CHAPTER 5: ESTIMATING EROSION ON CONSTRUCTION SITES USING THE REVISED UNIVERSAL SOIL LOSS EQUATION (RUSLE)
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CHAPTER 5: ESTIMATING EROSION ON CONSTRUCTION SITES USING THE REVISED UNIVERSAL SOIL LOSS EQUATION (USLE)

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5.1 INTRODUCTION

The development of the Universal Soil Loss Equation (USLE) began in 1940 as a cooperative effort by the State Experiment Stations, the Science and Education Administration, the Soil Conservation Service (now the Natural Resources Conservation Service), and the National Weather Service. The USLE has been reviewed and updated many times since it was first developed. The last major revision began in 1987, and the current form now used is called the Revised Universal Soil Loss Equation (RUSLE). The Soil and Water Conservation Society (SWCS, www.swcs.org) is currently marketing RUSLE software.

RUSLE is an erosion model designed to predict long-term annual soil loss carried by runoff from fields and rangeland under specific cropping and management conditions (USDA-NRCS, 1995). It is also applicable to non-agricultural conditions such as construction sites. RUSLE retains the equation structure of USLE, but the technology for evaluating these factors has been altered and new data added. RUSLE has been computerized to assist with calculations, and three databases for deriving these factors have been developed.

Even though the RUSLE is only an estimate, it is still the best method available to estimate soil erosion. The information that is used in predicting soil erosion is constantly being updated. However, great care must be taken to ensure that the RUSLE is used correctly. A basic knowledge of the factors used in calculating soil loss is essential. For assistance with the use of the RUSLE, please contact the University of the Virgin Islands Cooperative Extension Service or the USDA Natural Resources Conservation Service.

An alternative method was developed by Colorado State University, in collaboration with USGS, Island Resources Foundation, Inc., and the Virgin Islands National Park. Their GIS-based road surface erosion model (ROADMOD) estimates road surface erosion and sediment delivery from a digitized road network (MacDonald, et. al., 1997) utilizing data collected in the early 1990s on St. John. Input data for this model include an ASCII file, exported from a GIS, that lists road segments and segment characteristics such as segment identification number; connections to and from other segments; segment length, width, and slope; road surface (paved or unpaved); whether the segment is a discharge location; and a factor to proportionalize flow if it is split between downstream segments (MacDonald, et. al., 1997). The model uses a predictive equation:

$$E = 0.00057A \times S + 0.034 \qquad \textit{[EQ. 5-1]}$$

where

E is the cross-sectional road erosion in cubic meters per meter of road length per year, or square meters,
A is the upslope road drainage area in square meters, and
S is the segment slope as a decimal.

For information on utilizing this model to predict road surface erosion in the Virgin Islands, please contact Dr. Lee H. MacDonald, Department of Earth Resources, Colorado State University, Fort Collins, CO 80523-1482 or Island Resources Foundation, Inc. at www.irf.org.

5.2 REVIEW OF RUSLE AND FACTORS

The method described herein is based on the Revised Universal Soil Loss Equation (RUSLE) and it is used to predict soil loss from sheet and rill erosion. The rate of erosion as estimated by RUSLE depends on six factors: (1) rainfall energy and intensity, (2) soil erodibility, (3) land slope steepness and length of slope, (4) soil surface cover conditions (such as grass, woodland, pavement, or no cover), and (5) land management practice used. These factors may be assigned quantitative values to be used in estimating soil loss. However, this method does not account for soil loss by gully erosion.

The Revised Universal Soil Loss Equation is:

$$A = R * K * (LS) * C * P \qquad \textit{[EQ. 5-2]}$$

where

A = The estimated average annual soil loss from sheet and rill erosion caused by rainfall and its associated overland flow (in tons per acre). For volume estimates, Table 5.6 may be used to convert tons per acre to cubic yards based on soil textures.

R = The factor for annual rainfall erosivity - a measure of the erosive force of rainfall. R represents differences in erosivity among locations in the Caribbean area. For the Virgin Islands, the R factor is a constant of **250** for St. Croix and St. Thomas and **240** for St. John.

K = The soil erodibility factor. The K factor is based on soil type listed in the *1995 Revised Soil Survey of the Virgin Islands*. K values for the Virgin Islands are found in Table 5.1.

L = The slope length factor calculates the effect of slope length on erosion.

S = The slope steepness factor calculates the effect of soil steepness on erosion. The slope length and slope steepness are usually combined into a single topographic factor (LS) and computed from Tables 5.2.a - 5.2.c. Table 5.2.a is for low ratios of rill to interrill erosion, such as rangeland and other undisturbed soil conditions with cover. Table 5.2.b is for moderate ratios of rill to interrill erosion, such as row-cropped agricultural areas and other moderately consolidated soil conditions with little to moderate cover. Table 5.2.c is for high ratios of rill to interrill erosion, such as for freshly prepared construction sites and other highly disturbed areas with little or no cover. Table 5.2.a is typically used to estimate pre-development conditions, and Table 5.2.c to estimate conditions during construction.

C = The soil cover and management factor represents the effect of plants, soil cover, soil biomass, and soil disturbing activities on erosion. The C factor is also called the cover index and can be used to represent the effect of land cover or treatment that may be used to protect construction sites. The C factor zone for the Virgin Islands is **Southern Slopes**. The appropriate C factor can be selected from Table 5.5.

P = The management practice factor is the ratio of soil loss that occurs with certain conservation practices (like conservation tillage) compared to that of no practice. P factors for a combination of practices are computed as the product of P factors for the individual practices. Refer to Table 5.4 for P factors.

Table 5.6 provides the approximate soil weights of soil textures to convert tons per acre to cubic yards; and Table 5.7 provides USDA Texture Abbreviations.

5.3 EXAMPLES OF HOW THE REVISED UNIVERSAL SOIL LOSS EQUATION (RUSLE) IS USED

A disturbed site of 15 acres near Christiansted, St. Croix. The soil is Glynn gravelly loam and the B horizon is completely exposed. The average slope is 8% and the length is 200 feet.

5.3.1 Example 1

Problem: Determine the estimated soil loss from this site if it was scraped up and down the slope with a bulldozer and remains unprotected for one year.

Solution: **The rainfall factor, R, for St. Croix is 250** (given on page 5-1). Refer to Table 5.1 and determine that the **K value for the B horizon of Glynn gravelly loam is 0.20**. Note that the K values are not always the same for the B and C horizons of some soils. (Table 5.7 provides texture and modifiers for abbreviations given in Table 5.1).

Refer to Table 5.2c to determine the topographic adjustment factor (LS) for length and percent of slope. The length and slope data are not multiplied together in the formula, but are developed mathematically from a complex equation. They may be obtained directly from Table 5.2. **Find 8% in the left-hand column and move horizontally to read 1.72 under slope length 200 feet.** To find quantities not included in Table 5.2, one may interpolate between gradients and slope lengths to estimate the required LS or use the closest factor.

Table 5.3 provides the cover index factor, C, for planning conditions. **Note that the C-factor for exposed soil is 1.0**. Increasing the cover or soil protection decreases the C-factor accordingly. Refer to Table 5.4 for the practice factor, P. **The P-factor for a compact, smooth, bulldozer-scraped surface is 1.3.**

To determine the annual soil loss on this site, enter the above underlined data into the RUSLE and compute the erosion for these conditions as follows:

A = RKLSCP = 250 x 0.20 x 1.72 x 1.0 x 1.3 = 111.8 tons per acre
A = 111.8 tons/acre x 15 acres = **1677 tons of soil lost on that site in one year!!!**

To convert this amount to volume, use Table 5.6. Note that for the loam texture of the Glynn soil, one cubic foot of material weighs approximately 90 pounds. Each ton of soil equals 0.82 cubic yards (yd^3). Thus, 1677 tons times 0.82 yd^3/ton = **1375 cubic yards of soil eroded in one year from the site.**

5.3.2 Example 2

Problem: Determine the soil loss from this site during the period from June 1 to September 1.

Solution: Refer to Table 5.5 to obtain the St. Croix adjustment, M, factor for the period. **During this period, 6 + 7 + 11 = 24% of the average annual soil loss for these conditions will occur.** Therefore, 24% of 1677 tons is calculated as:

A = 0.24 x 1677 = **402.5 tons eroded between June 1 and September 1**, or
A = 0.24 x 1375 = **330 cubic yards of soil eroded between June 1 and September 1.**

5.3.3 Example 3

Problem: Determine the soil loss from this site during the period from November 1 to March 30, when hay mulch at a rate of 2 tons per acre has been applied.

Solution: Refer to Table 5.3 for the **C-factor for hay mulch at 2 tons per acre (0.02), and Table 5.5 to obtain the M factor for this period (M = 14 + 9 + 5 + 4 + 4 = 36%)**. Use the USLE to calculate the soil loss:

A = RKLSCP = (250 x 0.20 x 1.72 x 0.02 x 1.3) x 0.36
A = **0.81 tons per acre for November 1 to March 30 with hay mulch protection**
A = 0.81 x 15 = **12.1 tons for November 1 to March 30 with hay mulch protection**
A = 12.1 tons x 0.82 yd^3/ton = **9.9 yd^3 for November 1 to March 30 with hay mulch**

5.3.4 Example 4

To determine soil loss from gullies, we cannot use the USLE but must compute soil loss by direct measurement.

Problem: A gully has formed that is 60 feet long and averages 2 feet wide by 1 foot deep.

Solution: A = 60 feet x 2 feet x 1 foot = **120** cubic feet of soil. For a gravelly loam, Table 5.6, we compute the weight to be 120 ft^3 x 90 lbs/ft^3 = 10,800 pounds. To convert to tons, divide by 2000 pounds/ton. Therefore, A = 10800 ÷ 2000 = **5.4 tons of soil eroded from the site**.

5.4 TABLES

Table 5.1. Soil Erodibility Factors (K), Soil Loss Tolerance Factors (T), and Hydrologic Soil Groups of the A, B and C Horizons, Virgin Islands Soil Series (USDA-NRCS, 1995).

U.S. Department of Agriculture
Natural Resources Conservation Service
CB Table 2
6/13/95

Survey Area: VIRGIN ISLANDS OF THE UNITED STATES
Soil Data for RUSLE

Map Unit Symbol	Component Name	Surface Texture	Percent of Map Unit	Hydrologic Group	Kf	T*	Rock Cover %
AcD	ANNABERG	GR-L	60	D	.12	1	30
AcD	CRAMER	GR-CL	20	C	.08	2	25
AcE	ANNABERG	GR-L	60	D	.12	1	30
AcE	CRAMER	GR-CL	20	C	.08	2	25
AcF	ANNABERG	GR-L	60	D	.12	1	30
AcF	CRAMER	GR-CL	20	C	.08	2	25
AcG	ANNABERG	GR-L	60	D	.12	1	30
AcG	CRAMER	GR-CL	20	C	.08	2	25
AmD	ANNABERG	GR-L	50	D	.12	1	30
AmD	MAHO BAY	GR-L	30	D	.22	2	15
AmE	ANNABERG	GR-L	50	D	.12	1	30
AmE	MAHO BAY	GR-L	30	D	.22	2	15
AmF	ANNABERG	GR-L	50	D	.12	1	30
AmF	MAHO BAY	GR-L	30	D	.22	2	15
AmG	ANNABERG	GR-L	50	D	.12	1	30
AmG	MAHO BAY	GR-L	30	D	.22	2	15
AqA	AQUENTS	VAR	90	D		5	NO DATA
ArB	ARAWAK	GR-L	85	B	.12	2	25

Map Unit Symbol	Component Name	Surface Texture	Percent of Map Unit	Hydrologic Group	Kf	T*	Rock Cover %
ArC	ARAWAK	GR-L	85	B	.12	2	25
ArD	ARAWAK	GR-L	85	B	.12	2	25
ArE	ARAWAK	GR-L	85	B	.12	2	25
ArF	ARAWAK	GR-L	85	B	.12	2	25
BrB	ROCK OUTCROP	UWB	90	D			NO DATA
BsB	BEACHES	S	90	D		5	10
BtB	BEACHES	STX-S	90	D		5	NO DATA
CaA	CARIB	CL	85	D	.26	5	5
CbB	CINNAMON BAY	L	85	B		5	5
CgC	CINNAMON BAY	GR-L	85	B	.17	5	10
CvC	CRAMER	CL	50	C	.08	2	15
CvC	VICTORY	L	30	B	.22	3	20
CvD	CRAMER	CL	50	C	.08	2	15
CvD	VICTORY	L	30	B	.22	3	20
CvE	CRAMER	CL	50	C	.08	2	15
CvE	VICTORY	L	30	B	.22	3	20
CvF	CRAMER	CL	50	C	.08	2	15
CvF	VICTORY	L	40	B	.22	3	20
DoE	DOROTHEA	CL	80	C	.17	5	10
DoE	SUSANNABERG	CL	15	D	.12	2	30
DoF	DOROTHEA	CL	80	C	.17	5	10
DoF	SUSANNABERG	CL	15	D	.12	2	30
DoG	DOROTHEA	CL	80	C	.17	5	10
DoG	SUSANNABERG	CL	15	D	.12	2	30
FsD	FREDRIKSDAL	GRV-CL	50	D	.22	1	35
FsD	SUSANNABERG	CL	30	D	.12	2	30
FsE	FREDRIKSDAL	GRV-CL	50	D	.22	1	35
FsE	SUSANNABERG	CL	30	D	.12	2	30
FsF	FREDRIKSDAL	GRV-CL	50	D	.22	1	35
FsF	SUSANNABERG	CL	30	D	.12	2	30
FsG	FREDRIKSDAL	GRV-CL	50	D	.22	1	35
FsG	SUSANNABERG	CL	30	D	12	2	30
GyA	GLYNN	GR-L	85	C	.20	5	10
GyB	GLYNN	GR-L	85	C	.20	5	10
GyC	GLYNN	GR-L	85	C	.20	5	10
HeA	HESSELBERG	C	85	D	.05	2	0
HeB	HESSELBERG	C	85	D	.05	2	0
HeC	HESSELBERG	C	85	D	o5	2	0
HgA	HOGENSBORG	CL	85	D	.26	5	0
HgB	HOGENSBORG	CL	85	D	.26	5	0
HgC	HOGENSBORG	CL	85	D	.26	5	0
JaB	JAUCAS	S	85	A	.08	5	0
JsD	JEALOUSY	GR-CL	50	C	.15	3	10
JsD	SOUTHGATE	GR-L	30	D	.22	1	25
JSE	JEALOUSY	GR-CL	50	C	.15	3	10
JSE	SOUTHGATE	GR-L	30	D	.22	1	25
JsF	JEALOUSY	GR-CL	50	C	.17	3	10
JsF	SOUTHGATE	GR-L	30	D	.22	1	25
LmC	LAMESHUR	GR-SL	85	A	.12	5	55

Map Unit Symbol	Component Name	Surface Texture	Percent of Map Unit	Hydrologic Group	Kf	T*	Rock Cover %
PaB	PARASOL	CL	85	B	.15	5	0
PaC	PARASOL	CL	85	B	.15	5	0
Pt	PITS	UWB	90				NO DATA
RdB	REDHOOK	STX-S	85	A	.08	5	65
SaA	SALT FLATS	SICL	90	D		5	No DATA
SbA	SANDY POINT	SCL	50	D	.20	5	0
SbA	SUGAR BEACH	MUCK	40	D		3	0
SiA	SION	C	85	B	.05	4	5
SiB	SION	C	85	B	.05	4	5
SoA	SOLITUDE	GR-FSL	85	D	.20	5	20
SrD	SOUTHGATE	GRV-L	45	D	.22	1	30
SrD	ROCK OUTCROP	UWS	40	D			No DATA
SrE	SOUTHGATE	GRV-L	45	D	.22	1	30
SrE	ROCK OUTCROP	UWB	40	D			No DATA
SrF	SOUTHGATE	GRV-L	45	D	.22	1	30
SrF	ROCK OUTCROP	UWB	40	D			No DATA
SrG	SOUTHGATE	GRV-L	45	D	.22	1	30
SrG	ROCK OUTCROP	UWB	40	D			NO DATA
UbD	URBAN LAND	VAR	90				No DATA
UcC	URBAN LAND	VAR	80				No DATA
UcC	CINNAMON BAY	L	15	B	.17	5	5
UgC	URBAN LAND	VAR	80				NO DATA
UgC	GLYNN	GR-L	15	C	.20	5	10
VsC	VICTORY	L	45	B	.22	3	20
VsC	SOUTHGATE	GR-L	40	D	.22	1	25
VsD	VICTORY	L	45	B	.22	3	20
VsD	SOUTHGATE	GR-L	40	D	.22	1	25
VsE	VICTORY	L	45	B	.22	3	20
VsE	SOUTHGATE	GR-L	40	D	.22	1	25
VsF	VICTORY	L	45	B	.22	3	20
VsF	SOUTHGATE	GR-L	40	D	.22	1	25

****The soil loss tolerance or permissible soil loss (“T” factor) is expressed in tons/acre/year.***

Table 5.2.a. Topographic Adjustment Factors (LS) for Slope Percent and Slope Length (USDA-NRCS Caribbean Area, 1995) for Rangeland.[1]

Slope (%)	Horizontal Slope Length (Feet)																
	< 3	6	9	12	15	25	50	75	100	150	200	250	300	400	600	800	1000
0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.5	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
1.0	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.17	0.17
2.0	0.20	0.20	0.20	0.20	0.20	0.21	0.23	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.33	0.34	0.35
3.0	0.26	0.26	0.26	0.26	0.26	0.29	0.33	0.36	0.38	0.40	0.43	0.44	0.46	0.48	0.52	0.55	0.57
4.0	0.33	0.33	0.33	0.33	0.33	0.36	0.43	0.46	0.50	0.54	0.58	0.61	0.63	0.67	0.74	0.78	0.82
5.0	0.38	0.38	0.38	0.38	0.38	0.44	0.52	0.57	0.62	0.68	0.73	0.78	0.81	0.87	0.97	1.04	1.10
6.0	0.44	0.44	0.44	0.44	0.44	0.50	0.61	0.68	0.74	0.83	0.90	0.95	1.00	1.08	1.21	1.31	1.40
8.0	0.54	0.54	0.54	0.54	0.54	0.64	0.79	0.90	0.99	1.12	1.23	1.32	1.40	1.53	1.74	1.91	2.05
10.0	0.60	0.63	0.65	0.66	0.68	0.81	1.03	1.19	1.31	1.51	1.67	1.80	1.92	2.13	2.45	2.71	2.93
12.0	0.61	0.70	0.75	0.80	0.83	1.01	1.31	1.52	1.60	1.97	2.20	2.39	2.56	2.85	3.32	3.70	4.02
14.0	0.63	0.76	0.85	0.92	0.98	1.20	1.58	1.85	2.08	2.44	2.73	2.99	3.21	3.60	4.23	4.74	5.18
16.0	0.65	0.82	0.94	1.04	1.12	1.38	1.85	2.18	2.46	2.91	3.28	3.60	3.88	4.37	5.17	5.82	6.39
20.0	0.68	0.93	1.11	1.26	1.39	1.74	2.37	2.84	3.22	3.85	4.38	4.83	5.24	5.95	7.13	8.10	8.94
25.0	0.73	1.05	1.30	1.51	1.70	2.17	3.00	3.63	4.16	5.03	5.76	6.39	6.96	7.97	9.65	11.04	12.26
30.0	0.77	1.16	1.48	1.75	2.00	2.57	3.60	4.40	5.06	6.18	7.11	7.94	8.68	9.99	12.19	14.04	15.66
40.0	0.85	1.36	1.79	2.17	2.53	3.30	4.73	5.84	6.78	8.37	9.71	10.91	11.99	13.92	17.19	19.96	22.41
50.0	0.91	1.52	2.06	2.54	3.00	3.95	5.74	7.14	8.33	10.37	12.11	13.65	15.06	17.59	21.88	25.55	28.82
60.0	0.97	1.67	2.29	2.86	3.41	4.52	6.63	8.29	9.72	12.16	14.26	16.13	17.84	20.92	26.17	30.68	34.71

[1] *Such as for rangeland and other consolidated soil conditions with cover.*

Table 5.2. b. Topographic Adjustment Factors (LS) for Slope Percent and Slope Length (USDA-NRCS Caribbean Area, 1995) for Cropland.[1]

Slope (%)	Horizontal Slope Length (Feet)																
	< 3	6	9	12	15	25	50	75	100	150	200	250	300	400	600	800	1000
0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06
0.5	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10
1.0	0.11	0.11	0.11	0.11	0.11	0.12	0.13	0.14	0.14	0.15	0.16	0.17	0.17	0.18	0.19	0.20	0.20
2.0	0.17	0.17	0.17	0.17	0.17	0.19	0.22	0.25	0.27	0.29	0.37	0.33	0.35	0.37	0.41	0.44	0.47
3.0	0.22	0.22	0.22	0.22	0.22	0.25	0.32	0.36	0.39	0.44	0.48	0.52	0.55	0.60	0.68	0.75	0.80
4.0	0.26	0.26	0.26	0.26	0.26	0.31	0.40	0.47	0.52	0.60	0.67	0.72	0.77	0.86	0.99	1.10	1.19
5.0	0.30	0.30	0.30	0.30	0.30	0.37	0.49	0.58	0.65	0.76	0.85	0.93	1.01	1.13	1.33	1.49	1.63
6.0	0.34	0.34	0.34	0.34	0.34	0.43	0.58	0.69	0.78	0.93	1.05	1.16	1.25	1.42	1.69	1.91	2.11
8.0	0.42	0.42	0.42	0.42	0.42	0.53	0.74	0.91	1.04	1.26	1.45	1.62	1.77	2.03	2.47	2.83	3.15
10.0	0.46	0.48	0.50	0.51	0.52	0.67	0.97	1.19	1.38	1.71	1.98	2.22	2.44	2.84	3.50	4.06	4.56
12.0	0.47	0.53	0.58	0.61	0.64	0.84	1.23	1.53	1.79	2.23	2.61	2.95	3.26	3.81	4.75	5.56	6.28
14.0	0.48	0.58	0.65	0.70	0.75	1.00	1.48	1.86	2.19	2.76	3.25	3.69	4.09	4.82	6.07	7.15	8.11
16.0	0.49	0.63	0.72	0.79	0.85	1.15	1.73	2.20	2.60	3.30	3.90	4.45	4.95	5.86	7.43	8.79	10.02
20.0	0.52	0.71	0.85	0.96	1.06	1.45	2.22	2.85	3.40	4.36	5.21	5.97	6.68	7.97	10.23	12.20	13.99
25.0	0.56	0.80	1.00	1.16	1.30	1.81	2.82	3.65	4.39	5.69	6.83	7.88	8.86	10.65	13.80	16.58	19.13
30.0	0.59	0.89	1.13	1.34	1.53	2.15	3.39	4.42	5.34	6.98	8.43	9.76	11.01	13.30	17.37	20.99	24.31
40.0	0.65	1.05	1.38	1.68	1.95	2.77	4.45	5.87	7.14	9.43	11.47	13.37	15.14	18.43	24.32	29.60	34.48
50.0	0.71	1.18	1.59	1.97	2.32	3.32	5.40	7.17	8.78	11.66	14.26	16.67	18.94	23.17	30.78	37.65	44.02
60.0	0.76	1.30	1.78	2.23	2.65	3.81	6.24	8.33	10.23	13.65	16.76	19.64	22.36	27.45	36.63	44.96	52.70

[1] *Such as for row cropped agricultural and other moderately consolidated soil conditions with little-to-moderate cover.*

Table 5.2. c. Topographic Adjustment Factors (LS) for Slope Percent and Slope Length (USDA-NRCS Caribbean Area, 1995) for Construction Sites.[1]

Slope (%)	Horizontal Slope Length (Feet)																
	< 3	6	9	12	15	25	50	75	100	150	200	250	300	400	600	800	1000
0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.5	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.10	0.11	0.12	0.12	0.13
1.0	0.09	0.09	0.09	0.09	0.09	0.10	0.13	0.14	0.15	0.17	0.18	0.19	0.20	0.22	0.24	0.26	0.27
2.0	0.13	0.13	0.13	0.13	0.13	0.16	0.21	0.25	0.28	0.33	0.37	0.40	0.43	0.48	0.56	0.63	0.69
3.0	0.17	0.17	0.17	0.17	0.17	0.21	0.30	0.36	0.41	0.50	0.57	0.64	0.69	0.80	0.96	1.10	1.23
4.0	0.20	0.20	0.20	0.20	0.20	0.26	0.38	0.47	0.55	0.68	0.79	0.89	0.98	1.14	1.42	1.65	1.86
5.0	0.23	0.23	0.23	0.23	0.23	0.31	0.46	0.58	0.68	0.86	1.02	1.16	1.28	1.51	1.91	2.25	2.55
6.0	0.26	0.26	0.26	0.26	0.26	0.36	0.54	0.69	0.82	1.05	1.25	1.43	1.60	1.90	2.43	2.89	3.30
8.0	0.32	0.32	0.32	0.32	0.32	0.45	0.70	0.91	1.10	1.43	1.72	1.99	2.24	2.70	3.52	4.24	4.91
10.0	0.35	0.37	0.38	0.39	0.40	0.57	0.91	1.20	1.46	1.92	2.34	2.72	3.09	3.75	4.95	6.03	7.02
12.0	0.36	0.41	0.45	0.47	0.49	0.71	1.15	1.54	1.88	2.51	3.07	3.60	4.09	5.01	6.67	8.17	9.57
14.0	0.38	0.45	0.51	0.55	0.58	0.85	1.40	1.87	2.31	3.09	3.81	4.48	5.11	6.30	8.45	10.40	12.23
16.0	0.39	0.49	0.56	0.62	0.67	0.98	1.64	2.21	2.73	3.68	4.56	5.37	6.15	7.60	10.26	12.69	14.96
20.0	0.41	0.56	0.67	0.76	0.84	1.24	2.10	2.86	3.57	4.85	6.04	7.16	8.23	10.24	13.94	17.35	20.57
25.0	0.45	0.64	0.80	0.93	1.04	1.56	2.67	3.67	4.59	6.30	7.88	9.38	10.81	13.53	18.57	23.24	27.66
30.0	0.48	0.72	0.91	1.08	1.24	1.86	3.22	4.44	5.58	7.70	9.67	11.55	13.35	16.77	23.14	29.07	34.71
40.0	0.53	0.85	1.13	1.37	1.59	2.41	4.24	5.89	7.44	10.35	13.07	15.67	18.17	22.95	31.89	40.29	48.29
50.0	0.58	0.97	1.31	1.62	1.91	2.91	5.16	7.20	9.13	12.75	16.16	19.42	22.57	28.60	39.95	50.63	60.84
60.0	0.63	1.07	1.47	1.84	2.19	3.36	5.97	8.37	10.63	14.89	18.92	22.78	26.51	33.67	47.18	59.93	72.15

[1] Such as for freshly prepared construction and other highly disturbed soil conditions with little or no cover.

Table 5.3. Cover Index Factor (C) for Construction Sites (U.S. Department of Agriculture, Soil Conservation Service).

Type of Cover*		Factor C	Percent[1]
None (fallow or bare gr ound)		1.0	0.0
Temporary Seedings (90% stand)			
Ryegrass (perennial type)		0.05	95
Ryegrass (annuals)		0.10	90
Small grain		0.05	95
Millet or sudan grass		0.05	95
Permanent Seeding (90% stand)		0.01	99
Sod (laid immediately)		0.01	99
	Application Rate (tons/acre)		
Mulch			
Hay	0.50	0.25	75
Hay	1.00	0.13	87
Hay	1.50	0.07	93
Hay	2.00	0.02	98
Small grain straw	2.00	0.02	98
Wood chips	6.00	0.06	94
Wood cellulose	1.75	0.10	95
Fiberglass	0.50	0.05	95
Asphalt emulsion (1,250 gals/acre)		0.02	98

*** Fiber matting, excelsior, gravel and stone may also be used as protective cover.***
[1] Percent soil loss reduction as compared with fallow or bare ground.

Table 5.4. Practice Factor (P) for Surface Condition for Construction Sites (U.S. Department of Agriculture, Soil Conservation Service).

Surface Condition With No Cover	P Factor[1]
Compact and smooth, scraped with bulldozer or scraper up and down hill	1.3
Same condition, except raked with bulldozer root rake up and down hill	1.2
Compact and smooth, scraped with bulldozer or scraper across the slope	1.2
Same condition, except raked with bulldozer root rake across the slope	0.9
Loose as a disked plow layer	1.0
Rough irregular surface equipment tracks in all directions	0.9
Loose with rough surface greater than 12" depth	0.8
Loose with smooth surface greater than 12" depth	0.9

[1] *Values based on estimates.*

Table 5.5. Adjustment Factors (M) for Estimating Monthly and Portions of Annual Soil Loss (U.S. Department of Agriculture, Soil Conservation Service).

	St. Croix & St. Thomas (R = 250)	**St. John (R = 240)**
Month	**Percent**	**Percent**
January	5	6
February	4	5
March	4	5
April	5	7
May	10	10
June	6	6
July	7	7
August	11	10
September	12	12
October	13	11
November	14	12
December	9	9
	100	100

Table 5.6. Approximate Soil Weights in Pounds per Cubic Foot and Conversion Factors (U.S. Department of Agriculture, Soil Conservation Service).

Soil Texture*	**Volume Weight (lbs/ft^3)**	**Tons to Cubic Yards**
Sands and loamy sands	110	0.67
Sandy loam	105	0.71
Fine sandy loam	100	0.74
Loam	90	0.82
Silt loam	85	0.87
Silty clay loam	80	0.93
Clay loam	75	0.99
Silty, sandy clay and clay	70	1.06
Aerated sediment	80**	0.93
Saturated sediment	60**	1.24

**** Less than 2 mm particle size (includes gravelly and stony textural modifiers).***
***** These are the approximate aerated and saturated weights to be used at damaged sites (streams or reservoirs).***

Table 5.7. USDA Texture Abbreviations (U.S. Department of Agriculture, Soil Conservation Service).

Texture Modifiers	
CB - Cobbly	GRV - Very gravelly
CN - Channery	MK - Mucky
CNV - Very Channery	SR - Stratified
GR - Gravelly	ST - Stony
STV - Very stony	STX - Extremely stony
Textures	
G - Gravel	SL - Sandy loam
COS - Coarse Sand	FSL - Fine sandy loam
S - Sand	VSFL - Very fine sandy loam
FS - Fine sand	L - Loam
VFS - Very fine sand	SIL - Silt loam
LCOS - Loamy coarse sand	SI - Silt
LS - Loamy sand	CL - Clay loam
LFS - Loamy fine sand	SICL - Silty clay loam
LVFS - Loamy very fine sand	SIC - Silty clay
COSL - Coarse sandy loam	C - Clay
MUCK - Muck	

5.5 REFERENCES

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