

APPENDIX H - TOTAL MAXIMUM DAILY LOADS

H1.0 SEDIMENT

H1.1 OVERVIEW

A percent reduction based on average yearly loading was used as the primary approach for expressing the sediment TMDLs within this document because there is uncertainty associated with the loads derived from the source assessment, and using the estimated sediment loads alone creates a rigid perception that the loads are absolutely conclusive. However, in this appendix the TMDL is expressed using daily loads to satisfy an additional EPA required TMDL element. Daily loads should not be considered absolutely conclusive and may be refined in the future as part of the adaptive management process. The TMDLs may not be feasible at all locations within the watershed but if the allocations are followed, sediment loads are expected to be reduced to a degree that the sediment targets are met and beneficial uses are no longer impaired. It is not expected that daily loads will drive implementation activities.

H1.2 APPROACH

The preferred approach for calculating daily sediment loads is to use a nearby water quality gage with a long-term dataset for flow and suspended sediment. Within the entire Beaverhead watershed, there are several USGS gage stations with extensive discharge datasets; however there is only one gauging station with daily suspended sediment measurements and the data was collected over a 13 year period. Mean daily suspended sediment data collected from 1961 to 1974 at the USGS station on the Beaverhead River near Twin Bridges, MT (06018500) was used to calculate daily sediment loads on the Beaverhead River.

Although the annual suspended sediment for this time period is less than the total load from the source assessment, it provides an approximation of the relationship between sediment and flow in the Beaverhead River. Based on the sum of the calculated daily sediment loads, a daily percentage relative to the annual suspended sediment load was calculated for each day. The daily percentages were then applied to the total average annual loads associated with the TMDL percent reductions from **Section 5.0** to determine the average daily load.

To conserve resources, this appendix contains daily loads for the Beaverhead River as an example. As discussed in **Section 5.7.3.1**, the TMDL for the Beaverhead River is a 69% reduction in the total average annual sediment load and the TMDL is roughly 26,836 tons/year. The daily percentages discussed above were then multiplied by the annual load of 26,836 tons to get a daily expression of the Beaverhead River TMDL (**Table H-1**). For all other **waterbodies**, daily TMDLs may be derived by using the daily percentages in **Table H-1** and the TMDLs expressed as an average annual load, which are discussed in **Section 5.7** and presented in **Table H-2**. The daily loads are a composite of the allocations, but as allocations are not feasible on a daily basis, they are not contained within this appendix. If desired, daily allocations may be obtained by applying allocations provided in **Section 5.7** to the daily load.

Table H-1. Daily Sediment TMDL for the Beaverhead River based on suspended sediment discharge from USGS 06018500 (Beaverhead River near Twin Bridges)

Month	Day	Mean Tons/Day	Daily Percent of Annual Load	Month	Day	Mean Tons/Day	Daily Percent of Annual Load
January	1	76.74	0.29%	February	1	95.27	0.35%
January	2	67.92	0.25%	February	2	89.97	0.34%
January	3	68.80	0.26%	February	3	89.97	0.34%
January	4	62.63	0.23%	February	4	113.79	0.42%
January	5	57.34	0.21%	February	5	147.31	0.55%
January	6	60.86	0.23%	February	6	134.08	0.50%
January	7	67.92	0.25%	February	7	129.67	0.48%
January	8	66.16	0.25%	February	8	139.37	0.52%
January	9	89.09	0.33%	February	9	110.26	0.41%
January	10	82.03	0.31%	February	10	94.38	0.35%
January	11	67.92	0.25%	February	11	97.91	0.36%
January	12	50.28	0.19%	February	12	94.38	0.35%
January	13	57.34	0.21%	February	13	97.03	0.36%
January	14	69.69	0.26%	February	14	96.15	0.36%
January	15	76.74	0.29%	February	15	91.74	0.34%
January	16	82.03	0.31%	February	16	89.97	0.34%
January	17	97.91	0.36%	February	17	92.62	0.35%
January	18	89.97	0.34%	February	18	97.91	0.36%
January	19	89.97	0.34%	February	19	94.38	0.35%
January	20	84.68	0.32%	February	20	91.74	0.34%
January	21	83.80	0.31%	February	21	90.86	0.34%
January	22	82.03	0.31%	February	22	90.86	0.34%
January	23	84.68	0.32%	February	23	90.86	0.34%
January	24	77.62	0.29%	February	24	91.74	0.34%
January	25	74.98	0.28%	February	25	90.86	0.34%
January	26	74.98	0.28%	February	26	89.97	0.34%
January	27	72.33	0.27%	February	27	95.27	0.35%
January	28	74.10	0.28%	February	28	96.15	0.36%
January	29	68.80	0.26%	February	29	125.26	0.47%
January	30	70.57	0.26%				
January	31	82.03	0.31%				
March	1	92.62	0.35%	April	1	197.59	0.74%
March	2	97.91	0.36%	April	2	159.66	0.59%
March	3	99.68	0.37%	April	3	137.61	0.51%
March	4	94.38	0.35%	April	4	125.26	0.47%
March	5	99.68	0.37%	April	5	119.97	0.45%
March	6	99.68	0.37%	April	6	119.97	0.45%
March	7	93.50	0.35%	April	7	116.44	0.43%
March	8	90.86	0.34%	April	8	113.79	0.42%

Table H-1. Daily Sediment TMDL for the Beaverhead River based on suspended sediment discharge from USGS 06018500 (Beaverhead River near Twin Bridges)

Month	Day	Mean Tons/Day	Daily Percent of Annual Load	Month	Day	Mean Tons/Day	Daily Percent of Annual Load
March	9	89.09	0.33%	April	9	120.85	0.45%
March	10	94.38	0.35%	April	10	112.91	0.42%
March	11	98.79	0.37%	April	11	118.20	0.44%
March	12	103.21	0.38%	April	12	104.97	0.39%
March	13	119.97	0.45%	April	13	109.38	0.41%
March	14	122.61	0.46%	April	14	107.62	0.40%
March	15	111.14	0.41%	April	15	85.56	0.32%
March	16	127.02	0.47%	April	16	79.39	0.30%
March	17	150.84	0.56%	April	17	82.03	0.31%
March	18	156.13	0.58%	April	18	84.68	0.32%
March	19	123.49	0.46%	April	19	77.62	0.29%
March	20	116.44	0.43%	April	20	75.86	0.28%
March	21	112.03	0.42%	April	21	79.39	0.30%
March	22	106.73	0.40%	April	22	72.33	0.27%
March	23	115.55	0.43%	April	23	74.10	0.28%
March	24	119.97	0.45%	April	24	84.68	0.32%
March	25	112.91	0.42%	April	25	80.27	0.30%
March	26	109.38	0.41%	April	26	80.27	0.30%
March	27	140.25	0.52%	April	27	100.56	0.37%
March	28	189.65	0.71%	April	28	104.09	0.39%
March	29	177.30	0.66%	April	29	82.92	0.31%
March	30	157.90	0.59%	April	30	79.39	0.30%
March	31	174.65	0.65%				
May	1	82.92	0.31%	June	1	53.81	0.20%
May	2	87.33	0.33%	June	2	54.69	0.20%
May	3	67.92	0.25%	June	3	56.45	0.21%
May	4	65.28	0.24%	June	4	62.63	0.23%
May	5	58.22	0.22%	June	5	74.10	0.28%
May	6	54.69	0.20%	June	6	79.39	0.30%
May	7	51.16	0.19%	June	7	95.27	0.35%
May	8	56.45	0.21%	June	8	160.54	0.60%
May	9	52.04	0.19%	June	9	137.61	0.51%
May	10	42.34	0.16%	June	10	164.07	0.61%
May	11	40.58	0.15%	June	11	161.42	0.60%
May	12	42.34	0.16%	June	12	133.20	0.50%
May	13	37.93	0.14%	June	13	142.90	0.53%
May	14	32.64	0.12%	June	14	145.55	0.54%
May	15	31.76	0.12%	June	15	130.55	0.49%
May	16	26.46	0.10%	June	16	125.26	0.47%

Table H-1. Daily Sediment TMDL for the Beaverhead River based on suspended sediment discharge from USGS 06018500 (Beaverhead River near Twin Bridges)

Month	Day	Mean Tons/Day	Daily Percent of Annual Load	Month	Day	Mean Tons/Day	Daily Percent of Annual Load
May	17	23.82	0.09%	June	17	132.31	0.49%
May	18	22.93	0.09%	June	18	121.73	0.45%
May	19	24.70	0.09%	June	19	103.21	0.38%
May	20	42.34	0.16%	June	20	104.09	0.39%
May	21	42.34	0.16%	June	21	112.03	0.42%
May	22	41.46	0.15%	June	22	119.08	0.44%
May	23	42.34	0.16%	June	23	98.79	0.37%
May	24	70.57	0.26%	June	24	107.62	0.40%
May	25	56.45	0.21%	June	25	98.79	0.37%
May	26	61.75	0.23%	June	26	91.74	0.34%
May	27	47.63	0.18%	June	27	97.03	0.36%
May	28	44.10	0.16%	June	28	119.97	0.45%
May	29	43.22	0.16%	June	29	108.50	0.40%
May	30	40.58	0.15%	June	30	92.62	0.30%
May	31	45.87	0.17%				
July	1	98.79	0.32%	August	1	25.58	0.08%
July	2	116.44	0.38%	August	2	21.17	0.07%
July	3	88.21	0.29%	August	3	21.17	0.07%
July	4	74.10	0.24%	August	4	25.58	0.08%
July	5	69.69	0.23%	August	5	26.46	0.09%
July	6	57.34	0.19%	August	6	29.11	0.10%
July	7	56.45	0.19%	August	7	26.46	0.09%
July	8	47.63	0.16%	August	8	26.46	0.09%
July	9	44.99	0.15%	August	9	28.23	0.09%
July	10	46.75	0.15%	August	10	26.46	0.09%
July	11	43.22	0.14%	August	11	24.70	0.08%
July	12	39.69	0.13%	August	12	26.46	0.09%
July	13	34.40	0.11%	August	13	32.64	0.11%
July	14	35.28	0.12%	August	14	30.87	0.10%
July	15	43.22	0.14%	August	15	27.34	0.09%
July	16	44.99	0.15%	August	16	24.70	0.08%
July	17	40.58	0.13%	August	17	26.46	0.09%
July	18	36.17	0.12%	August	18	29.11	0.10%
July	19	37.93	0.12%	August	19	29.11	0.10%
July	20	33.52	0.11%	August	20	26.46	0.09%
July	21	40.58	0.13%	August	21	29.99	0.10%
July	22	37.93	0.12%	August	22	35.28	0.12%
July	23	37.05	0.12%	August	23	37.05	0.12%
July	24	28.23	0.09%	August	24	35.28	0.12%

Table H-1. Daily Sediment TMDL for the Beaverhead River based on suspended sediment discharge from USGS 06018500 (Beaverhead River near Twin Bridges)

Month	Day	Mean Tons/Day	Daily Percent of Annual Load	Month	Day	Mean Tons/Day	Daily Percent of Annual Load
July	25	24.70	0.08%	August	25	32.64	0.11%
July	26	23.82	0.08%	August	26	33.52	0.11%
July	27	23.82	0.08%	August	27	32.64	0.11%
July	28	24.70	0.08%	August	28	32.64	0.11%
July	29	26.46	0.09%	August	29	34.40	0.11%
July	30	25.58	0.08%	August	30	42.34	0.14%
July	31	26.46	0.09%	August	31	46.75	0.15%
September	1	59.10	0.19%	October	1	39.69	0.13%
September	2	63.51	0.21%	October	2	34.40	0.11%
September	3	59.10	0.19%	October	3	35.28	0.12%
September	4	59.98	0.20%	October	4	41.46	0.14%
September	5	63.51	0.21%	October	5	37.05	0.12%
September	6	58.22	0.19%	October	6	35.28	0.12%
September	7	58.22	0.19%	October	7	35.28	0.12%
September	8	63.51	0.21%	October	8	37.05	0.12%
September	9	61.75	0.20%	October	9	40.58	0.13%
September	10	54.69	0.18%	October	10	46.75	0.15%
September	11	53.81	0.18%	October	11	44.99	0.15%
September	12	54.69	0.18%	October	12	46.75	0.15%
September	13	52.93	0.17%	October	13	46.75	0.15%
September	14	52.04	0.17%	October	14	49.40	0.16%
September	15	52.04	0.17%	October	15	52.93	0.17%
September	16	49.40	0.16%	October	16	56.45	0.19%
September	17	52.04	0.17%	October	17	58.22	0.19%
September	18	55.57	0.18%	October	18	53.81	0.18%
September	19	53.81	0.18%	October	19	49.40	0.16%
September	20	55.57	0.18%	October	20	52.93	0.17%
September	21	54.69	0.18%	October	21	56.45	0.19%
September	22	55.57	0.18%	October	22	51.16	0.17%
September	23	53.81	0.18%	October	23	56.45	0.19%
September	24	52.04	0.17%	October	24	57.34	0.19%
September	25	52.04	0.17%	October	25	57.34	0.19%
September	26	54.69	0.18%	October	26	52.93	0.17%
September	27	46.75	0.15%	October	27	52.04	0.17%
September	28	40.58	0.13%	October	28	50.28	0.17%
September	29	37.05	0.12%	October	29	50.28	0.17%
September	30	37.05	0.12%	October	30	56.45	0.19%
				October	31	54.69	0.18%
November	1	62.63	0.21%	December	1	70.57	0.23%

Table H-1. Daily Sediment TMDL for the Beaverhead River based on suspended sediment discharge from USGS 06018500 (Beaverhead River near Twin Bridges)

Month	Day	Mean Tons/Day	Daily Percent of Annual Load	Month	Day	Mean Tons/Day	Daily Percent of Annual Load
November	2	61.75	0.20%	December	2	74.10	0.24%
November	3	54.69	0.18%	December	3	78.51	0.26%
November	4	54.69	0.18%	December	4	82.03	0.27%
November	5	68.80	0.23%	December	5	74.98	0.25%
November	6	76.74	0.25%	December	6	72.33	0.24%
November	7	74.98	0.25%	December	7	80.27	0.26%
November	8	73.21	0.24%	December	8	81.15	0.27%
November	9	74.10	0.24%	December	9	89.09	0.29%
November	10	75.86	0.25%	December	10	89.09	0.29%
November	11	78.51	0.26%	December	11	82.92	0.27%
November	12	82.03	0.27%	December	12	83.80	0.28%
November	13	83.80	0.28%	December	13	79.39	0.26%
November	14	80.27	0.26%	December	14	82.92	0.27%
November	15	82.92	0.27%	December	15	84.68	0.28%
November	16	78.51	0.26%	December	16	82.92	0.27%
November	17	74.10	0.24%	December	17	76.74	0.25%
November	18	75.86	0.25%	December	18	79.39	0.26%
November	19	74.10	0.24%	December	19	87.33	0.29%
November	20	74.98	0.25%	December	20	83.80	0.28%
November	21	74.10	0.24%	December	21	77.62	0.26%
November	22	70.57	0.23%	December	22	79.39	0.26%
November	23	63.51	0.21%	December	23	99.68	0.33%
November	24	64.39	0.21%	December	24	84.68	0.28%
November	25	67.04	0.22%	December	25	75.86	0.25%
November	26	63.51	0.21%	December	26	72.33	0.24%
November	27	65.28	0.21%	December	27	69.69	0.23%
November	28	59.98	0.20%	December	28	74.10	0.24%
November	29	56.45	0.19%	December	29	78.51	0.26%
November	30	60.86	0.20%	December	30	70.57	0.23%
				December	31	74.10	0.24%

Table H-2. TMDLs expressed as an average annual load and can be used in conjunction with the values in Table H-1 to compute daily loads.

Stream Segment	Waterbody ID	TMDL Expressed as Average Annual Load (tons/year)
Beaverhead River, lower segment	MT41B001_020	26,836
Blacktail Deer Creek	MT41B002_030	5,394
Clark Canyon Creek	MT41B002_110	500
Dyce Creek	MT41B002_140	660
Farlin Creek	MT41B002_020	355
French Creek	MT41B002_100	376
Grasshopper Creek	MT41B002_010	6,376
Rattlesnake Creek, upper segment	MT41B002_091	1,954
Rattlesnake Creek, lower segment	MT41B002_090	2,452
Reservoir Creek	MT41B002_120	987
Scudder Creek	MT41B002_180	536
Spring Creek	MT41B002_080	1,387
Steel Creek	MT41B002_160	184
Stone Creek, upper segment	MT41B002_132	942
Stone Creek, lower segment	MT41B002_131	1,346
Taylor Creek	MT41B002_170	1,061
West Fork Blacktail Deer Creek	MT41B002_060	1,089
West Fork Dyce Creek	MT41B002_070	173

