials for many years. He was the lead consultant in the development of bench-scale testing procedures for the Erosion Control Technology Council. Mr. Sprague has authored numerous technical papers on his research and is readily available to assist clients with their research and testing needs.

Operations Management

Sam Allen, TRI's Division Vice President provides operational management of all TRI laboratories and can be contacted at:

Mr. Sam Allen, Vice President & Program Manager
9063 Bee Caves Road
Austin, TX 78733
Ph: 512/263-2101; Fax: 512/263-2558; sallen@tri-env.com

Mr. Allen pioneered the laboratory index testing of rolled erosion control products (RECPs) and has been actively involved in the development and standardization of testing protocol and apparatus for more than 10 years. He set up and oversees TRI's erosion and sediment control testing laboratories. His oversight responsibilities include test coordination, reporting, and failure resolution associated with the National Transportation Product Evaluation Program (NTPEP) for RECPs.