US Army Corps
of Engineers
Kansas City District

CENWK-ED-HR 20 October 2014

MEMORANDUM TO OD-R

SUBJECT: Monitoring Program for Regulatory Plan for Commercial Dredging Activities on the Kansas River 2013/2014

1. The purpose of this memorandum is to document changes in the Kansas River riverbed elevations for the Monitoring Program as described in C*ommercial Dredging Activities on the Kansas River, Appendix A: Regulatory Plan*. This memorandum documents changes in average bed elevations for purposes of regulating dredging activities per the existing regulatory plan. It is understood that the regulatory plan is scheduled for update this year. Baseline data was collected in 1992 and the most recent data was collected in Fall 2013 and Spring 2014. The Kansas River dredgers funded the collection of 111 cross-sections in and near dredging reaches to allow an assessment of bed elevation change in 5-mile reaches that intersect their authorized dredging reaches. Enclosure 1 graphs the locations and extent of bed change at the individual cross-sections compared to the 1992 baseline.

2. According to "Dredging Restrictions, Section I. Restrictions Concerning Riverbed Degradation", *Commercial Dredging Activities on the Kansas River, Appendix A: Regulatory Plan*, Page A-3, "If riverbed elevations in a 5-mile-long reach of river approach 2 feet of degradation, dredging activities which adversely affect bed elevations in that reach will be altered or terminated before unacceptable impacts occur. Further, if the average reduction of riverbed elevations in a 5-mile-long reach of river attains 2 feet (regardless of cause), dredging activities which adversely affect bed elevations in that reach will be terminated." From 1992 to 2013/2014, 5-mile reach averages spanning RM 26.5 to 40.5 and RM 40.6 to 51.4 experienced 2 ft or greater degradation. Enclosure 2 presents the average bed change from 1992 to 2013/14 for every 5-mile reach.

3. Bed changes in the 5-mile average reaches associated with each potential dredging reach are listed in Table 1. Negative bed change implies degradation. Shaded rows indicate dredging reaches with degradation of at least 2 ft which therefore meet the criteria for cessation of dredging per the *Commercial Dredging Activities on the Kansas River, Appendix A: Regulatory Plan*.

Table 1. Most Degraded 5-mi Reaches Intersecting Potential Dredging Reaches

Reach	Most degraded 5-mi reach associated with the dredging reach	Average bed change (1992 to 2013/14) in associated 5-mi reach, ft
9.4 - 10.4	9.4 - 14.4	-1.31
12.8 - 13.9	9.4 - 14.4	-1.31
15.4 - 16.9	10.4 - 15.4	0.01
18.65 - 20.15	20.2 - 25.2	-1.24
20.55 - 20.6	20.6 - 25.6	-1.37
21 - 21.15	21.2 - 26.2	-1.64
42.6 - 44.1	43.6 - 48.6	-3.08
47.1 - 48	43.6 - 48.6	-3.08
45.2 - 46.7	43.6 - 48.6	-3.08
49.6 - 51.35	44.6 - 49.6	-2.94
50.9 - 51.35	45.9 - 50.9	-2.59
77.1 - 78.6	77 - 82	-1.19

4. A limitation to this analysis in three stretches of the river is the lack of baseline and monitoring data required to analyze all the 5-mile average reaches that intersect the dredging reaches. For example, the analysis for dredging reach RM 9.4 to 10.4 should include cross-sections from 4.4 to 15.4 to include all 5-mile reaches. However, baseline data (and data collection in subsequent years) begins at RM 9.4. The dredging reach itself (9.4 to 10.4) has degraded 3.55 ft since 1992, with degradation generally increasing in the downstream direction as can be seen in Enclosure 1. Similarly, baseline and monitoring data stops at RM 51.5. To compute all intersecting 5-mile reaches, the data should extend to RM 56.4. Finally, to analyze the dredging reach spanning 77.1 to 78.6, cross-sections should extend to RM 72.1, whereas now they stop at 77.

5. Point of contact for this memorandum is Mr. John Shelley, Hydraulic Engineer, ED-HR, 816-389-2310.

Enclosures

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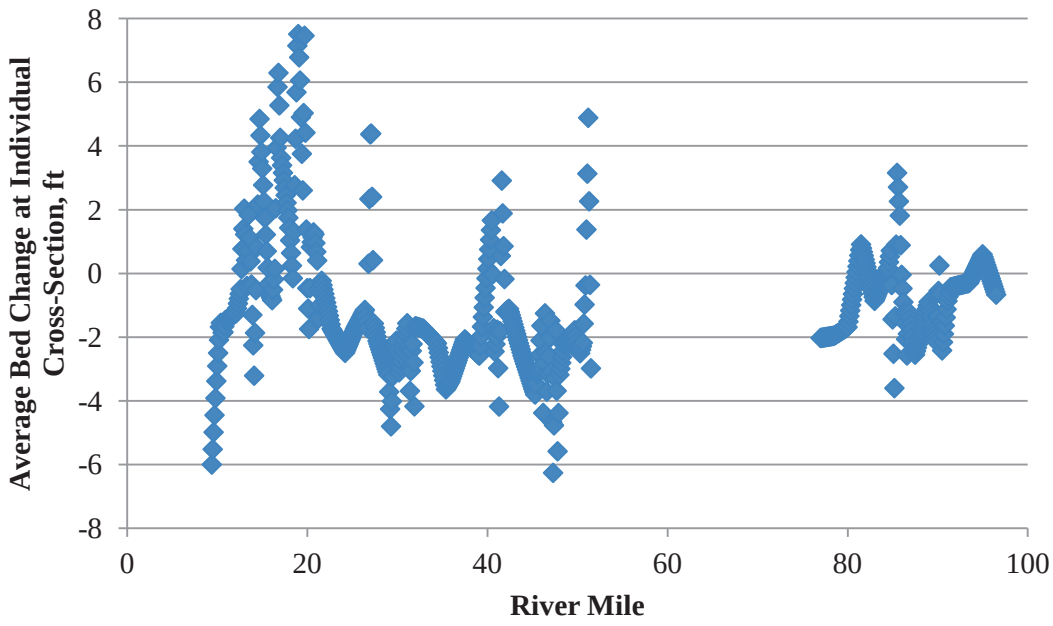

Enclosure 1. Change in Average Bed Elevation at Individual Cross-Sections from 1992 to 2013/14 survey

5-mile reaches	5-mile average bed change, ft	5-mile reaches	5-mile average bed change, ft	5-mile reaches	5-mile average bed change, ft	5-mile reaches	5-mile average bed change, ft
9.4 - 14.4	-1.31	14.1 - 19.1	2.21	18.8 - 23.8	0.56	23.5 - 28.5	-1.45
9.5 - 14.5	-1.15	14.2 - 19.2	2.39	18.9 - 23.9	0.40	23.6 - 28.6	-1.47
9.6 - 14.6	-0.97	14.3 - 19.3	2.52	19 - 24	0.22	23.7 - 28.7	-1.48
9.7 - 14.7	-0.78	14.4 - 19.4	2.61	19.1 - 24.1	0.02	23.8 - 28.8	-1.49
9.8 - 14.8	-0.61	14.5 - 19.5	2.64	19.2 - 24.2	-0.16	23.9 - 28.9	-1.51
9.9 - 14.9	-0.46	14.6 - 19.6	2.70	19.3 - 24.3	-0.33	24 - 29	-1.53
10 - 15	-0.33	14.7 - 19.7	2.78	19.4 - 24.4	-0.47	24.1 - 29.1	-1.55
10.1 - 15.1	-0.22	14.8 - 19.8	2.77	19.5 - 24.5	-0.59	24.2 - 29.2	-1.59
10.2 - 15.2	-0.12	14.9 - 19.9	2.71	19.6 - 24.6	-0.68	24.3 - 29.3	-1.63
10.3 - 15.3	-0.05	15 - 20	2.63	19.7 - 24.7	-0.82	24.4 - 29.4	-1.66
10.4 - 15.4	0.01	15.1 - 20.1	2.54	19.8 - 24.8	-1.01	24.5 - 29.5	-1.68
10.5 - 15.5	0.05	15.2 - 20.2	2.45	19.9 - 24.9	-1.14	24.6 - 29.6	-1.69
10.6 - 15.6	0.09	15.3 - 20.3	2.40	20 - 25	-1.20	24.7 - 29.7	-1.69
10.7 - 15.7	0.12	15.4 - 20.4	2.38	20.1 - 25.1	-1.23	24.8 - 29.8	-1.69
10.8 - 15.8	0.14	15.5 - 20.5	2.37	20.2 - 25.2	-1.24	24.9 - 29.9	-1.69
10.9 - 15.9	0.16	15.6 - 20.6	2.38	20.3 - 25.3	-1.24	25 - 30	-1.70
11 - 16	0.18	15.7 - 20.7	2.40	20.4 - 25.4	-1.27	25.1 - 30.1	-1.71
11.1 - 16.1	0.19	15.8 - 20.8	2.44	20.5 - 25.5	-1.32	25.2 - 30.2	-1.74
11.2 - 16.2	0.21	15.9 - 20.9	2.47	20.6 - 25.6	-1.37	25.3 - 30.3	-1.76
11.3 - 16.3	0.23	16 - 21	2.49	20.7 - 25.7	-1.42	25.4 - 30.4	-1.78
11.4 - 16.4	0.26	16.1 - 21.1	2.52	20.8 - 25.8	-1.47	25.5 - 30.5	-1.80
11.5 - 16.5	0.33	16.2 - 21.2	2.52	20.9 - 25.9	-1.52	25.6 - 30.6	-1.81
11.6 - 16.6	0.43	16.3 - 21.3	2.51	21 - 26	-1.57	25.7 - 30.7	-1.83
11.7 - 16.7	0.57	16.4 - 21.4	2.49	21.1 - 26.1	-1.61	25.8 - 30.8	-1.84
11.8 - 16.8	0.72	16.5 - 21.5	2.47	21.2 - 26.2	-1.64	25.9 - 30.9	-1.85
11.9 - 16.9	0.85	16.6 - 21.6	2.43	21.3 - 26.3	-1.65	26 - 31	-1.85
12 - 17	0.96	16.7 - 21.7	2.35	21.4 - 26.4	-1.65	26.1 - 31.1	-1.86
12.1 - 17.1	1.06	16.8 - 21.8	2.22	21.5 - 26.5	-1.66	26.2 - 31.2	-1.88
12.2 - 17.2	1.15	16.9 - 21.9	2.08	21.6 - 26.6	-1.67	26.3 - 31.3	-1.91
12.3 - 17.3	1.23	17 - 22	1.97	21.7 - 26.7	-1.70	26.4 - 31.4	-1.96
12.4 - 17.4	1.31	17.1 - 22.1	1.86	21.8 - 26.8	-1.69	26.5 - 31.5	-2.00
12.5 - 17.5	1.38	17.2 - 22.2	1.77	21.9 - 26.9	-1.63	26.6 - 31.6	-2.02
12.6 - 17.6	1.44	17.3 - 22.3	1.68	22 - 27	-1.54	26.7 - 31.7	-2.03
12.7 - 17.7	1.49	17.4 - 22.4	1.60	22.1 - 27.1	-1.43	26.8 - 31.8	-2.05
12.8 - 17.8	1.53	17.5 - 22.5	1.51	22.2 - 27.2	-1.37	26.9 - 31.9	-2.14
12.9 - 17.9	1.54	17.6 - 22.6	1.43	22.3 - 27.3	-1.34	27 - 32	-2.22
13 - 18	1.55	17.7 - 22.7	1.34	22.4 - 27.4	-1.35	27.1 - 32.1	-2.34
13.1 - 18.1	1.53	17.8 - 22.8	1.26	22.5 - 27.5	-1.36	27.2 - 32.2	-2.45
13.2 - 18.2	1.51	17.9 - 22.9	1.19	22.6 - 27.6	-1.36	27.3 - 32.3	-2.53
13.3 - 18.3	1.51	18 - 23	1.12	22.7 - 27.7	-1.37	27.4 - 32.4	-2.58
13.4 - 18.4	1.52	18.1 - 23.1	1.05	22.8 - 27.8	-1.38	27.5 - 32.5	-2.58
13.5 - 18.5	1.53	18.2 - 23.2	0.99	22.9 - 27.9	-1.39	27.6 - 32.6	-2.58
13.6 - 18.6	1.55	18.3 - 23.3	0.94	23 - 28	-1.40	27.7 - 32.7	-2.58
13.7 - 18.7	1.61	18.4 - 23.4	0.89	23.1 - 28.1	-1.41	27.8 - 32.8	-2.57
13.8 - 18.8	1.71	18.5 - 23.5	0.86	23.2 - 28.2	-1.42	27.9 - 32.9	-2.56
13.9 - 18.9	1.86	18.6 - 23.6	0.79	23.3 - 28.3	-1.43	28 - 33	-2.56
14 - 19	2.03	18.7 - 23.7	0.69	23.4 - 28.4	-1.44	28.1 - 33.1	-2.55

5-mile reaches	5-mile average bed change, ft	5-mile reaches	5-mile average bed change, ft	5-mile reaches	5-mile average bed change, ft	5-mile reaches	5-mile average bed change, ft
28.2 - 33.2	-2.53	33.3 - 38.3	-2.60	38.4 - 43.4	-1.17	43.5 - 48.5	-3.08
28.3 - 33.3	-2.52	33.4 - 38.4	-2.61	38.5 - 43.5	-1.16	43.6 - 48.6	-3.08
28.4 - 33.4	-2.51	33.5 - 38.5	-2.62	38.6 - 43.6	-1.16	43.7 - 48.7	-3.08
28.5 - 33.5	-2.50	33.6 - 38.6	-2.63	38.7 - 43.7	-1.16	43.8 - 48.8	-3.07
28.6 - 33.6	-2.48	33.7 - 38.7	-2.64	38.8 - 43.8	-1.16	43.9 - 48.9	-3.07
28.7 - 33.7	-2.46	33.8 - 38.8	-2.65	38.9 - 43.9	-1.16	44 - 49	-3.05
28.8 - 33.8	-2.45	33.9 - 38.9	-2.66	39 - 44	-1.17	44.1 - 49.1	-3.04
28.9 - 33.9	-2.43	34 - 39	-2.67	39.1 - 44.1	-1.17	44.2 - 49.2	-3.03
29 - 34	-2.41	34.1 - 39.1	-2.68	39.2 - 44.2	-1.18	44.3 - 49.3	-3.01
29.1 - 34.1	-2.39	34.2 - 39.2	-2.68	39.3 - 44.3	-1.19	44.4 - 49.4	-2.99
29.2 - 34.2	-2.35	34.3 - 39.3	-2.68	39.4 - 44.4	-1.21	44.5 - 49.5	-2.97
29.3 - 34.3	-2.31	34.4 - 39.4	-2.67	39.5 - 44.5	-1.24	44.6 - 49.6	-2.94
29.4 - 34.4	-2.26	34.5 - 39.5	-2.65	39.6 - 44.6	-1.27	44.7 - 49.7	-2.91
29.5 - 34.5	-2.23	34.6 - 39.6	-2.63	39.7 - 44.7	-1.32	44.8 - 49.8	-2.89
29.6 - 34.6	-2.22	34.7 - 39.7	-2.59	39.8 - 44.8	-1.37	44.9 - 49.9	-2.86
29.7 - 34.7	-2.22	34.8 - 39.8	-2.55	39.9 - 44.9	-1.43	45 - 50	-2.84
29.8 - 34.8	-2.23	34.9 - 39.9	-2.50	40 - 45	-1.49	45.1 - 50.1	-2.82
29.9 - 34.9	-2.24	35 - 40	-2.44	40.1 - 45.1	-1.57	45.2 - 50.2	-2.80
30 - 35	-2.26	35.1 - 40.1	-2.37	40.2 - 45.2	-1.65	45.3 - 50.3	-2.77
30.1 - 35.1	-2.27	35.2 - 40.2	-2.29	40.3 - 45.3	-1.74	45.4 - 50.4	-2.74
30.2 - 35.2	-2.29	35.3 - 40.3	-2.21	40.4 - 45.4	-1.83	45.5 - 50.5	-2.72
30.3 - 35.3	-2.29	35.4 - 40.4	-2.11	40.5 - 45.5	-1.92	45.6 - 50.6	-2.70
30.4 - 35.4	-2.31	35.5 - 40.5	-2.01	40.6 - 45.6	-2.01	45.7 - 50.7	-2.67
30.5 - 35.5	-2.32	35.6 - 40.6	-1.94	40.7 - 45.7	-2.07	45.8 - 50.8	-2.63
30.6 - 35.6	-2.34	35.7 - 40.7	-1.90	40.8 - 45.8	-2.08	45.9 - 50.9	-2.59
30.7 - 35.7	-2.36	35.8 - 40.8	-1.88	40.9 - 45.9	-2.08	46 - 51	-2.52
30.8 - 35.8	-2.39	35.9 - 40.9	-1.86	41 - 46	-2.07	46.1 - 51.1	-2.43
30.9 - 35.9	-2.41	36 - 41	-1.83	41.1 - 46.1	-2.09	46.2 - 51.2	-2.27
31 - 36	-2.44	36.1 - 41.1	-1.80	41.2 - 46.2	-2.14	46.3 - 51.3	-2.14
31.1 - 36.1	-2.47	36.2 - 41.2	-1.79	41.3 - 46.3	-2.13	46.4 - 51.4	-2.09
31.2 - 36.2	-2.50	36.3 - 41.3	-1.81	41.4 - 46.4	-2.08	46.5 - 51.5	-2.13
31.3 - 36.3	-2.52	36.4 - 41.4	-1.79	41.5 - 46.5	-2.09		
31.4 - 36.4	-2.52	36.5 - 41.5	-1.72	41.6 - 46.6	-2.17	77 - 82	-1.19
31.5 - 36.5	-2.50	36.6 - 41.6	-1.61	41.7 - 46.7	-2.29	77.1 - 82.1	-1.15
31.6 - 36.6	-2.49	36.7 - 41.7	-1.52	41.8 - 46.8	-2.38	77.2 - 82.2	-1.11
31.7 - 36.7	-2.50	36.8 - 41.8	-1.44	41.9 - 46.9	-2.44	77.3 - 82.3	-1.07
31.8 - 36.8	-2.51	36.9 - 41.9	-1.40	42 - 47	-2.46	77.4 - 82.4	-1.03
31.9 - 36.9	-2.50	37 - 42	-1.37	42.1 - 47.1	-2.50	77.5 - 82.5	-1.00
32 - 37	-2.47	37.1 - 42.1	-1.34	42.2 - 47.2	-2.57	77.6 - 82.6	-0.97
32.1 - 37.1	-2.49	37.2 - 42.2	-1.32	42.3 - 47.3	-2.67	77.7 - 82.7	-0.94
32.2 - 37.2	-2.50	37.3 - 42.3	-1.30	42.4 - 47.4	-2.74	77.8 - 82.8	-0.91
32.3 - 37.3	-2.51	37.4 - 42.4	-1.27	42.5 - 47.5	-2.78	77.9 - 82.9	-0.89
32.4 - 37.4	-2.52	37.5 - 42.5	-1.26	42.6 - 47.6	-2.79	78 - 83	-0.86
32.5 - 37.5	-2.53	37.6 - 42.6	-1.24	42.7 - 47.7	-2.84	78.1 - 83.1	-0.84
32.6 - 37.6	-2.53	37.7 - 42.7	-1.23	42.8 - 47.8	-2.92	78.2 - 83.2	-0.82
32.7 - 37.7	-2.54	37.8 - 42.8	-1.22	42.9 - 47.9	-2.98	78.3 - 83.3	-0.79
32.8 - 37.8	-2.55	37.9 - 42.9	-1.20	43 - 48	-3.01	78.4 - 83.4	-0.76
32.9 - 37.9	-2.56	38 - 43	-1.19	43.1 - 48.1	-3.03	78.5 - 83.5	-0.74
33 - 38	-2.57	38.1 - 43.1	-1.19	43.2 - 48.2	-3.05	78.6 - 83.6	-0.71
33.1 - 38.1	-2.58	38.2 - 43.2	-1.18	43.3 - 48.3	-3.07	78.7 - 83.7	-0.68
33.2 - 38.2	-2.59	38.3 - 43.3	-1.17	43.4 - 48.4	-3.08	78.8 - 83.8	-0.64

5-mile reaches	5-mile average bed change, ft	5-mile reaches	5-mile average bed change, ft	5-mile reaches	5-mile average bed change, ft
78.9 - 83.9	-0.61	84 - 89	-0.92	89 - 94	-0.80
79 - 84	-0.58	84.1 - 89.1	-0.94	89.1 - 94.1	-0.78
79.1 - 84.1	-0.54	84.2 - 89.2	-0.96	89.2 - 94.2	-0.76
79.2 - 84.2	-0.51	84.3 - 89.3	-0.98	89.3 - 94.3	-0.73
79.3 - 84.3	-0.47	84.4 - 89.4	-1.01	89.4 - 94.4	-0.70
79.4 - 84.4	-0.43	84.5 - 89.5	-1.04	89.5 - 94.5	-0.66
79.5 - 84.5	-0.40	84.6 - 89.6	-1.08	89.6 - 94.6	-0.63
79.6 - 84.6	-0.35	84.7 - 89.7	-1.13	89.7 - 94.7	-0.58
79.7 - 84.7	-0.31	84.8 - 89.8	-1.18	89.8 - 94.8	-0.54
79.8 - 84.8	-0.26	84.9 - 89.9	-1.23	89.9 - 94.9	-0.49
79.9 - 84.9	-0.23	85 - 90	-1.25	90 - 95	-0.43
80 - 85	-0.23	85.1 - 90.1	-1.23	90.1 - 95.1	-0.40
80.1 - 85.1	-0.25	85.2 - 90.2	-1.18	90.2 - 95.2	-0.38
80.2 - 85.2	-0.29	85.3 - 90.3	-1.12	90.3 - 95.3	-0.38
80.3 - 85.3	-0.29	85.4 - 90.4	-1.12	90.4 - 95.4	-0.36
80.4 - 85.4	-0.25	85.5 - 90.5	-1.19	90.5 - 95.5	-0.33
80.5 - 85.5	-0.16	85.6 - 90.6	-1.29	90.6 - 95.6	-0.28
80.6 - 85.6	-0.10	85.7 - 90.7	-1.38	90.7 - 95.7	-0.23
80.7 - 85.7	-0.04	85.8 - 90.8	-1.46	90.8 - 95.8	-0.20
80.8 - 85.8	0.01	85.9 - 90.9	-1.52	90.9 - 95.9	-0.17
80.9 - 85.9	0.03	86 - 91	-1.56	91 - 96	-0.15
81 - 86	0.03	86.1 - 91.1	-1.58	91.1 - 96.1	-0.13
81.1 - 86.1	0.02	86.2 - 91.2	-1.58	91.2 - 96.2	-0.12
81.2 - 86.2	0.00	86.3 - 91.3	-1.58	91.3 - 96.3	-0.12
81.3 - 86.3	-0.03	86.4 - 91.4	-1.56	91.4 - 96.4	-0.12
81.4 - 86.4	-0.07	86.5 - 91.5	-1.54	91.5 - 96.5	-0.12
81.5 - 86.5	-0.13	86.6 - 91.6	-1.51		
81.6 - 86.6	-0.20	86.7 - 91.7	-1.47		
81.7 - 86.7	-0.25	86.8 - 91.8	-1.44		
81.8 - 86.8	-0.29	86.9 - 91.9	-1.42		
81.9 - 86.9	-0.33	87 - 92	-1.40		
82 - 87	-0.37	87.1 - 92.1	-1.38		
82.1 - 87.1	-0.41	87.2 - 92.2	-1.35		
82.2 - 87.2	-0.45	87.3 - 92.3	-1.32		
82.3 - 87.3	-0.49	87.4 - 92.4	-1.28		
82.4 - 87.4	-0.54	87.5 - 92.5	-1.25		
82.5 - 87.5	-0.59	87.6 - 92.6	-1.20		
82.6 - 87.6	-0.63	87.7 - 92.7	-1.16		
82.7 - 87.7	-0.67	87.8 - 92.8	-1.12		
82.8 - 87.8	-0.70	87.9 - 92.9	-1.09		
82.9 - 87.9	-0.73	88 - 93	-1.05		
83 - 88	-0.75	88.1 - 93.1	-1.02		
83.1 - 88.1	-0.77	88.2 - 93.2	-0.99		
83.2 - 88.2	-0.79	88.3 - 93.3	-0.96		
83.3 - 88.3	-0.81	88.4 - 93.4	-0.93		
83.4 - 88.4	-0.83	88.5 - 93.5	-0.91		
83.5 - 88.5	-0.85	88.6 - 93.6	-0.88		
83.6 - 88.6	-0.86	88.7 - 93.7	-0.86		
83.7 - 88.7	-0.88	88.8 - 93.8	-0.84		
83.8 - 88.8	-0.89	88.9 - 93.9	-0.82		
83.9 - 88.9	-0.91	89 - 94	-0.80		