Application of Universal Soil Loss Equation (USLE) for Estimation of Soil Loss from Earthworks - During Construction for each Subcatchment

Prepared by R. Wannyn, 28 April 2010 Modified by ET Burke 20 July 2010

T:\261600\61647_00_Cambridge_Bypass\SW drainage management\Scheme Assessment Report July 2010\AEE 2nd Draft Sept 2010\Erosion and Sedimentation Control Plan\Appendix 2 USLE Cals\[Appendix 2 - Cambridge USLE Sep

Site Name: **Cambridge Bypass**

Subctch. No.	Earthworks Area(ha)	R	K	LS	C	P	time (yr)	Estimated Sed. Yield (tonnes)	sdr	sed eff	Net Sed Loss (tonnes)	t/ha	Remarks
1	1.1	51.3	0.83	0.57	1	1.3	0.08	2.78	0.5	0.5	0.69	0.63	
2a	5.7	51.3	0.83	3.17	1	1.3	0.20	199.91	0.5	0.5	49.98	8.77	
2b	4.7	51.3	0.83	0.57	1	1.3	0.20	29.68	0.5	0.5	7.42	1.58	
2c	0.3	51.3	0.83	0.57	1	1.3	0.04	0.38	0.5	0.5	0.09	0.32	
3	0.4	51.3	0.83	0.46	1	1.3	0.04	0.40	0.5	0.5	0.10	0.25	
4	0.8	51.3	0.83	0.46	1	1.3	0.04	0.81	0.5	0.5	0.20	0.25	
5a	0.4	51.3	0.83	0.57	1	1.3	0.04	0.51	0.5	0.5	0.13	0.32	
5b	0.25	51.3	0.83	0.57	1	1.3	0.04	0.32	0.5	0.5	0.08	0.32	
6	0.25	51.3	0.83	0.57	1	1.3	0.04	0.32	0.5	0.5	0.08	0.32	
7	0.3	51.3	0.83	0.57	1	1.3	0.04	0.38	0.5	0.5	0.09	0.32	
8	0.5	51.3	0.83	0.57	1	1.3	0.04	0.63	0.5	0.5	0.16	0.32	
9	0.5	51.3	0.83	0.57	1	1.3	0.04	0.63	0.5	0.5	0.16	0.32	
10	0.45	51.3	0.83	0.57	1	1.3	0.04	0.57	0.5	0.5	0.14	0.32	
11	0.45	51.3	0.83	0.57	1	1.3	0.04	0.57	0.5	0.5	0.14	0.32	
12	0.35	51.3	0.83	0.57	1	1.3	0.04	0.44	0.5	0.5	0.11	0.32	
13	0.35	51.3	0.83	0.57	1	1.3	0.04	0.44	0.5	0.5	0.11	0.32	
14	1.05	51.3	0.83	0.57	1	1.3	0.04	1.33	0.5	0.5	0.33	0.32	
15	1.05	51.3	0.83	0.57	1	1.3	0.04	1.33	0.5	0.5	0.33	0.32	
16	0.75	51.3	0.83	0.57	1	1.3	0.04	0.95	0.5	0.5	0.24	0.32	
17	0.75	51.3	0.83	0.57	1	1.3	0.04	0.95	0.5	0.5	0.24	0.32	
18	0.8	51.3	0.83	1.11	1	1.3	0.04	1.97	0.5	0.5	0.49	0.62	
19	0.38	51.3	0.83	1.11	1	1.3	0.04	0.94	0.5	0.5	0.23	0.62	
20a&b	3	51.3	0.83	1.11	1	1.3	0.15	27.77	0.5	0.5	6.94	2.31	
21	1.75	51.3	0.83	1.11	1	1.3	0.15	16.20	0.5	0.5	4.05	2.31	
22a	0.6	51.3	0.83	0.99	1	1.3	0.04	1.31	0.5	0.5	0.33	0.55	
22b	3.6	51.3	0.83	0.57	1	1.3	0.25	28.42	0.5	0.5	7.10	1.97	
23a	0.6	51.3	0.83	0.99	1	1.3	0.04	1.31	0.5	0.5	0.33	0.55	
23b	3.6	51.3	0.83	0.57	1	1.3	0.25	28.42	0.5	0.5	7.10	1.97	
23c	3.5	51.3	0.83	2.09	1	1.3	1.00	404.05	0.5	0.5	101.01	28.86	
24	0.75	51.3	0.83	2.09	1	1.3	1.00	86.58	0.5	0.5	21.65	28.86	
25	0.75	51.3	0.83	2.09	1	1.3	1.00	86.58	0.5	0.5	21.65	28.86	
26	1.35	51.3	0.83	1.22	1	1.3	1.00	91.25	0.5	0.5	22.81	16.90	
27	1.35	51.3	0.83	1.22	1	1.3	1.00	91.25	0.5	0.5	22.81	16.90	
28	0.4	51.3	0.83	1.22	1	1.3	0.04	1.08	0.5	0.5	0.27	0.68	
29	0.4	51.3	0.83	1.22	1	1.3	0.04	1.08	0.5	0.5	0.27	0.68	
30	0.4	51.3	0.83	0.62	1	1.3	0.04	0.55	0.5	0.5	0.14	0.35	
31	0.15	51.3	0.83	0.57	1	1.3	0.04	0.19	0.5	0.5	0.05	0.32	
32	0.15	51.3	0.83	0.57	1	1.3	0.04	0.19	0.5	0.5	0.05	0.32	
33	0.9	51.3	0.83	0.57	1	1.3	0.06	1.71	0.5	0.5	0.43	0.47	
34	0.9	51.3	0.83	0.57	1	1.3	0.06	1.71	0.5	0.5	0.43	0.47	
35a	0.26	51.3	0.83	3.98	1	1.3	0.04	2.29	0.5	0.5	0.57	2.20	
35b	0.11	51.3	0.83	2.42	1	1.3	0.04	0.59	0.5	0.5	0.15	1.34	
36a	0.26	51.3	0.83	3.98	1	1.3	0.04	2.29	0.5	0.5	0.57	2.20	
36b	0.11	51.3	0.83	2.42	1	1.3	0.04	0.59	0.5	0.5	0.15	1.34	
37	0.75	51.3	0.83	0.57	1	1.3	0.06	1.42	0.5	0.5	0.36	0.47	
38	0.75	51.3	0.83	0.57	1	1.3	0.06	1.42	0.5	0.5	0.36	0.47	
39	0.15	51.3	0.83	1.11	1	1.3	0.04	0.37	0.5	0.5	0.09	0.62	
40	0.13	51.3	0.83	1.11	1	1.3	0.04	0.32	0.5	0.5	0.08	0.62	
41	0.15	51.3	0.83	1.11	1	1.3	0.04	0.37	0.5	0.5	0.09	0.62	
42	0.15	51.3	0.83	1.11	1	1.3	0.04	0.37	0.5	0.5	0.09	0.62	
43	0.3	51.3	0.83	1.11	1	1.3	0.04	0.74	0.5	0.5	0.19	0.62	
44	0.25	51.3	0.83	1.11	1	1.3	0.04	0.62	0.5	0.5	0.15	0.62	
45	0.3	51.3	0.83	1.11	1	1.3	0.04	0.74	0.5	0.5	0.19	0.62	
46	0.3	51.3	0.83	1.11	1	1.3	0.04	0.74	0.5	0.5	0.19	0.62	
47	0.3	51.3	0.83	1.11	1	1.3	0.04	0.74	0.5	0.5	0.19	0.62	
48	0.3	51.3	0.83	1.11	1	1.3	0.04	0.74	0.5	0.5	0.19	0.62	
49	0.8	51.3	0.83	0.57	1	1.3	0.04	1.01	0.5	0.5	0.25	0.32	
50	0.8	51.3	0.83	0.57	1	1.3	0.04	1.01	0.5	0.5	0.25	0.32	
51	0.7	51.3	0.83	0.27	1	1.3	0.04	0.42	0.5	0.5	0.10	0.15	
52	0.7	51.3	0.83	0.27	1	1.3	0.04	0.42	0.5	0.5	0.10	0.15	
53	5.6	51.3	0.83	1.72	1	1.3	0.40	213.54	0.5	0.5	53.39	9.53	
54	3.9	51.3	0.83	1.72	1	1.3	0.25	92.95	0.5	0.5	23.24	5.96	
55	1.1	51.3	0.83	1.13	1	1.3	0.15	10.29	0.5	0.5	2.57	2.34	
56	2.6	51.3	0.83	1.03	1	1.3	0.25	37.02	0.5	0.5	9.25	3.56	
57	0.15	51.3	0.83	0.25	1	1.3	0.04	0.08	0.5	0.5	0.02	0.14	
58	0.15	51.3	0.83	0.25	1	1.3	0.04	0.08	0.5	0.5	0.02	0.14	
59	0.15	51.3	0.83	0.25	1	1.3	0.04	0.08	0.5	0.5	0.02	0.14	
60	0.12	51.3	0.83	0.25	1	1.3	0.04	0.07	0.5	0.5	0.02	0.14	
61	5.6	51.3	0.83	3.35	1	1.3	0.25	259.39	0.5	0.5	64.85	11.58	
62	4	51.3	0.83	3.35	1	1.3	0.25	185.28	0.5	0.5	46.32	11.58	
gully	0.7	51.3	0.83	3.35	1	1.3	0.08	10.38	0.5	0.5	2.59	3.71	
Swayne	0.45	51.3	0.83	0.29	1	1.3	0.08	0.58	0.5	0.5	0.14	0.32	
St Kilda	0.5	51.3	0.83	0.23	1	1.3	0.08	0.50	0.5	0.5	0.13	0.25	
Thornton	0.3	51.3	0.83	0.23	1	1.3	0.08	0.30	0.5	0.5	0.08	0.25	
Total	**78.62**							**1943.66**			**485.91**	**6.18**	

The general form of Universal Soil Loss Equation is
A= R*K*LS*C*P, where

A= Soil Loss (t/ha/yr)

R = Rainfall erosion index (J/ha)

R is based on 6 hr/2 yr 41.6 mm (use current Cambridge intensity)

$R = 0.00828 \times (41.6)^{2.2} \times 1.7$

R = 51.3 J/ha

K = Soil Erodibility Factor (tonnes/Unit of R)

During Construction

Soil tests show soil composition varies. However, clay content is consistently low, ±10%
The remainder varies between silts and sands being predominant. Therefore assume 45% Sand and 45% Silt
Therefore => 0.49
0% organic matter => $K_{(corected)} = K + 0.14$
$K_{(corrected)} = 0.63$
Unit conversion => 0.63 x 1.32 = 0.83

Therefore => 0.49
0% organic matter => $K_{(corected)} = K + 0.14$
$K_{(corrected)} = 0.63$
Unit conversion => 0.63 x 1.32 = 0.83

LS = Slope length and steepness factor (dimensionless)

Sub catchment	L(m)	S(%)	'm'	LS
1	25	5.7	0.5	0.57
2a	25	18.2	0.5	3.17
2b	25	5.7	0.5	0.57
2c	25	5.7	0.5	0.57
3	16	5.7	0.5	0.46
4	16	5.7	0.5	0.46
5a	25	5.7	0.5	0.57
5b	25	5.7	0.5	0.57
6	25	5.7	0.5	0.57
7	25	5.7	0.5	0.57
8	25	5.7	0.5	0.57
9	25	5.7	0.5	0.57
10	25	5.7	0.5	0.57
11	25	5.7	0.5	0.57
12	25	5.7	0.5	0.57
13	25	5.7	0.5	0.57
14	25	5.7	0.5	0.57
15	25	5.7	0.5	0.57
16	25	5.7	0.5	0.57
17	25	5.7	0.5	0.57
18	25	9.3	0.5	1.11
19	25	9.3	0.5	1.11
20a&b	25	9.3	0.5	1.11
21	25	9.3	0.5	1.11
22a	15	10.2	0.5	0.99
22b	25	5.7	0.5	0.57
23a	15	10.2	0.5	0.99
23b	25	5.7	0.5	0.57
23c	35	12.6	0.5	2.09
24	35	12.6	0.5	2.09
25	35	12.6	0.5	2.09
26	30	9.3	0.5	1.22
27	30	9.3	0.5	1.22
28	30	9.3	0.5	1.22
29	30	9.3	0.5	1.22
30	30	5.7	0.5	0.62
31	25	5.7	0.5	0.57
32	25	5.7	0.5	0.57
33	25	5.7	0.5	0.57
34	25	5.7	0.5	0.57
35a	20	22.4	0.5	3.98
35b	12	19.3	0.5	2.42
36a	20	22.4	0.5	3.98
36b	12	19.3	0.5	2.42
37	25	5.7	0.5	0.57
38	25	5.7	0.5	0.57
39	25	9.3	0.5	1.11
40	25	9.3	0.5	1.11
41	25	9.3	0.5	1.11
42	25	9.3	0.5	1.11
43	25	9.3	0.5	1.11
44	25	9.3	0.5	1.11
45	25	9.3	0.5	1.11
46	25	9.3	0.5	1.11
47	25	9.3	0.5	1.11
48	25	9.3	0.5	1.11
49	25	5.7	0.5	0.57
50	25	5.7	0.5	0.57
51	25	3	0.3	0.27
52	25	3	0.3	0.27
53	30	11.7	0.5	1.72
54	30	11.7	0.5	1.72
55	30	8.8	0.5	1.13
56	25	8.8	0.5	1.03
57	20	3	0.3	0.25
58	20	3	0.3	0.25
59	20	3	0.3	0.25
60	20	3	0.3	0.25
61	30	17.8	0.5	3.35
62	30	17.8	0.5	3.35
Gully	8	17.8	0.5	1.73
Swayne	10	3	0.3	0.21
St Kilda	14	3	0.3	0.23
Thornton	14	3	0.3	0.23

C = Vegetation cover factor (dimensionless)

During Construction Bare site ; C = 1.0

P = Erosion control practice factor (dimensionless) Smooth bare site ; P = 1.3

Application of Universal Soil Loss Equation (USLE) for Estimation of Soil Loss from Earthworks - During Construction (Haul Road)

Prepared by R. Wannyn, 28 April 2010 Modified by ET Burke 20 July 2010

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Site Name: **Cambridge Bypass**

Subctch. No.	Earthworks Area(ha)	R	K	LS	C	P	time (yr)	Estimated Sed. Yield (tonnes)	sdr	sed eff	Net Sed Loss (tonnes)	t/ha	Remarks
1	0.00	51.3	0.83	0.57	1	1.3	2.42	0.00	0.5	0.5	0.00		
2a	0.00	51.3	0.83	3.17	1	1.3	2.30	0.00	0.5	0.5	0.00		
2b	0.51	51.3	0.83	0.57	1	1.3	2.30	37.04	0.5	0.5	9.26	18.16	
2c	0.00	51.3	0.83	0.57	1	1.3	2.46	0.00	0.5	0.5	0.00		
3	0.00	51.3	0.83	0.46	1	1.3	2.46	0.00	0.5	0.5	0.00		
4	0.00	51.3	0.83	0.46	1	1.3	2.46	0.00	0.5	0.5	0.00		
5a	0.04	51.3	0.83	0.57	1	1.3	2.46	3.26	0.5	0.5	0.82	19.42	
5b	0.04	51.3	0.83	0.57	1	1.3	2.46	3.26	0.5	0.5	0.82	19.42	
6	0.03	51.3	0.83	0.57	1	1.3	2.46	2.33	0.5	0.5	0.58	19.42	
7	0.03	51.3	0.83	0.57	1	1.3	2.46	2.33	0.5	0.5	0.58	19.42	
8	0.06	51.3	0.83	0.57	1	1.3	2.46	4.66	0.5	0.5	1.17	19.42	
9	0.06	51.3	0.83	0.57	1	1.3	2.46	4.66	0.5	0.5	1.17	19.42	
10	0.05	51.3	0.83	0.57	1	1.3	2.46	4.19	0.5	0.5	1.05	19.42	
11	0.05	51.3	0.83	0.57	1	1.3	2.46	4.19	0.5	0.5	1.05	19.42	
12	0.04	51.3	0.83	0.57	1	1.3	2.46	3.26	0.5	0.5	0.82	19.42	
13	0.04	51.3	0.83	0.57	1	1.3	2.46	3.26	0.5	0.5	0.82	19.42	
14	0.10	51.3	0.83	0.57	1	1.3	2.46	7.57	0.5	0.5	1.89	19.42	
15	0.10	51.3	0.83	0.57	1	1.3	2.46	7.57	0.5	0.5	1.89	19.42	
16	0.08	51.3	0.83	0.57	1	1.3	2.46	5.83	0.5	0.5	1.46	19.42	
17	0.08	51.3	0.83	0.57	1	1.3	2.46	5.83	0.5	0.5	1.46	19.42	
18	0.09	51.3	0.83	1.11	1	1.3	2.46	14.34	0.5	0.5	3.59	37.95	
19	0.05	51.3	0.83	1.11	1	1.3	2.46	6.83	0.5	0.5	1.71	37.95	
20a&b	0.36	51.3	0.83	1.11	1	1.3	2.35	52.20	0.5	0.5	13.05	36.25	
21	0.21	51.3	0.83	1.11	1	1.3	2.35	30.45	0.5	0.5	7.61	36.25	
22a	0.00	51.3	0.83	0.99	1	1.3	2.46	0.00	0.5	0.5	0.00		
22b	0.44	51.3	0.83	0.57	1	1.3	2.25	30.90	0.5	0.5	7.73	17.76	
23a	0.00	51.3	0.83	0.99	1	1.3	2.46	0.00	0.5	0.5	0.00		
23b	0.44	51.3	0.83	0.57	1	1.3	2.25	30.90	0.5	0.5	7.73	17.76	
23c	0.00	51.3	0.83	2.09	1	1.3	1.50	0.00	0.5	0.5	0.00		
24	0.00	51.3	0.83	2.09	1	1.3	1.50	0.00	0.5	0.5	0.00		
25	0.00	51.3	0.83	2.09	1	1.3	1.50	0.00	0.5	0.5	0.00		
26	0.11	51.3	0.83	1.22	1	1.3	1.50	10.65	0.5	0.5	2.66	25.35	
27	0.11	51.3	0.83	1.22	1	1.3	1.50	10.65	0.5	0.5	2.66	25.35	
28	0.05	51.3	0.83	1.22	1	1.3	2.46	7.48	0.5	0.5	1.87	41.57	
29	0.05	51.3	0.83	1.22	1	1.3	2.46	7.48	0.5	0.5	1.87	41.57	
30	0.05	51.3	0.83	0.62	1	1.3	2.46	3.83	0.5	0.5	0.96	21.27	
31	0.02	51.3	0.83	0.57	1	1.3	2.46	1.40	0.5	0.5	0.35	19.42	
32	0.02	51.3	0.83	0.57	1	1.3	2.46	1.40	0.5	0.5	0.35	19.42	
33	0.11	51.3	0.83	0.57	1	1.3	2.44	8.32	0.5	0.5	2.08	19.26	
34	0.11	51.3	0.83	0.57	1	1.3	2.44	8.32	0.5	0.5	2.08	19.26	
35a	0.00	51.3	0.83	3.98	1	1.3	2.46	0.00	0.5	0.5	0.00		
35b	0.00	51.3	0.83	2.42	1	1.3	2.46	0.00	0.5	0.5	0.00		
36a	0.00	51.3	0.83	3.98	1	1.3	2.46	0.00	0.5	0.5	0.00		
36b	0.00	51.3	0.83	2.42	1	1.3	2.46	0.00	0.5	0.5	0.00		
37	0.09	51.3	0.83	0.57	1	1.3	2.44	6.93	0.5	0.5	1.73	19.26	
38	0.09	51.3	0.83	0.57	1	1.3	2.44	6.93	0.5	0.5	1.73	19.26	
39	0.02	51.3	0.83	1.11	1	1.3	2.46	2.73	0.5	0.5	0.68	37.95	
40	0.02	51.3	0.83	1.11	1	1.3	2.46	2.28	0.5	0.5	0.57	37.95	
41	0.02	51.3	0.83	1.11	1	1.3	2.46	2.73	0.5	0.5	0.68	37.95	
42	0.02	51.3	0.83	1.11	1	1.3	2.46	2.73	0.5	0.5	0.68	37.95	
43	0.04	51.3	0.83	1.11	1	1.3	2.46	5.46	0.5	0.5	1.37	37.95	
44	0.03	51.3	0.83	1.11	1	1.3	2.46	4.55	0.5	0.5	1.14	37.95	
45	0.04	51.3	0.83	1.11	1	1.3	2.46	5.46	0.5	0.5	1.37	37.95	
46	0.04	51.3	0.83	1.11	1	1.3	2.46	5.46	0.5	0.5	1.37	37.95	
47	0.04	51.3	0.83	1.11	1	1.3	2.46	5.46	0.5	0.5	1.37	37.95	
48	0.04	51.3	0.83	1.11	1	1.3	2.46	5.46	0.5	0.5	1.37	37.95	
49	0.10	51.3	0.83	0.57	1	1.3	2.46	7.46	0.5	0.5	1.86	19.42	
50	0.10	51.3	0.83	0.57	1	1.3	2.46	7.46	0.5	0.5	1.86	19.42	
51	0.08	51.3	0.83	0.27	1	1.3	2.46	3.09	0.5	0.5	0.77	9.20	
52	0.08	51.3	0.83	0.27	1	1.3	2.46	3.09	0.5	0.5	0.77	9.20	
53	0.60	51.3	0.83	1.72	1	1.3	2.10	120.12	0.5	0.5	30.03	50.05	
54	0.42	51.3	0.83	1.72	1	1.3	2.25	90.09	0.5	0.5	22.52	53.62	
55	0.11	51.3	0.83	1.13	1	1.3	2.35	15.83	0.5	0.5	3.96	36.65	
56	0.31	51.3	0.83	1.03	1	1.3	2.25	39.98	0.5	0.5	10.00	32.04	
57	0.02	51.3	0.83	0.25	1	1.3	2.46	0.83	0.5	0.5	0.21	8.61	
58	0.02	51.3	0.83	0.25	1	1.3	2.46	0.83	0.5	0.5	0.21	8.61	
59	0.02	51.3	0.83	0.25	1	1.3	2.46	0.83	0.5	0.5	0.21	8.61	
60	0.02	51.3	0.83	0.25	1	1.3	2.46	0.83	0.5	0.5	0.21	8.61	
61	0.00	51.3	0.83	3.35	1	1.3	2.25	0.00	0.5	0.5	0.00		
62	0.18	51.3	0.83	3.35	1	1.3	2.25	75.04	0.5	0.5	18.76	104.22	
gully	0.00	51.3	0.83	3.35	1	1.3	2.42	0.00	0.5	0.5	0.00		
Swayne	0.00	51.3	0.83	0.29	1	1.3	2.42	0.00	0.5	0.5	0.00		
St Kilda	0.00	51.3	0.83	0.23	1	1.3	2.42	0.00	0.5	0.5	0.00		
Thornton	0.00	51.3	0.83	0.23	1	1.3	2.42	0.00	0.5	0.5	0.00		
Total	**6.02**							**746.10**			**186.53**	**30.97**	

The general form of Universal Soil Loss Equation is
A= R*K*LS*C*P, where

A= Soil Loss (t/ha/yr)

R = Rainfall erosion index (J/ha)

R is based on 6 hr/2 yr 41.6 mm (use current Cambridge intensity)

$R = 0.00828 \times (41.6)^{2.2} \times 1.7$

R = 51.3 J/ha

K = Soil Erodibility Factor (tonnes/Unit of R)

During Construction

Soil tests show soil composition varies. However, clay content is consistently low, ±10%
The remainder varies between silts and sands being predominant. Therefore assume 45% Sand and 45% Silt
Therefore => 0.49

0% organic matter => $K_{(corected)} = K + 0.14$

$K_{(corrected)} = 0.63$

Unit conversion => 0.63 x 1.32 = 0.83

Therefore => 0.49

0% organic matter => $K_{(corected)} = K + 0.1$

$K_{(corrected)} = 0.63$

Unit conversion => 0.63 x 1.32 = 0.83

LS = Slope length and steepness factor (dimensionless)

Sub catchment	L(m)	S(%)	'm'	LS
1	25	5.7	0.5	0.57
2a	25	18.2	0.5	3.17
2b	25	5.7	0.5	0.57
2c	25	5.7	0.5	0.57
3	16	5.7	0.5	0.46
4	16	5.7	0.5	0.46
5a	25	5.7	0.5	0.57
5b	25	5.7	0.5	0.57
6	25	5.7	0.5	0.57
7	25	5.7	0.5	0.57
8	25	5.7	0.5	0.57
9	25	5.7	0.5	0.57
10	25	5.7	0.5	0.57
11	25	5.7	0.5	0.57
12	25	5.7	0.5	0.57
13	25	5.7	0.5	0.57
14	25	5.7	0.5	0.57
15	25	5.7	0.5	0.57
16	25	5.7	0.5	0.57
17	25	5.7	0.5	0.57
18	25	9.3	0.5	1.11
19	25	9.3	0.5	1.11
20a&b	25	9.3	0.5	1.11
21	25	9.3	0.5	1.11
22a	15	10.2	0.5	0.99
22b	25	5.7	0.5	0.57
23a	15	10.2	0.5	0.99
23b	25	5.7	0.5	0.57
23c	35	12.6	0.5	2.09
24	35	12.6	0.5	2.09
25	35	12.6	0.5	2.09
26	30	9.3	0.5	1.22
27	30	9.3	0.5	1.22
28	30	9.3	0.5	1.22
29	30	9.3	0.5	1.22
30	30	5.7	0.5	0.62
31	25	5.7	0.5	0.57
32	25	5.7	0.5	0.57
33	25	5.7	0.5	0.57
34	25	5.7	0.5	0.57
35a	20	22.4	0.5	3.98
35b	12	19.3	0.5	2.42
36a	20	22.4	0.5	3.98
36b	12	19.3	0.5	2.42
37	25	5.7	0.5	0.57
38	25	5.7	0.5	0.57
39	25	9.3	0.5	1.11
40	25	9.3	0.5	1.11
41	25	9.3	0.5	1.11
42	25	9.3	0.5	1.11
43	25	9.3	0.5	1.11
44	25	9.3	0.5	1.11
45	25	9.3	0.5	1.11
46	25	9.3	0.5	1.11
47	25	9.3	0.5	1.11
48	25	9.3	0.5	1.11
49	25	5.7	0.5	0.57
50	25	5.7	0.5	0.57
51	25	3	0.3	0.27
52	25	3	0.3	0.27
53	30	11.7	0.5	1.72
54	30	11.7	0.5	1.72
55	30	8.8	0.5	1.13
56	25	8.8	0.5	1.03
57	20	3	0.3	0.25
58	20	3	0.3	0.25
59	20	3	0.3	0.25
60	20	3	0.3	0.25
61	30	17.8	0.5	3.35
62	30	17.8	0.5	3.35
Gully	8	17.8	0.5	1.73
Swayne	10	3	0.3	0.21
St Kilda	14	3	0.3	0.23
Thornton	14	3	0.3	0.23

C = Vegetation cover factor (dimensionless)

During Construction Bare site ; C = 1.0

P = Erosion control practice factor (dimensionless) Smooth bare site ; P = 1.3

Application of Universal Soil Loss Equation (USLE) for Estimation of Soil Loss from Earthworks - After Construction

Prepared by R. Wannyn, 28 April 2010 Modified by ET Burke 20 July 2010

T:\261600\61647_00_Cambridge_Bypass\SW drainage management\Scheme Assessment Report July 2010\AEE 2nd Draft Sept 2010\Erosion and Sedimentation Control Plan\Appendix 2 USLE Cals\[Appendix 2 - Cambridge USLE Sept 10.›

Site Name: **Cambridge Bypass**

Subctch. No.	Earthworks Area(ha)	R	K	LS	C	P	time (yr)	Estimated Sed. Yield (tonnes)	sdr	sed eff	Net Sed Loss (tonnes)	t/ha	Remarks
1	0.16	51.3	0.46	0.40	0.1	1	0.17	0.03	0.5	0.5	0.01	0.04	
2a	2	51.3	0.46	1.79	0.1	1	0.17	1.44	0.5	0.5	0.36	0.18	
2b	0.6	51.3	0.46	0.20	0.1	1	0.17	0.05	0.5	0.5	0.01	0.02	
2c	0.01	51.3	0.46	0.20	0.1	1	0.17	0.00	0.5	0.5	0.00	0.02	
3	0.01	51.3	0.46		0.1	1	0.17	0.00	0.5	0.5	0.00	0.00	
4	0.01	51.3	0.46		0.1	1	0.17	0.00	0.5	0.5	0.00	0.00	
5a	0.03	51.3	0.46	0.29	0.1	1	0.17	0.00	0.5	0.5	0.00	0.03	
5b	0.03	51.3	0.46	0.29	0.1	1	0.17	0.00	0.5	0.5	0.00	0.03	
6	0.02	51.3	0.46	0.20	0.1	1	0.17	0.00	0.5	0.5	0.00	0.02	
7	0.02	51.3	0.46	0.20	0.1	1	0.17	0.00	0.5	0.5	0.00	0.02	
8	0.04	51.3	0.46	0.20	0.1	1	0.17	0.00	0.5	0.5	0.00	0.02	
9	0.04	51.3	0.46	0.20	0.1	1	0.17	0.00	0.5	0.5	0.00	0.02	
10	0.03	51.3	0.46	0.20	0.1	1	0.17	0.00	0.5	0.5	0.00	0.02	
11	0.03	51.3	0.46	0.20	0.1	1	0.17	0.00	0.5	0.5	0.00	0.02	
12	0.03	51.3	0.46	0.20	0.1	1	0.17	0.00	0.5	0.5	0.00	0.02	
13	0.03	51.3	0.46	0.20	0.1	1	0.17	0.00	0.5	0.5	0.00	0.02	
14	0.09	51.3	0.46	0.29	0.1	1	0.17	0.01	0.5	0.5	0.00	0.03	
15	0.09	51.3	0.46	0.29	0.1	1	0.17	0.01	0.5	0.5	0.00	0.03	
16	0.12	51.3	0.46	0.53	0.1	1	0.17	0.03	0.5	0.5	0.01	0.05	
17	0.12	51.3	0.46	0.53	0.1	1	0.17	0.03	0.5	0.5	0.01	0.05	
18	0.18	51.3	0.46	0.67	0.1	1	0.17	0.05	0.5	0.5	0.01	0.07	
19	0.09	51.3	0.46	0.67	0.1	1	0.17	0.02	0.5	0.5	0.01	0.07	
20a&b	0.72	51.3	0.46	0.67	0.1	1	0.17	0.19	0.5	0.5	0.05	0.07	
21	0.35	51.3	0.46	0.53	0.1	1	0.17	0.07	0.5	0.5	0.02	0.05	
22a	0.24	51.3	0.46	0.98	0.1	1	0.17	0.09	0.5	0.5	0.02	0.10	
22b	0.66	51.3	0.46	0.40	0.1	1	0.17	0.11	0.5	0.5	0.03	0.04	
23a	0.24	51.3	0.46	0.98	0.1	1	0.17	0.09	0.5	0.5	0.02	0.10	
23b	0.66	51.3	0.46	0.53	0.1	1	0.17	0.14	0.5	0.5	0.04	0.05	
23c	0.48	51.3	0.46	1.79	0.1	1	0.17	0.34	0.5	0.5	0.09	0.18	
24	0.24	51.3	0.46	1.79	0.1	1	0.17	0.17	0.5	0.5	0.04	0.18	
25	0.24	51.3	0.46	1.79	0.1	1	0.17	0.17	0.5	0.5	0.04	0.18	
26	0.36	51.3	0.46	0.98	0.1	1	0.17	0.14	0.5	0.5	0.04	0.10	
27	0.36	51.3	0.46	0.98	0.1	1	0.17	0.14	0.5	0.5	0.04	0.10	
28	0.11	51.3	0.46	0.82	0.1	1	0.17	0.04	0.5	0.5	0.01	0.08	
29	0.11	51.3	0.46	0.82	0.1	1	0.17	0.04	0.5	0.5	0.01	0.08	
30	0.06	51.3	0.46	0.40	0.1	1	0.17	0.01	0.5	0.5	0.00	0.04	
31	0.03	51.3	0.46	0.20	0.1	1	0.17	0.00	0.5	0.5	0.00	0.02	
32	0.03	51.3	0.46	0.20	0.1	1	0.17	0.00	0.5	0.5	0.00	0.02	
33	0.095	51.3	0.46	0.29	0.1	1	0.17	0.01	0.5	0.5	0.00	0.03	
34	0.095	51.3	0.46	0.29	0.1	1	0.17	0.01	0.5	0.5	0.00	0.03	
35a	0.12	51.3	0.46	1.79	0.1	1	0.17	0.09	0.5	0.5	0.02	0.18	
35b	0.04	51.3	0.46	0.40	0.1	1	0.17	0.01	0.5	0.5	0.00	0.04	
36a	0.12	51.3	0.46	1.79	0.1	1	0.17	0.09	0.5	0.5	0.02	0.18	
36b	0.04	51.3	0.46	0.40	0.1	1	0.17	0.01	0.5	0.5	0.00	0.04	
37	0.12	51.3	0.46	0.40	0.1	1	0.17	0.02	0.5	0.5	0.00	0.04	
38	0.12	51.3	0.46	0.40	0.1	1	0.17	0.02	0.5	0.5	0.00	0.04	
39	0.035	51.3	0.46	0.82	0.1	1	0.17	0.01	0.5	0.5	0.00	0.08	
40	0.035	51.3	0.46	0.82	0.1	1	0.17	0.01	0.5	0.5	0.00	0.08	
41	0.035	51.3	0.46	0.82	0.1	1	0.17	0.01	0.5	0.5	0.00	0.08	
42	0.035	51.3	0.46	0.82	0.1	1	0.17	0.01	0.5	0.5	0.00	0.08	
43	0.07	51.3	0.46	0.82	0.1	1	0.17	0.02	0.5	0.5	0.01	0.08	
44	0.07	51.3	0.46	0.82	0.1	1	0.17	0.02	0.5	0.5	0.01	0.08	
45	0.07	51.3	0.46	0.82	0.1	1	0.17	0.02	0.5	0.5	0.01	0.08	
46	0.07	51.3	0.46	0.82	0.1	1	0.17	0.02	0.5	0.5	0.01	0.08	
47	0.06	51.3	0.46	0.82	0.1	1	0.17	0.02	0.5	0.5	0.00	0.08	
48	0.06	51.3	0.46	0.82	0.1	1	0.17	0.02	0.5	0.5	0.00	0.08	
49	0.09	51.3	0.46	0.29	0.1	1	0.17	0.01	0.5	0.5	0.00	0.03	
50	0.09	51.3	0.46	0.29	0.1	1	0.17	0.01	0.5	0.5	0.00	0.03	
51	0.01	51.3	0.46		0.1	1	0.17	0.00	0.5	0.5	0.00	0.00	
52	0.01	51.3	0.46		0.1	1	0.17	0.00	0.5	0.5	0.00	0.00	
53	1.14	51.3	0.46	0.67	0.1	1	0.17	0.31	0.5	0.5	0.08	0.07	
54	0.78	51.3	0.46	0.67	0.1	1	0.17	0.21	0.5	0.5	0.05	0.07	
55	0.24	51.3	0.46	0.67	0.1	1	0.17	0.06	0.5	0.5	0.02	0.07	
56	2.6	51.3	0.46	0.40	0.1	1	0.17	0.41	0.5	0.5	0.10	0.04	
57	0.01	51.3	0.46		0.1	1	0.17	0.00	0.5	0.5	0.00	0.00	
58	0.01	51.3	0.46		0.1	1	0.17	0.00	0.5	0.5	0.00	0.00	
59	0.01	51.3	0.46		0.1	1	0.17	0.00	0.5	0.5	0.00	0.00	
60	0.01	51.3	0.46		0.1	1	0.17	0.00	0.5	0.5	0.00	0.00	
61	1.44	51.3	0.46	1.79	0.1	1	0.17	1.03	0.5	0.5	0.26	0.18	
62	1.03	51.3	0.46	1.79	0.1	1	0.17	0.74	0.5	0.5	0.18	0.18	
gully	0.7	51.3	0.46	0.80	0.1	1	0.17	0.22	0.5	0.5	0.06	0.08	
Swayne	0.14	51.3	0.46	0.16	0.1	1	0.17	0.01	0.5	0.5	0.00	0.02	
St Kilda	0.5	51.3	0.46	0.23	0.1	1	0.17	0.05	0.5	0.5	0.01	0.02	
Thornton	0.3	51.3	0.46	0.23	0.1	1	0.17	0.03	0.5	0.5	0.01	0.02	
Total	**19.07**							**6.96**			**1.74**	**4.36**	

The general form of Universal Soil Loss Equation is
A= R*K*LS*C*P, where

A= Soil Loss (t/ha/yr)

R = Rainfall erosion index (J/ha) R is based on 6 hr/2 yr 41.6 mm (use current Cambridge intensity)

K = Soil Erodibility Factor (tonnes/Unit of R)

After Construction

Soil tests show soil composition varies. However, clay content is consistently low, ±10%
The remainder varies between silts and sands being predominant. Therefore assume 45% Sand and 45% Silt
Therefore => 0.49
4% organic matter, reestablished vegetation => $K_{(corected)}$= K - 0.14
$K_{(corrected)}$ = 0.35
Unit conversion => 0.35 x 1.32 = 0.46

LS = Slope length and steepness factor (dimensionless)

Sub catc	L(m)	S(%)	'm'	LS
1	30	4	0.4	0.40
2a	30	12	0.5	1.79
2b	30	2	0.3	0.20
2c	30	2	0.3	0.20
3	-	-	-	
4	-	-	-	
5a	30	3	0.3	0.29
5b	30	3	0.3	0.29
6	30	2	0.3	0.20
7	30	2	0.3	0.20
8	30	2	0.3	0.20
9	30	2	0.3	0.20
10	30	2	0.3	0.20
11	30	2	0.3	0.20
12	30	2	0.3	0.20
13	30	2	0.3	0.20
14	30	3	0.3	0.29
15	30	3	0.3	0.29
16	30	5	0.5	0.53
17	30	5	0.5	0.53
18	30	6	0.5	0.67
19	30	6	0.5	0.67
20a&b	30	6	0.5	0.67
21	30	5	0.5	0.53
22a	30	8	0.5	0.98
22b	30	4	0.4	0.40
23a	30	8	0.5	0.98
23b	30	5	0.5	0.53
23c	30	12	0.5	1.79
24	30	12	0.5	1.79
25	30	12	0.5	1.79
26	30	8	0.5	0.98
27	30	8	0.5	0.98
28	30	7	0.5	0.82
29	30	7	0.5	0.82
30	30	4	0.4	0.40
31	30	2	0.3	0.20
32	30	2	0.3	0.20
33	30	3	0.3	0.29
34	30	3	0.3	0.29
35a	30	12	0.5	1.79
35b	30	4	0.4	0.40
36a	30	12	0.5	1.79
36b	30	4	0.4	0.40
37	30	4	0.4	0.40
38	30	4	0.4	0.40
39	30	7	0.5	0.82
40	30	7	0.5	0.82
41	30	7	0.5	0.82
42	30	7	0.5	0.82
43	30	7	0.5	0.82
44	30	7	0.5	0.82
45	30	7	0.5	0.82
46	30	7	0.5	0.82
47	30	7	0.5	0.82
48	30	7	0.5	0.82
49	30	3	0.3	0.29
50	30	3	0.3	0.29
51	-	-	-	
52	-	-	-	
53	30	6	0.5	0.67
54	30	6	0.5	0.67
55	30	6	0.5	0.67
56	30	4	0.4	0.40
57	-	-	-	
58	-	-	-	
59	-	-	-	
60	-	-	-	
61	30	12	0.5	1.79
62	30	12	0.5	1.79
gully	6	12	0.5	0.80
Swyane	4	3	0.3	0.16
St Kilda	14	3	0.3	0.23
Thornton	14	3	0.3	0.23

C = Vegetation cover factor (dimensionless)

During Construction C = 0.1

P = Erosion control practice factor (dimensionless) P = 1.0