Method Development for Watershed Sediment Budgets to Support the CHIA/PHC Process: A Focus on Sediment Modeling for Estimating Sediment Loads

Photos from New River Basin, Scott County, TN

US Department of Interior, Office of Surface Mining
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University of Tennessee - Knoxville
Department of Civil and Environmental Engineering

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Appendices

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APPENDICES

APPENDIX A:

RAPID GEOMORPHIC ASSESSMENT (RGA) FIELD FORMS

CHANNEL-STABILITY RANKING SCHEME

Station #_______________ **Station Description**______________________________

Date ___________ **Crew** _____________ **Samples Taken**____________________

Pictures (circle) upstream downstream cross section **Slope**________

1. Primary bed material

Bedrock	Boulder/Cobble	Gravel	Sand	Silt Clay	
0	1	2	3	4	____

2. Bed/bank protection

Yes	No	(with)	1 bank protected	2 banks	
0	1		2	3	____

3. Degree of incision (Relative ele. Of "normal" low water; floodplain/terrace @ 100%)

0-10%	11-25%	26-50%	51-75%	76-100%	
4	3	2	1	0	____

4. Degree of constriction (Relative decrease in top-bank width from up to downstream)

0-10%	11-25%	26-50%	51-75%	76-100%	
0	1	2	3	4	____

5. Streambank erosion (Each bank)

	None	fluvial	mass wasting (failures)	
Left	0	1	2	____
Right	0	1	2	____

6. Streambank instability (Percent of each bank failing)

	0-10%	11-25%	26-50%	51-75%	76-100%	
Left	0	0.5	1	1.5	2	____
Right	0	0.5	1	1.5	2	____

7. Established ripirian woody-vegetative cover (Each bank)

	0-10%	11-25%	26-50%	51-75%	76-100%	
Left	2	1.5	1	0.5	0	____
Right	2	1.5	1	0.5	0	____

8. Occurrence of bank accretion (Percent of each bank with fluvial deposition)

	0-10%	11-25%	26-50%	51-75%	76-100%	
Left	2	1.5	1	0.5	0	____
Right	2	1.5	1	0.5	0	____

9. Stage of channel evolution

I	II	III	IV	V	VI	
0	1	2	4	3	1.5	____

TOTAL ____

CHANNEL-STABILITY PARTICLE COUNT FORM

Station #________________ Station Description____________________________

Date ____________ Crew _____________

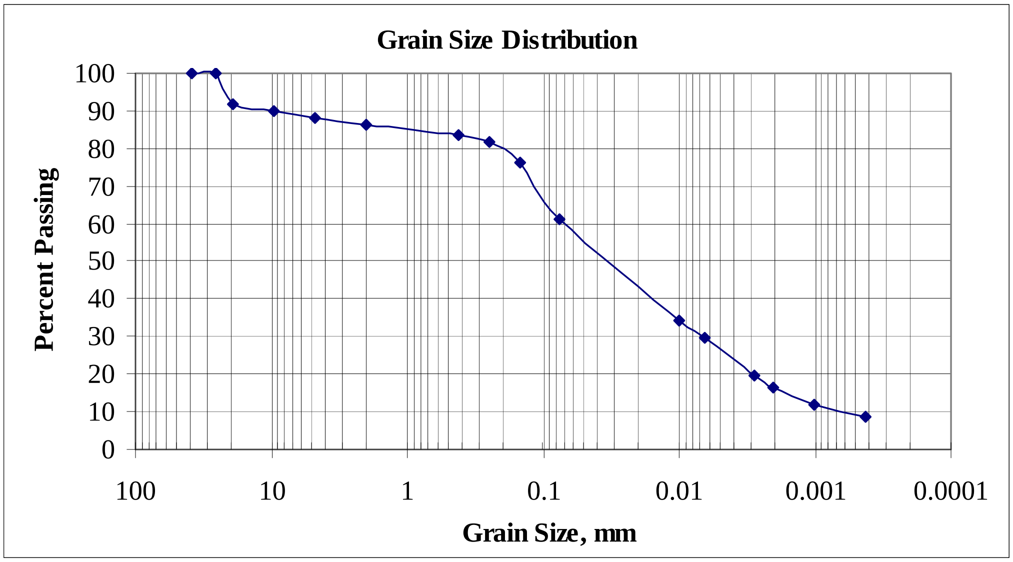
Location/Description ____

(pool, riffle, 1 of 3, additional samples?)

1 ______	26 ______	51 ______	76 ______
2 ______	27 ______	52 ______	77 ______
3 ______	28 ______	53 ______	78 ______
4 ______	29 ______	54 ______	79 ______
5 ______	30 ______	55 ______	80 ______
6 ______	31 ______	56 ______	81 ______
7 ______	32 ______	57 ______	82 ______
8 ______	33 ______	58 ______	83 ______
9 ______	34 ______	59 ______	84 ______
10 ______	35 ______	60 ______	85 ______
11 ______	36 ______	61 ______	86 ______
12 ______	37 ______	62 ______	87 ______
13 ______	38 ______	63 ______	88 ______
14 ______	39 ______	64 ______	89 ______
15 ______	40 ______	65 ______	90 ______
16 ______	41 ______	66 ______	91 ______
17 ______	42 ______	67 ______	92 ______
18 ______	43 ______	68 ______	93 ______
19 ______	44 ______	69 ______	94 ______
20 ______	45 ______	70 ______	95 ______
21 ______	46 ______	71 ______	96 ______
22 ______	47 ______	72 ______	97 ______
23 ______	48 ______	73 ______	98 ______
24 ______	49 ______	74 ______	99 ______
25 ______	50 ______	75 ______	100 ______

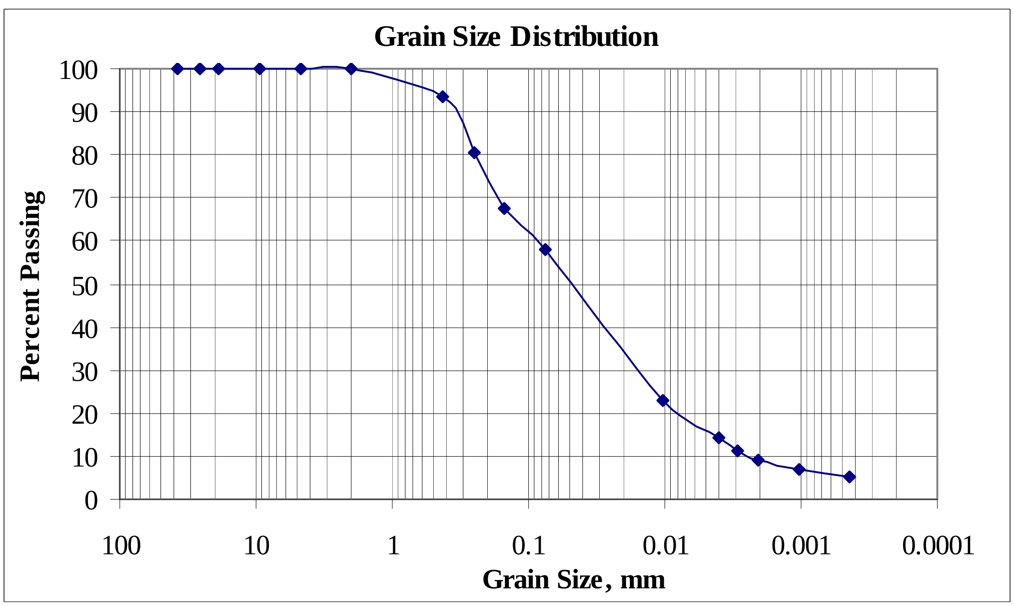
APPENDIX B:

Uplands Sediment Samples: Particles Size Distributions



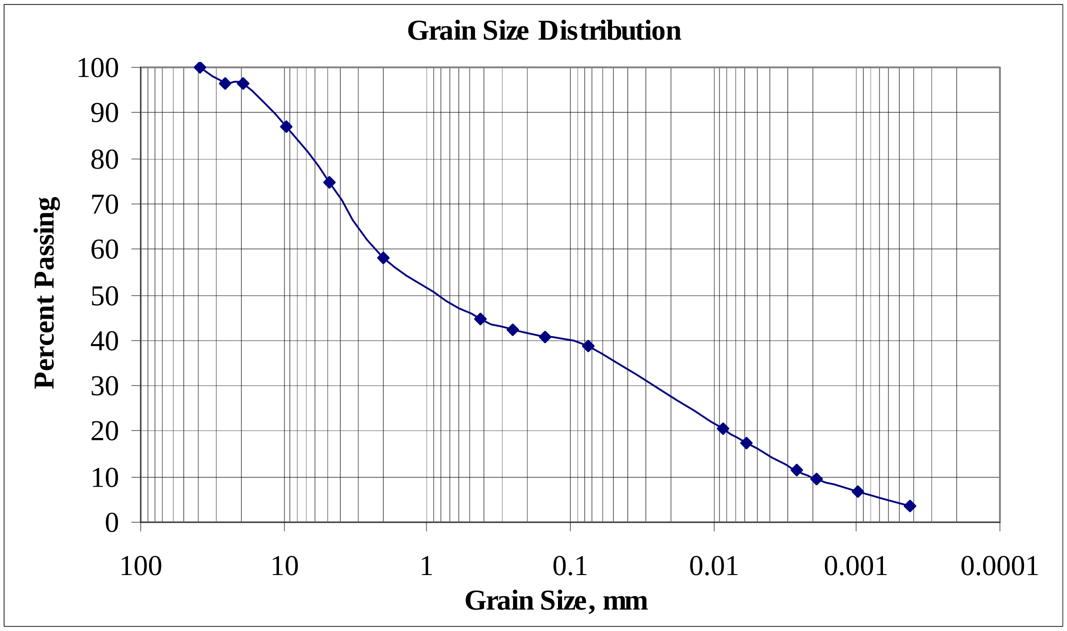
Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-BR-1	**Brimstone Creek**	61	16	0.035	1.0

Figure B.1. Particle (Grain) Size Distribution for Brimstone stream site U-BR-1.



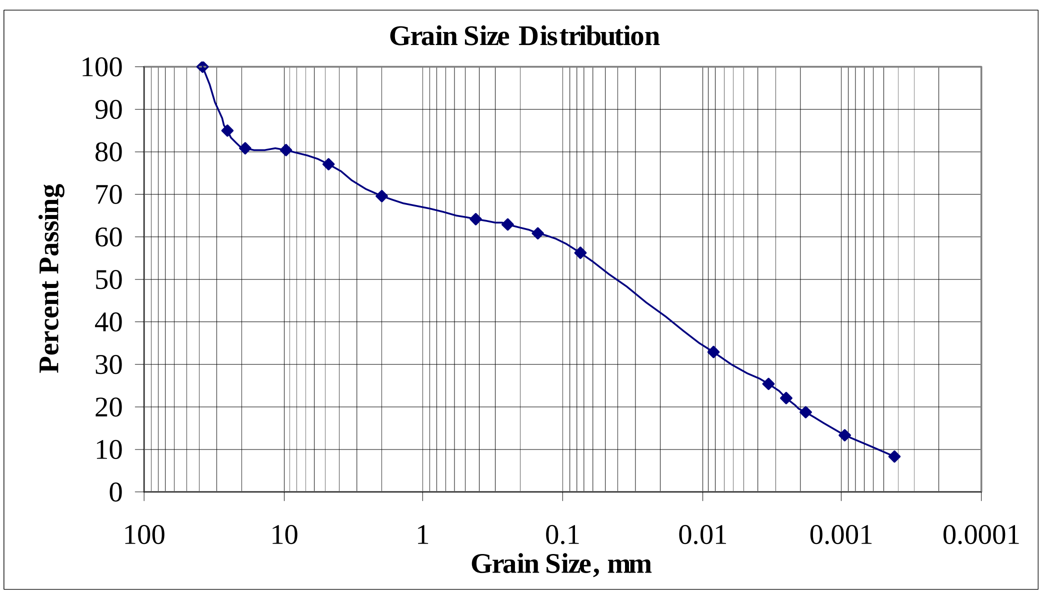
Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-BR-2	**Brimstone Creek**	57	9	0.05	0.25

Figure B.2. Particle (Grain) Size Distribution for Brimstone stream site U-BR-2.



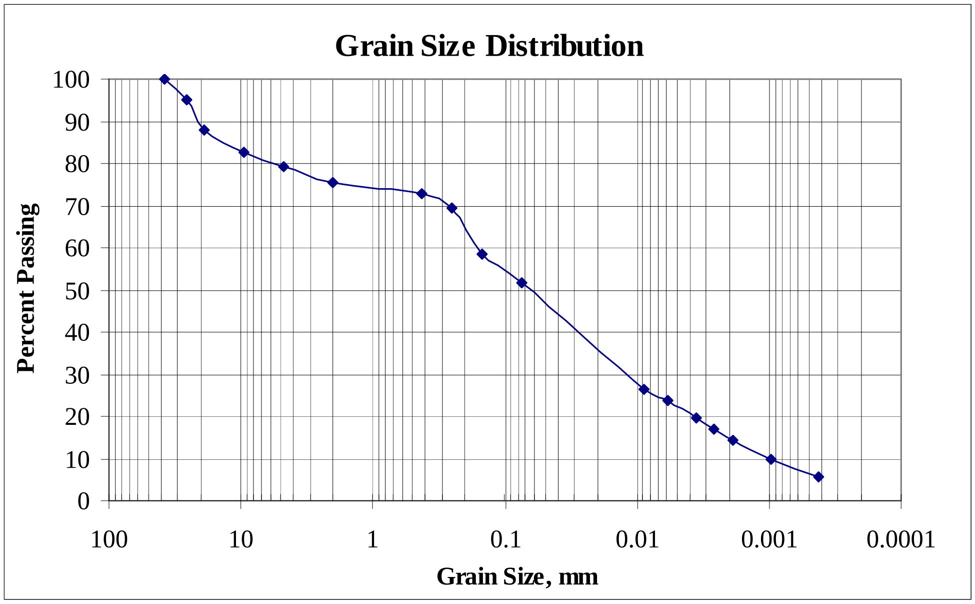
Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-BR-3	**Brimstone Creek**	39	10	0.85	8.0

Figure B.3. Particle (Grain) Size Distribution for Brimstone stream site U-BR-3.



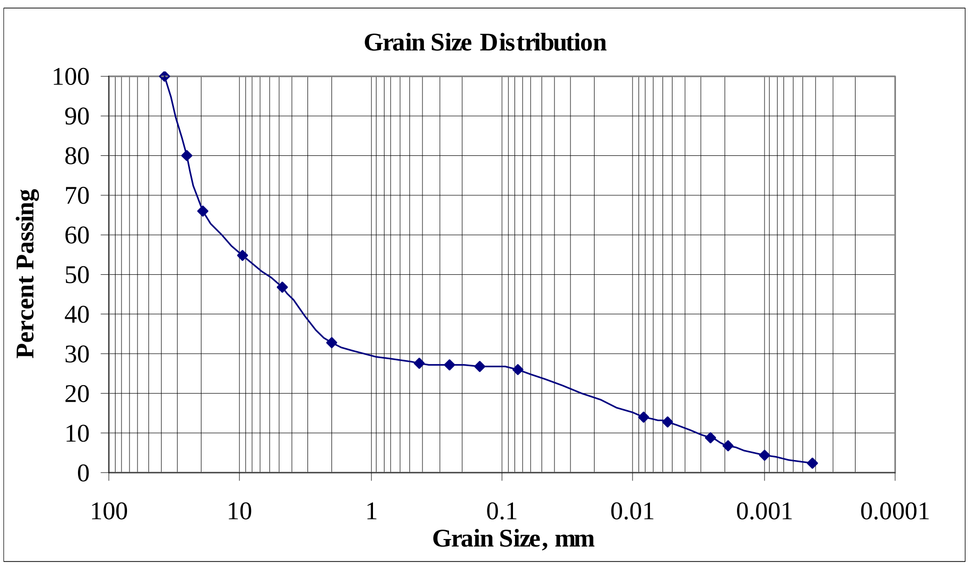
Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-BR-4	**Brimstone Creek**	56	19	0.04	11.5

Figure B.4. Particle (Grain) Size Distribution for Brimstone stream site U-BR-4.



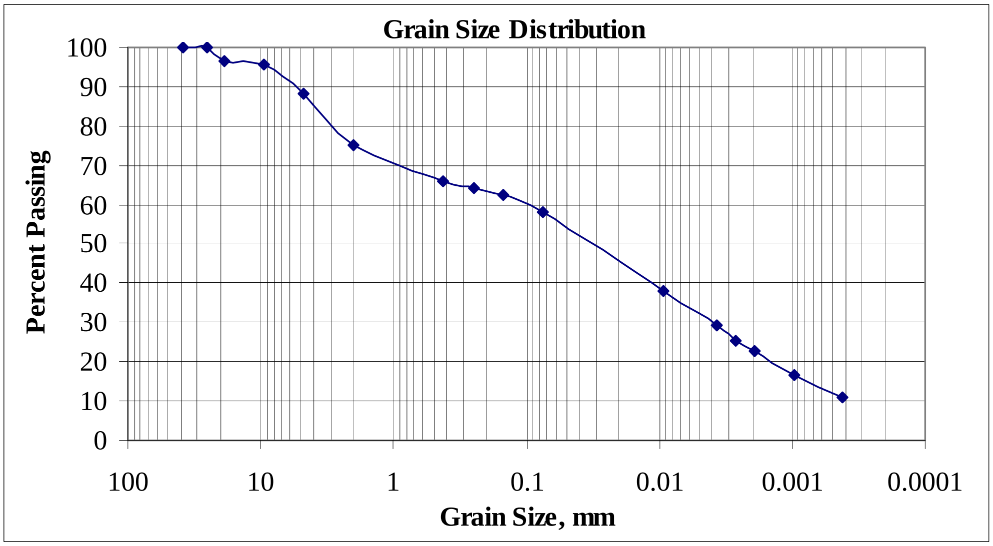
Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-MF-1	**Montgomery Fork**	52	14	0.07	10.5

Figure B.5. Particle (Grain) Size Distribution for Montgomery stream site U-MF-1.



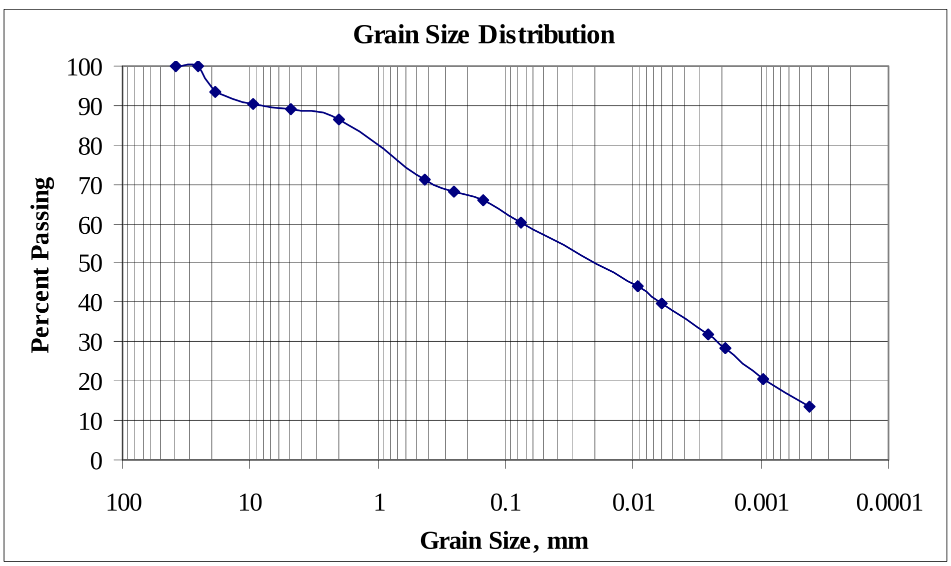
Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-MF-2	**Montgomery Fork**	26	7	6	11.7

Figure B.6. Particle (Grain) Size Distribution for Brimstone stream site U-MF-2.



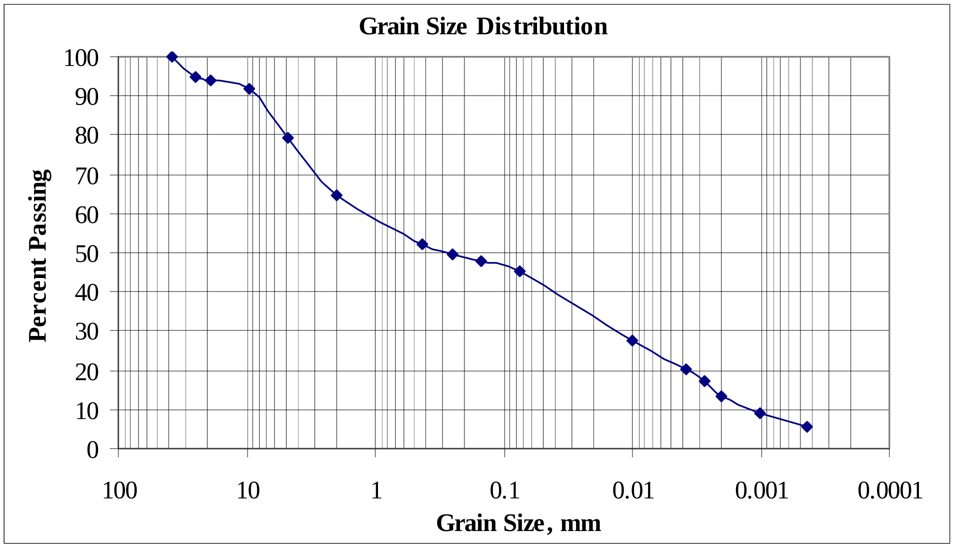
Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-MF-3	**Montgomery Fork**	58	22	0.03	4.0

Figure B.7. Particle (Grain) Size Distribution for Brimstone stream site U-MF-3.



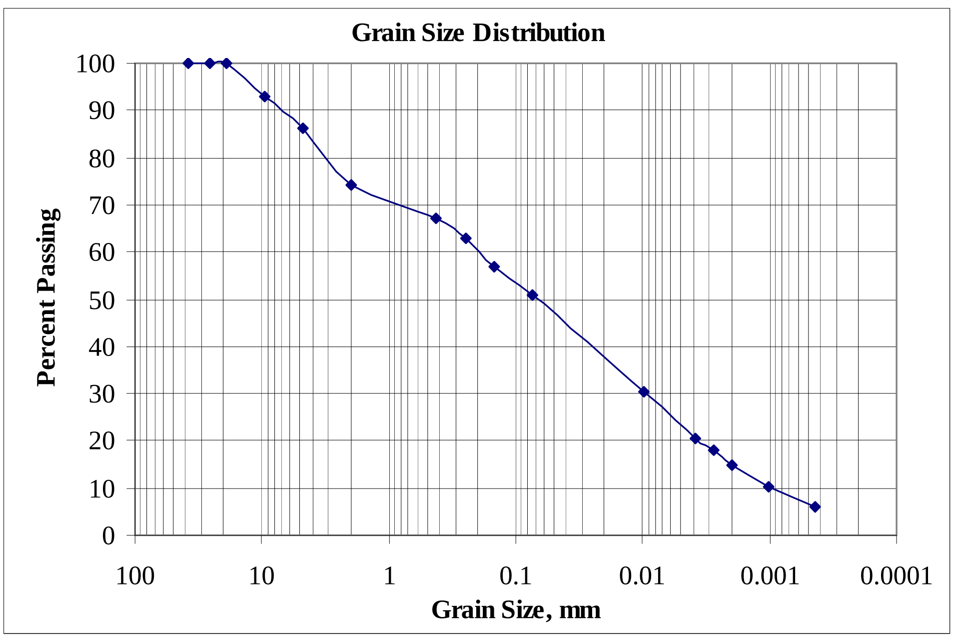
Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-MF-4	**Montgomery Fork**	60	28	0.02	1.8

Figure B.8. Particle (Grain) Size Distribution for Brimstone stream site U-MF-4.



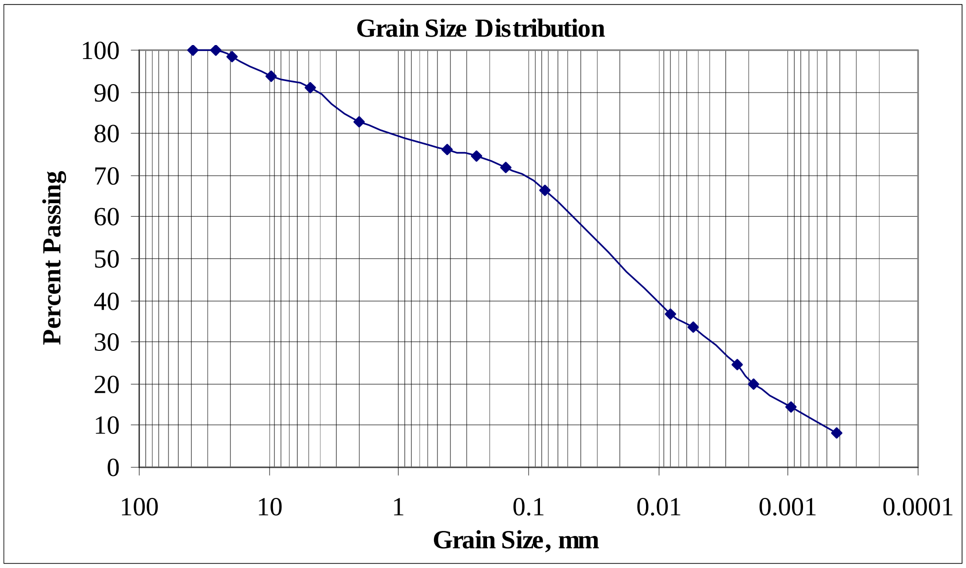
Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-SC-1	**Smokey Creek**	45	13	0.3	6.0

Figure B.9. Particle (Grain) Size Distribution for Smokey stream site U-SC-1.



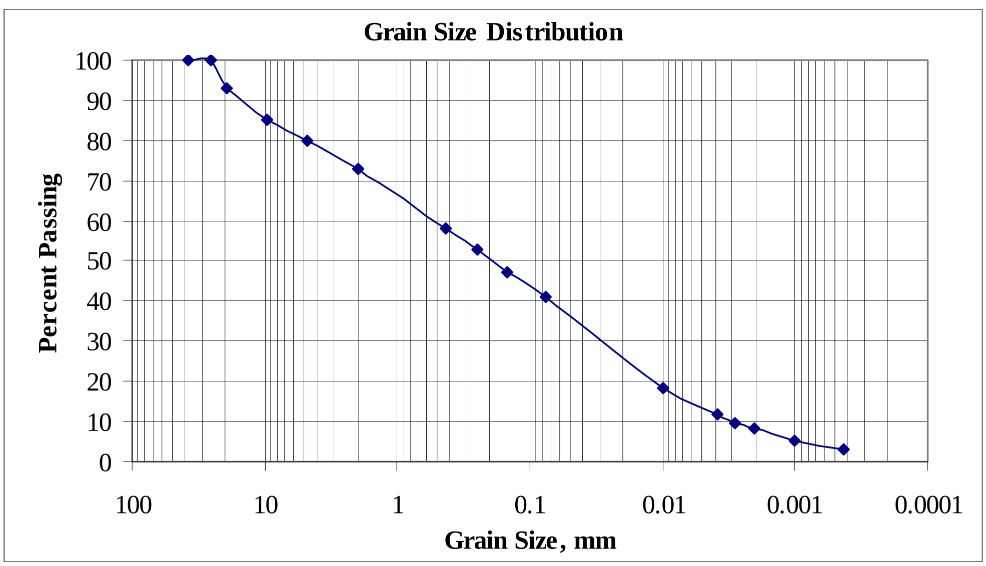
Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-SC-2	**Smokey Creek**	51	14	0.07	4.0

Figure B.10. Particle (Grain) Size Distribution for Smokey stream site U-SC-2.



Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-SC-3	Smokey Creek	67	20	0.022	2.5

Figure B.11. Particle (Grain) Size Distribution for Smokey stream site U-SC-3



Site ID	Watershed	% finer than 200	% clay	D50 (mm)	D84 (mm)
U-SC-4	Smokey Creek	41	8	0.2	9.0

Figure B.12. Particle (Grain) Size Distribution for Smokey stream site U-SC-4.

APPENDIX C:

AnnAGNPS MODEL CALIBRATION RESULTS

C.1. AnnAGNPS Model Calibrations: Flow Cell and Reach Generation

Before calibrating the AnnAGNPS model for each subwatershed, the flow cells were adequately sized to represent the different types of land use activities and soil types within the area (Phase I Report). For each subwatershed, the cell simulation area (CSA) and minimum simulation channel length (MSCL) were set to 15 hectares and 100 meters, respectively. Smaller set of flow cell areas and lengths in the AnnAGNPS produced model errors or would group the same amount of land use and soil aspects of the area as before but require a longer time to compute more cell shapes. Once a uniform set of flow cells have been defined, the model outlet was set at the location of the stage recorder, and the various land use and soil type polygons created from the ArcMap GIS software were grouped into different flow cells for AnnAGNPS hydrologic computations. After the flow cell polygons were created, the AnnAGNPS model selects the dominant land use and soil type within a cell's area; therefore, each cell is entirely represented by a single land use activity and soil type. Figures C.1 through C.4 show the original land use types in a watershed before and after the cells capture the most dominant land use activities. Figures C.1 through C.4 have been divided into two segments: segment (a) and segment (b). For each figure, (a) illustrates the 2006 custom land use for each subwatershed imported into the AnnAGNPS model, and (b) illustrates the dominant land use types for each flow cell that the AnnAGNPS model uses for runoff and sediment yield computations. As seen in Figures C.1 through C.4, the AnnAGNPS model's flow cells only perform computations on a few of the land use activities that are largely found within each study subwatershed. Note, large white areas in the lower portion of the subwatershed are areas that were not modeled and have no flow cells. Modeled areas were above our stage recording stations.

Figures C.5 through C.8 show the original soil types within a watershed before and after the cells attempt to capture the most dominant soils within the area. Like that of each subwatershed's land use previously mentioned, Figures C.5 throughC.8 have been divided into (a) the GIS-defined soil types, and (b) the soil types defined by flow cell. For each figure, the segment (a) is provided to illustrate the soil data for each sub-watershed imported into the AnnAGNPS model. Each figure (b) is provided to illustrate the dominant types for each flow cell that the AnnAGNPS model uses for runoff and sediment yield computations. As seen in Figures C.5 through C.8, the AnnAGNPS model's flow cells only select the dominant soil types within each subwatershed. The flow cells are largely created by the different topography of a watershed, and with such a steep terrain in the New River subwatersheds, several flow cells vary considerably in size.

C.2. AnnAGNPS Model Calibrations: Runoff Calibration

The measured storm water runoff at the outlet of each subwatershed was measured by the coupled use of stream stage monitors set to record in 20-minute increments with manual velocity measurements taken at a variety of different stream stage heights. During several of the large storm events, the four subwatersheds' stream velocity could not be safely measured, so the HEC-RAS model was used to estimate the stream discharge at stream stages that would represent bankfull conditions or better. By organizing the stage and velocity measurements at the main channel's outlet of each subwatershed, a stage-discharge relationship could be established to create a series of equations that would transform the continuously collected stage data into a flow rate. The stage-discharge plots for the outlet of each subwatershed, with the appropriate equations to describe the different relationships, are shown in Figures C.9 through C.12.

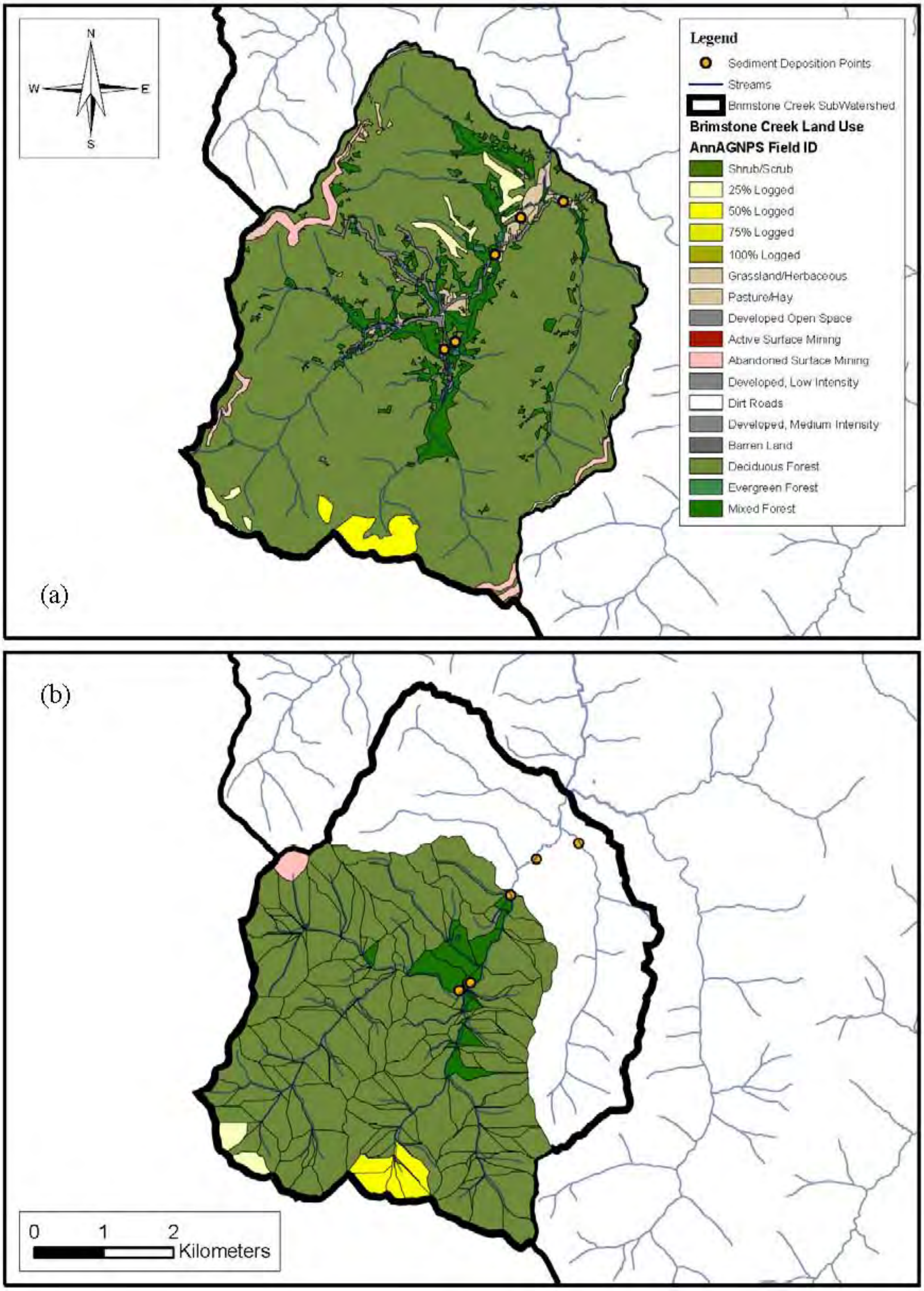


Figure C.1 Brimstone Creek subwatershed a) land use characterization in 2006 and b) land use types per AnnAGNPS model flow cell.

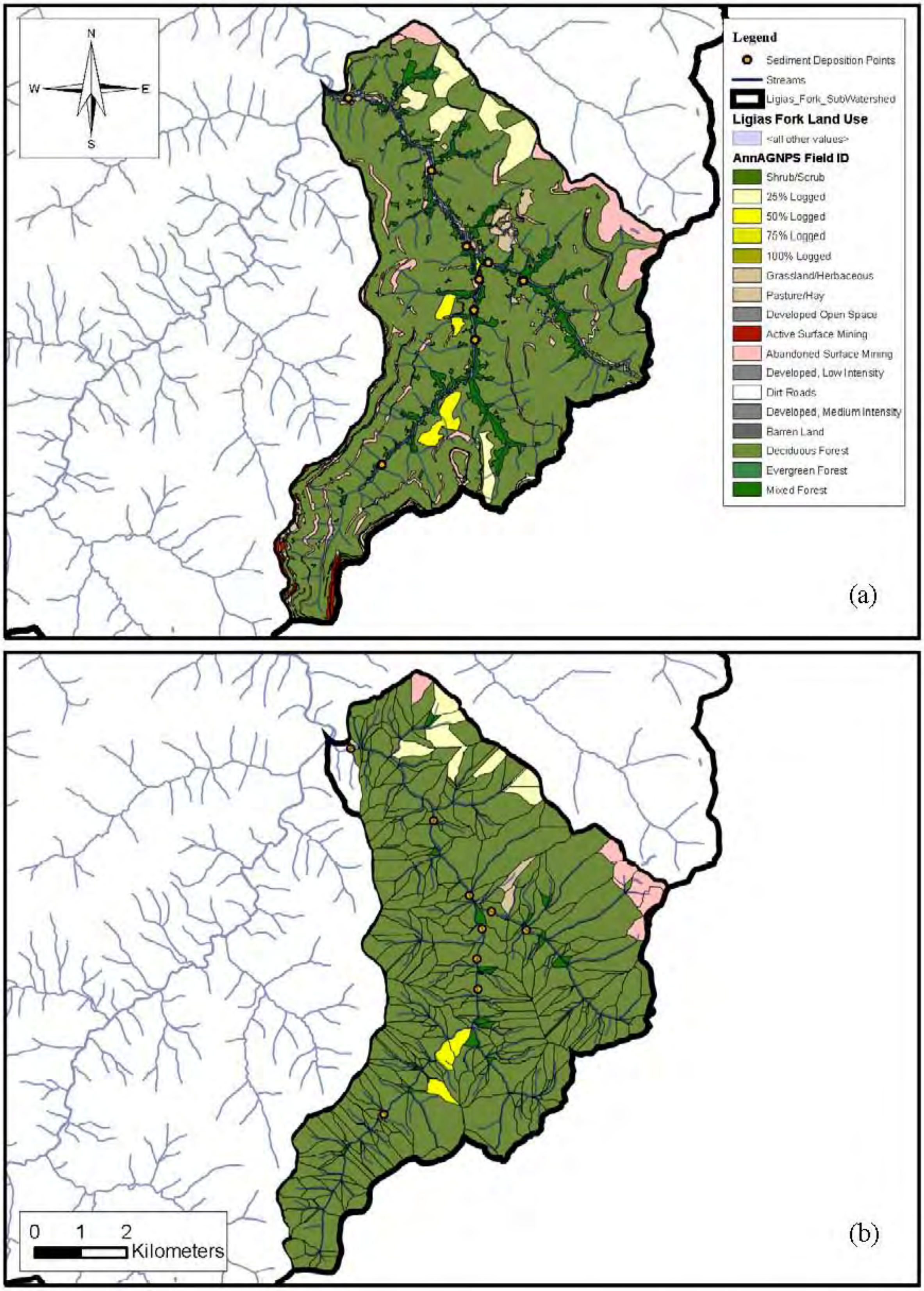


Figure C.2 Ligias Fork subwatershed a) land use characterization in 2006 and b) land use types per AnnAGNPS model flow cell.

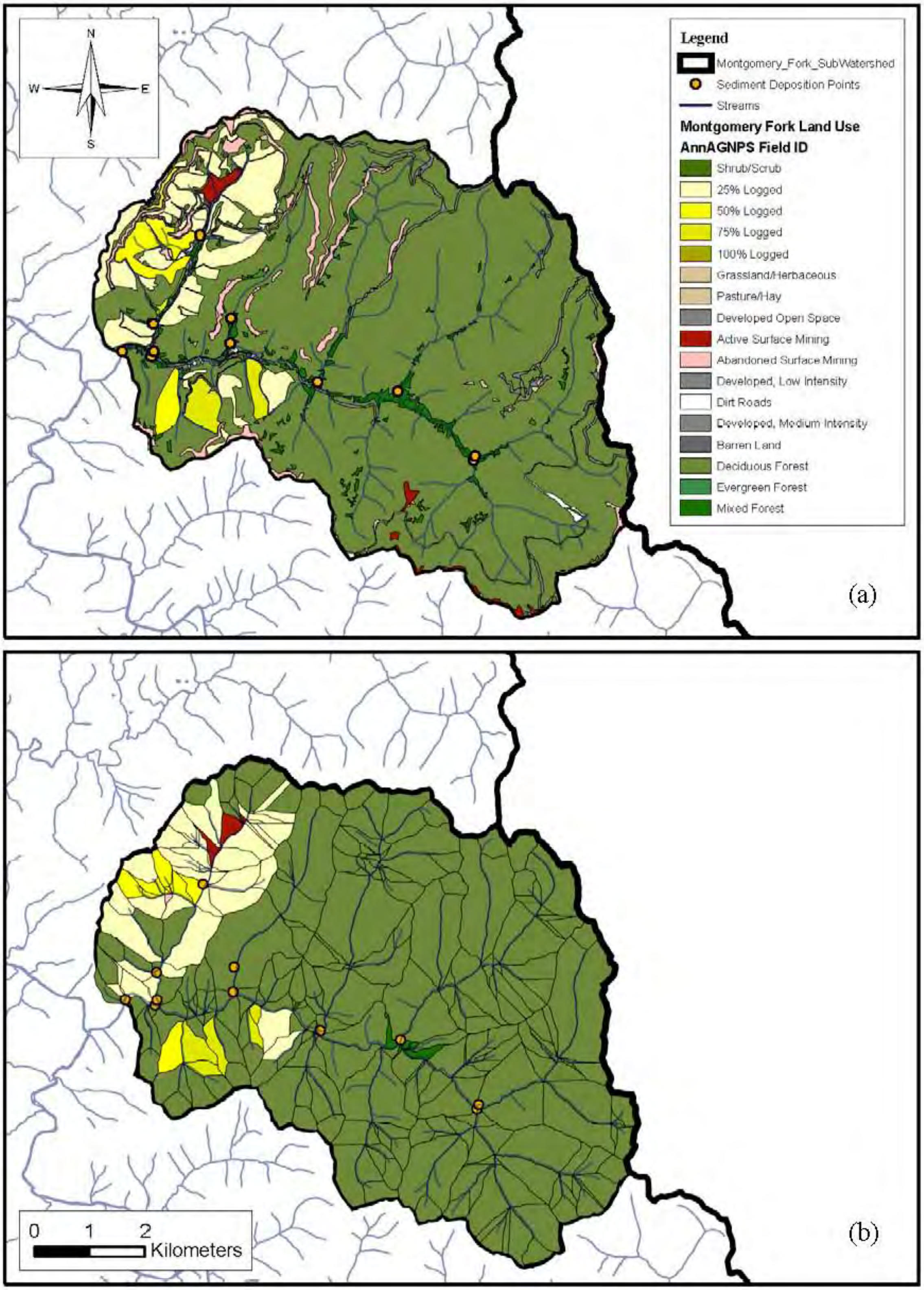


Figure C.3 Montgomery Fork subwatershed a) land use characterization in 2006 and b) land use types per AnnAGNPS model flow cell.

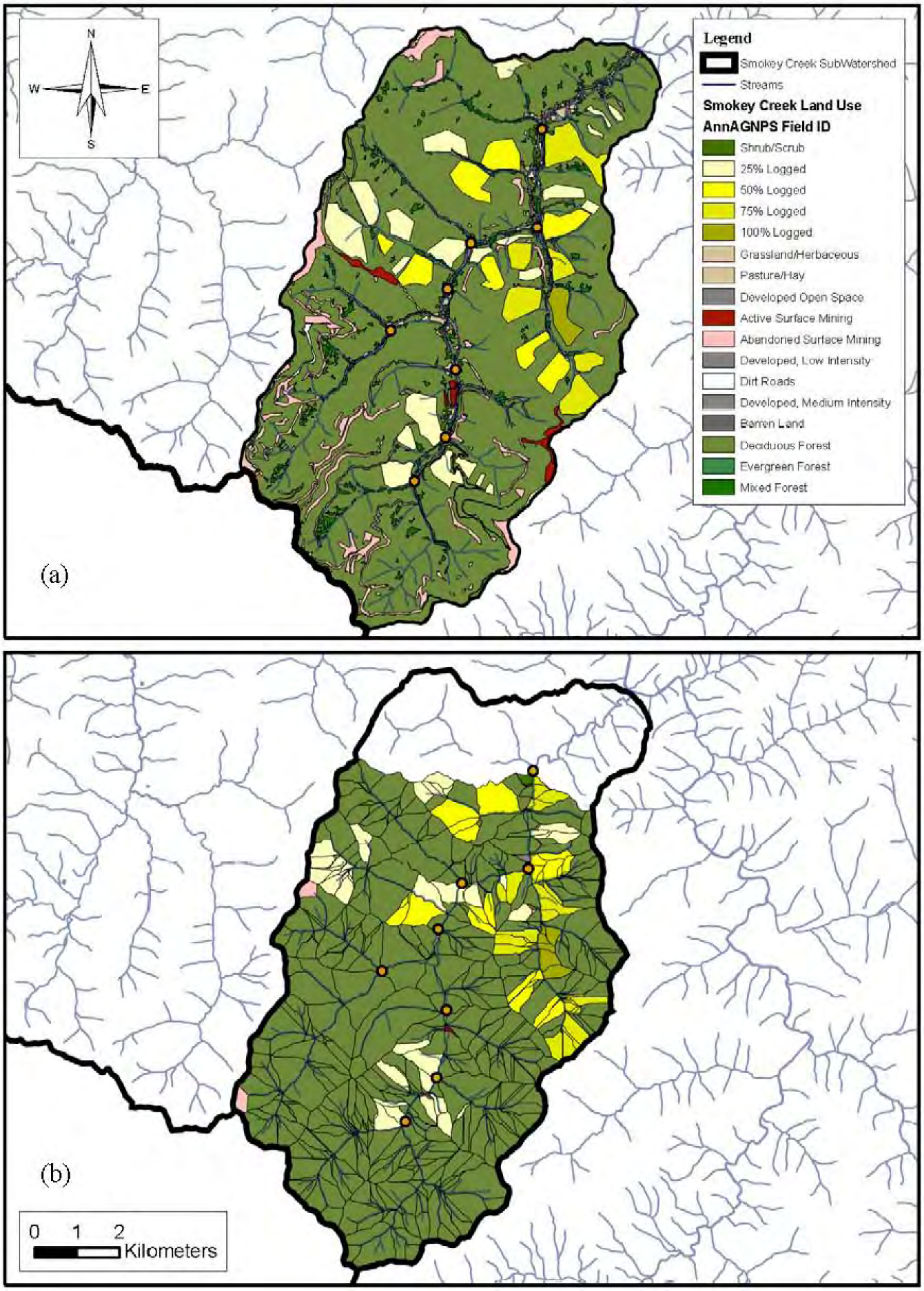


Figure C.4 Smokey Creek subwatershed a) land use characterization in 2006 and b) land use types per AnnAGNPS model flow cell.

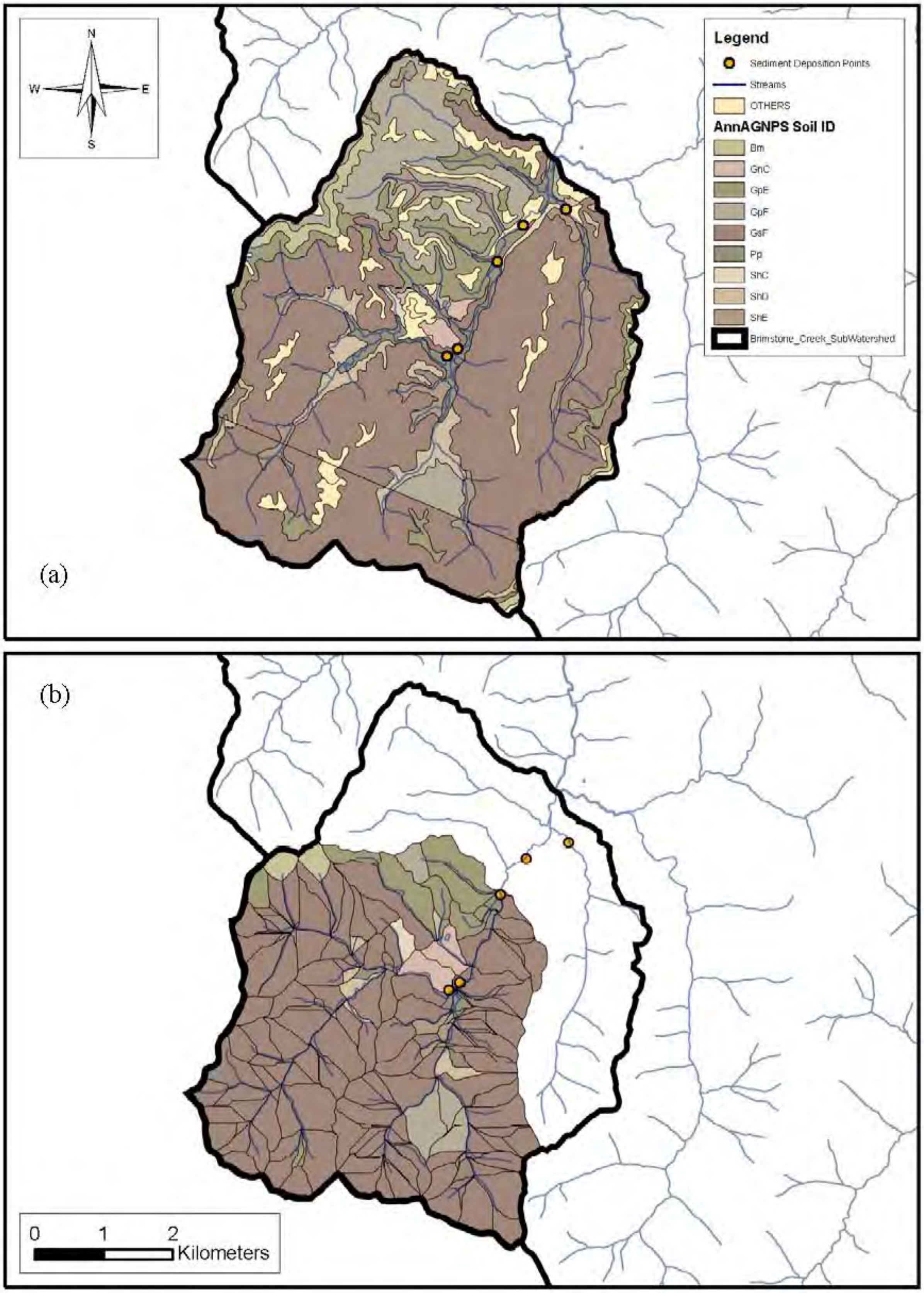


Figure C.5. Brimstone Creek subwatershed: a) soil type characterization and b) soil types per AnnAGNPS model flow cell.

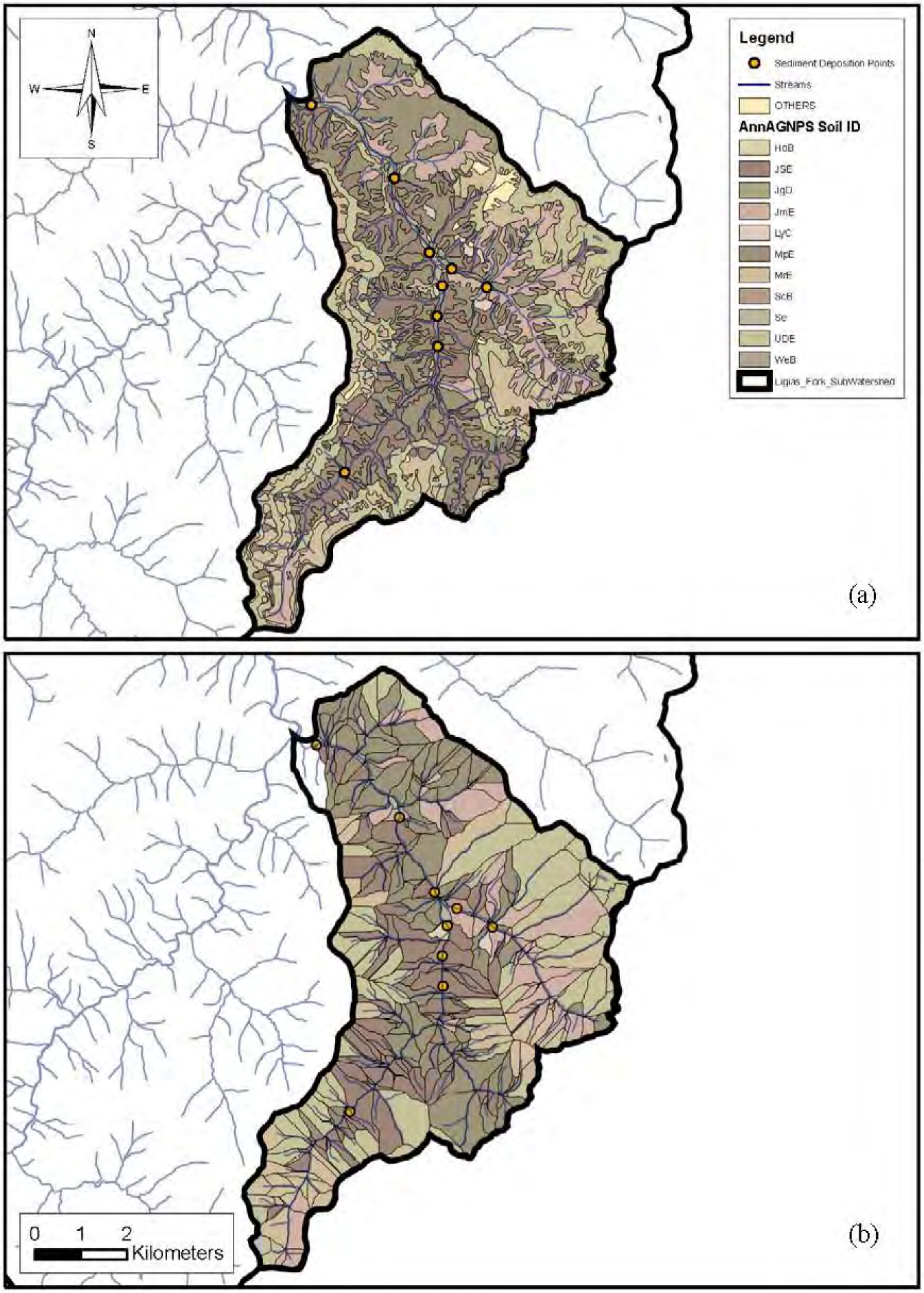


Figure C.6. Ligias Fork subwatershed: a) soil type characterization and b) soil types per AnnAGNPS model flow cell.

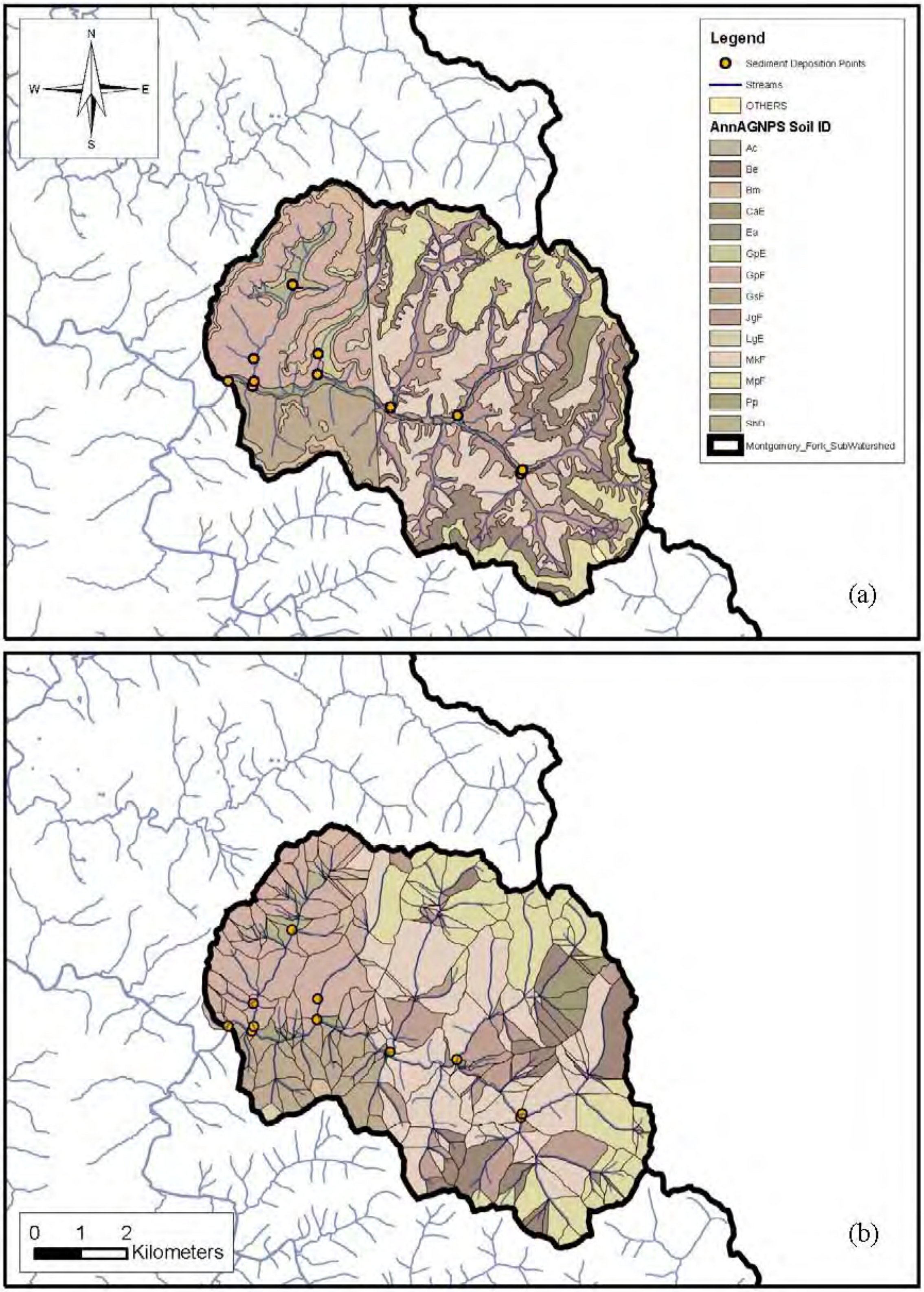


Figure C.7. Montgomery Fork subwatershed: a) soil type characterization and b) soil types per AnnAGNPS model flow cell.

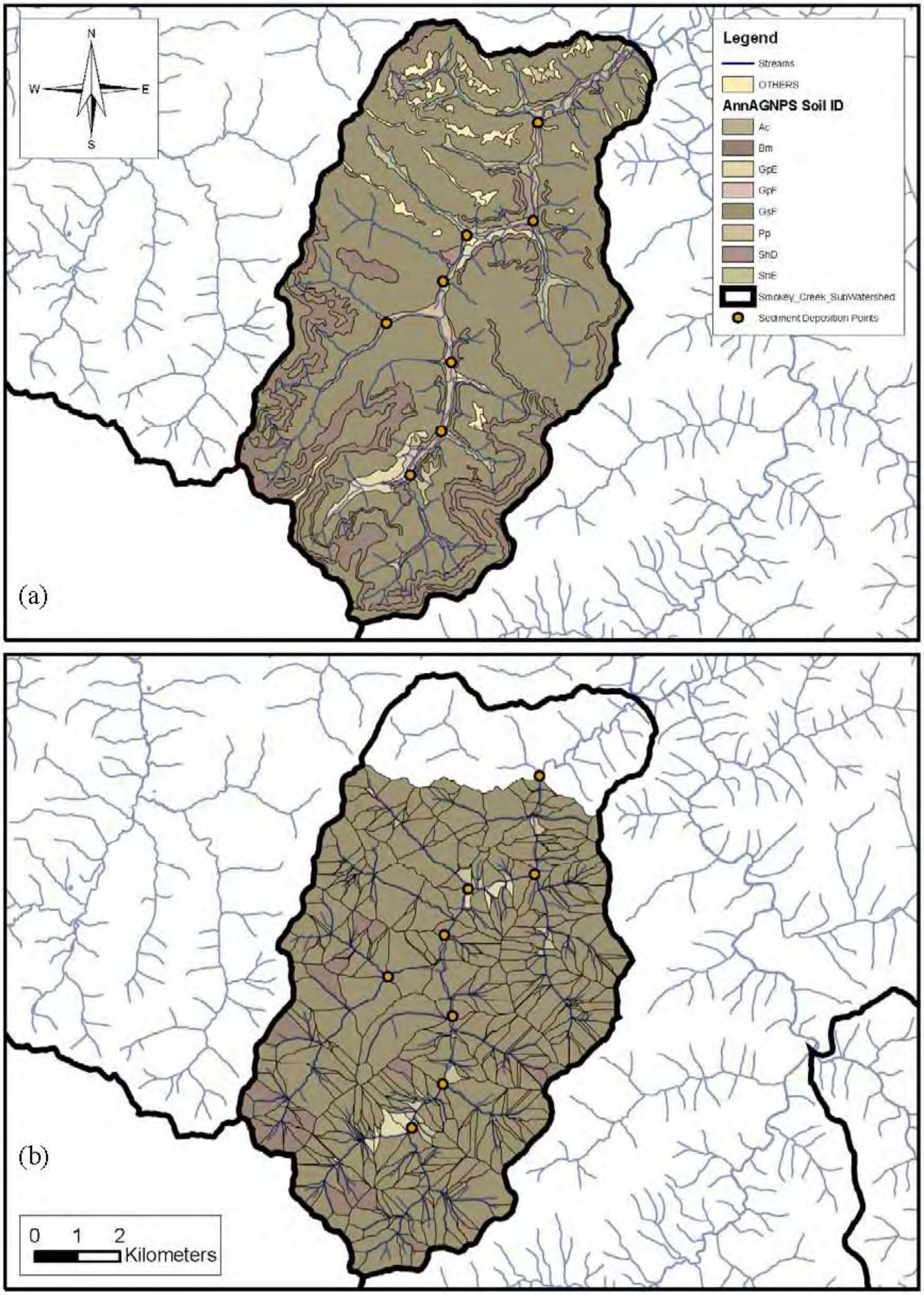


Figure C.8. Smokey Creek subwatershed: a) soil type characterization and b) soil types per AnnAGNPS model flow cell.

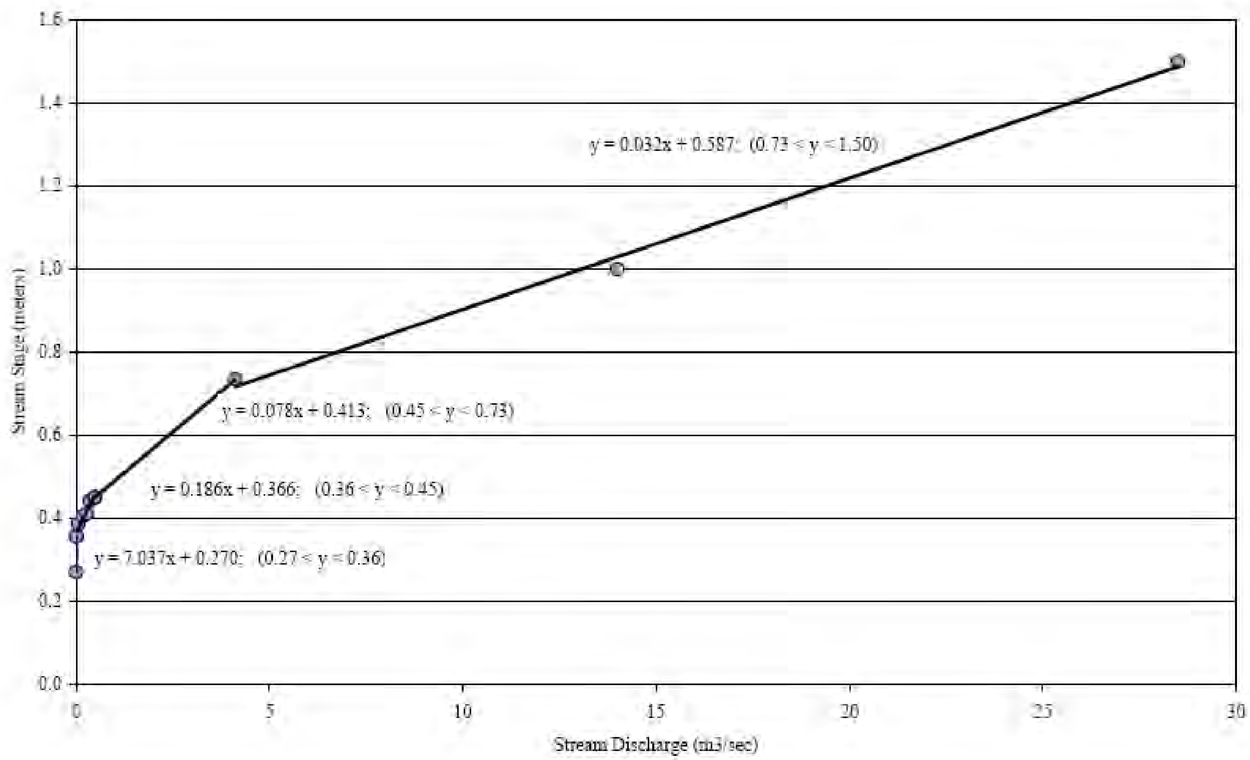


Figure C.9. Brimstone Creek measured stage-discharge relationships. Discharges for stage over 1 m were estimated with HEC-RAS (Massey 2008).

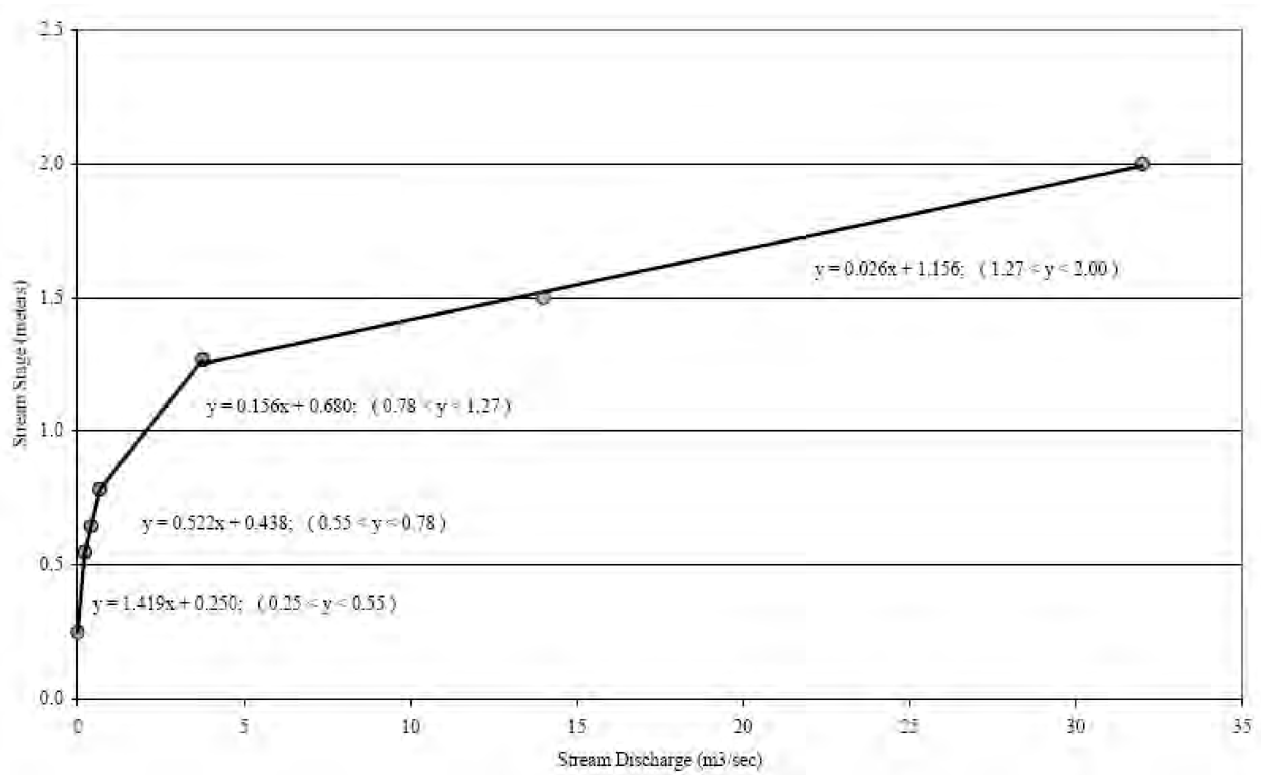


Figure C.10. Ligias Fork measured stage-discharge relationships. Discharges for stage over 1 m were estimated with HEC-RAS (Massey 2008).

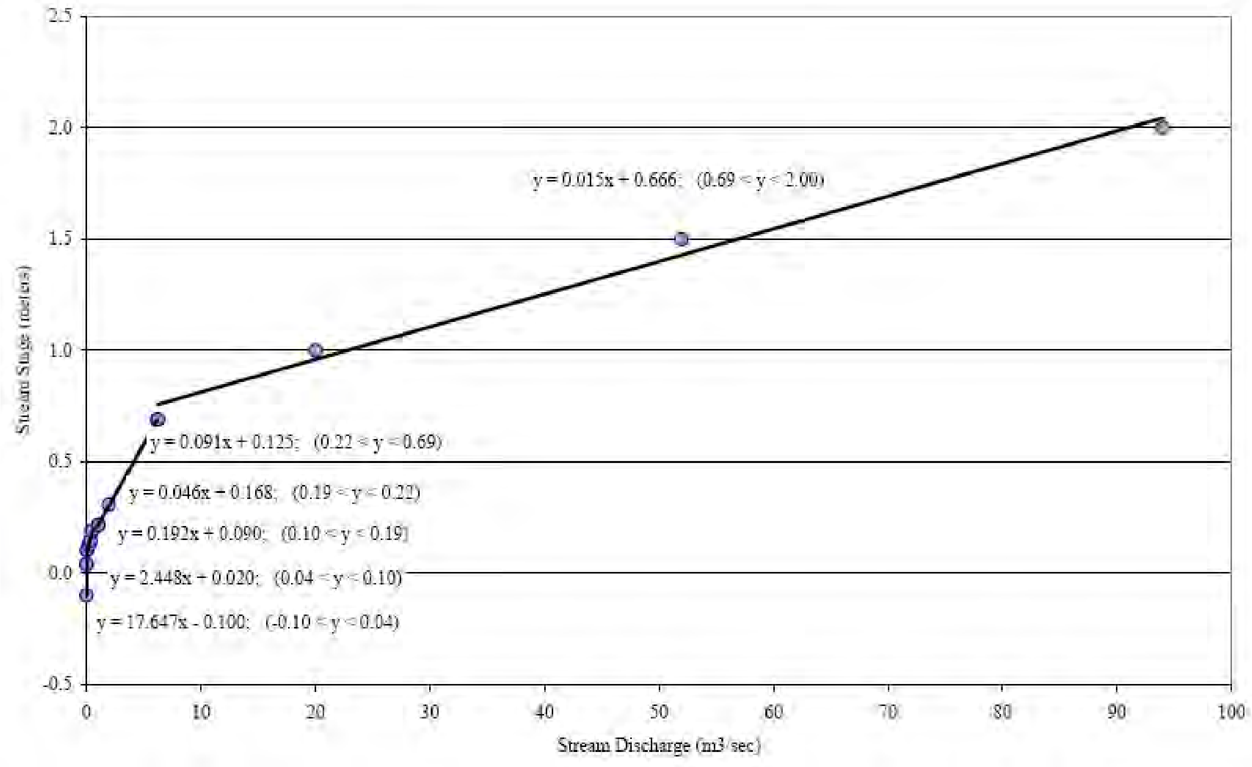


Figure C.11 Montgomery Fork measured stage-discharge relationships. Discharges for stage over 1 m were estimated with HEC-RAS (Massey 2008).

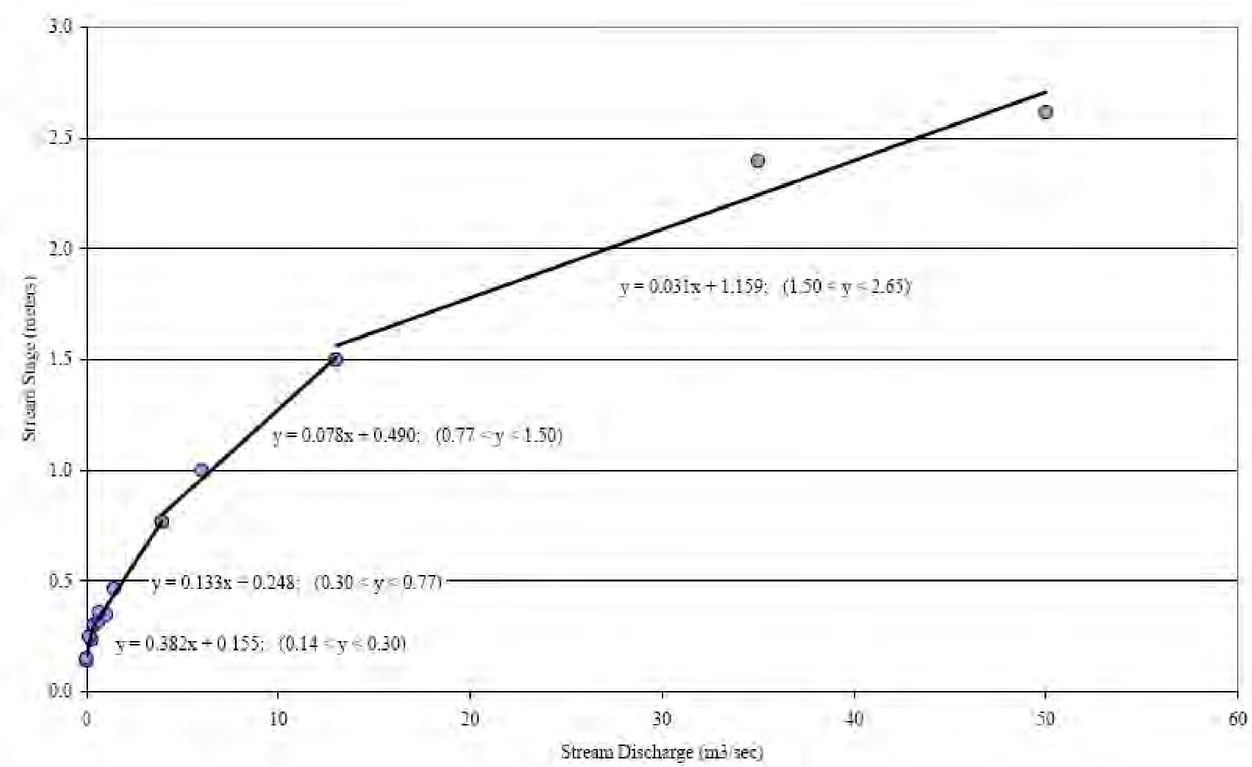


Figure C.12. Smokey Creek measured stage-discharge relationships. Discharges for stage over 1 m were estimated with HEC-RAS (Massey 2008).

After using the established stage-discharge relationships at the outlet of each subwatershed, the continuously measured stage data was converted into a flow rate. Between each storm event, which produced a surface runoff amount, the baseflow was separated from the stage data recorded to produce a measured daily runoff amount at each of the four subwatersheds of interest in the New River Basin. This measured daily surface runoff amount was then compared to the estimated or predicted runoff found from the AnnAGNPS model from a limited amount of local climate data measured from the Big South Fork Weather Station as well as four other local rain gauges near to all subwatersheds. To better calibrate each subwatershed, the precipitation data from the Big South Fork River and Recreation Area’s Full Weather Station was slightly modified with the precipitation data from the four other tipping bucket rain gauges (which are located around the New River Basin) to better represent the amount of rainfall occurring in this mountainous landscape. The Big South Fork River and Recreation Area’s precipitation data was tailored with the other tipping bucket rain gauges based on the tipping bucket’s elevation and location in respect to each of the four subwatersheds used in this study. More tipping bucket rain gauges within each subwatershed would have been ideal, but due to this study’s lack of time, finance, and personnel, the only climate data that was used was from devices previously installed by other agencies for long-term measurements.

Since the AnnAGNPS model uses the USDA-NRCS (SCS) Runoff Curve Number (CN) method for different land use activities and hydrologic soil groups, the CNs for in each subwatershed were slightly modified from standard suggested textbook values to better represent and calibrate the predicted runoff from the AnnAGNPS model with measured values. Table C.1 provides the CNs that produced satisfactory results for each of the subwatershed’s common land uses.

The peak flow rate produced by the AnnAGNPS model is a function of the Manning’s n roughness coefficients for sheet, shallow, and concentrated flows from the cells and reaches defined in the AnnAGNPS model. Since the Manning’s n values for the landscape and streams affects the sediment yield as well, these values for each subwatershed were adjusted later in the calibration process with that of predicted sediment yield. Overall, the Manning’s n values for sheet and concentrated flow are slightly higher than what is suggested from most open channel textbooks for different land use environments. Table C.2 summarizes the different Manning’s n values used in each subwatershed with the AnnAGNPS model.

Even with slightly higher Manning’s n values for the four different subwatersheds, the peak flow rate produced from the model was usually overestimated by the AnnAGNPS model in comparison to the measured peak discharge at the outlet of each subwatershed. The measured peak discharge was obtained from the largest discharge by the stage discharge relationship obtained from the stage recorders. The summarized comparison of the measured versus predicted peak discharge at each subwatershed can be seen in Figures C.13 through C.16.

Though the predicted peak discharge from AnnAGNPS was consistently greater than the measured peak discharge at the outlet of the four different subwatersheds, the predicted total daily runoff matched fairly well with the measured total daily runoff at each subwatershed. The summarized predicted versus measured total daily runoff at the outlet of each of the subwatersheds can be seen graphically in Figures C.17 through C.20. To better represent how well the measured daily runoff agrees with that produced by the AnnAGNPS model, an average runoff discharge frequency plot was developed for each of the four subwatersheds. Shown in

Table C.1. Runoff curve numbers (CN) used in the AnnAGNPS model.

AnnAGNPS Field ID	Land use / Land cover Description	Curve Numbers for Hydrologic Soil Groups			
		A	B	C	D
1	Open Water	0	0	0	0
2	Developed Open Space	47	69	79	86
3	Developed, Low Intensity	51	68	79	84
4	Developed, Medium Intensity	77	85	90	92
5	Developed, High Intensity	81	88	91	93
6	Barren Land (Rock/Sand/Clay)	68	79	86	89
7	Deciduous Forest	36	59	72	79
8	Evergreen Forest	36	59	72	79
9	Mixed Forest	36	59	72	79
10	Shrub/Scrub	34	48	65	73
11	Grassland/Herbaceous	39	61	74	80
12	Pasture/Hay	49	69	79	84
13	Cultivated Crops	66	74	80	82
14	Woody Wetlands	38	62	78	82
101	25% Logged	39	63	75	80
102	50% Logged	45	67	78	82
103	75% Logged	59	77	82	89
104	100% Logged	74	82	88	94
201	Active Surface Mining	77	86	91	94
202	Abandoned Surface Mining	49	66	76	82
301	Dirt Roads	72	82	87	89

Figures C.21 through C.24 are the daily average runoff discharge values measured and predicted by the AnnAGNPS model for each of the four study subwatersheds. These values used in the frequency plots have a variety of data points, since some of the subwatersheds contained measured data beginning in July 2007, and others did not have available measured runoff values until November 2007. As can be seen in the frequency discharge relationships between measured and predicted by AnnAGNPS, the model seems to slightly overestimate smaller runoff causing events, while it slightly underestimates the larger runoff causing events. With most of the subwatersheds, the medium sized runoff events seem to vary the most from measured versus predicted values with the AnnAGNPS model.

From a uniform set of NRCS TR-55 curve numbers and Manning's n values determined for the different land use characteristics through calibration techniques, the predicted daily runoff values estimated by the AnnAGNPS model seem to correspond to the actual New River hydrology reasonable well with the limited amount of weather and streamflow data. Overall, there is some error in the model's computations of peak flow, which are likely due to the steep slope of the New River Basin topography, insufficient weather data, and the NRCS TR-55's assumption of all storm event intensities having a Type II distribution. The daily total surface

Table C.2. Manning's n for sheet flow of each cell based on land use.

AnnAGNPS Field ID	Land use / Land cover Description	Manning's n Roughness Coefficient: Cell Sheetflow	Cell Shallow Concentrated	Reach Concentrated
2	Developed Open Space	0.01	0.025	0.08
3	Developed, Low Intensity	0.01	0.025	0.08
4	Developed, Medium Intensity	0.01	0.025	0.08
5	Developed, High Intensity	0.01	0.025	0.08
6	Barren Land (Rock/Sand/Clay)	0.01	0.025	0.08
7	Deciduous Forest	0.95	0.055	0.08
8	Evergreen Forest	0.95	0.055	0.08
9	Mixed Forest	0.95	0.055	0.08
10	Shrub/Scrub	0.95	0.055	0.08
11	Grassland/Herbaceous	0.15	0.055	0.08
12	Pasture/Hay	0.15	0.025	0.08
13	Cultivated Crops	0.15	0.025	0.08
14	Woody Wetlands	0.50	0.055	0.08
101	25% Logged	0.75	0.025	0.08
102	50% Logged	0.45	0.025	0.08
103	75% Logged	0.15	0.025	0.08
104	100% Logged	0.03	0.025	0.08
201	Active Surface Mining	0.05	0.025	0.08
202	Abandoned Surface Mining	0.05	0.025	0.08
301	Dirt Roads	0.05	0.025	0.08

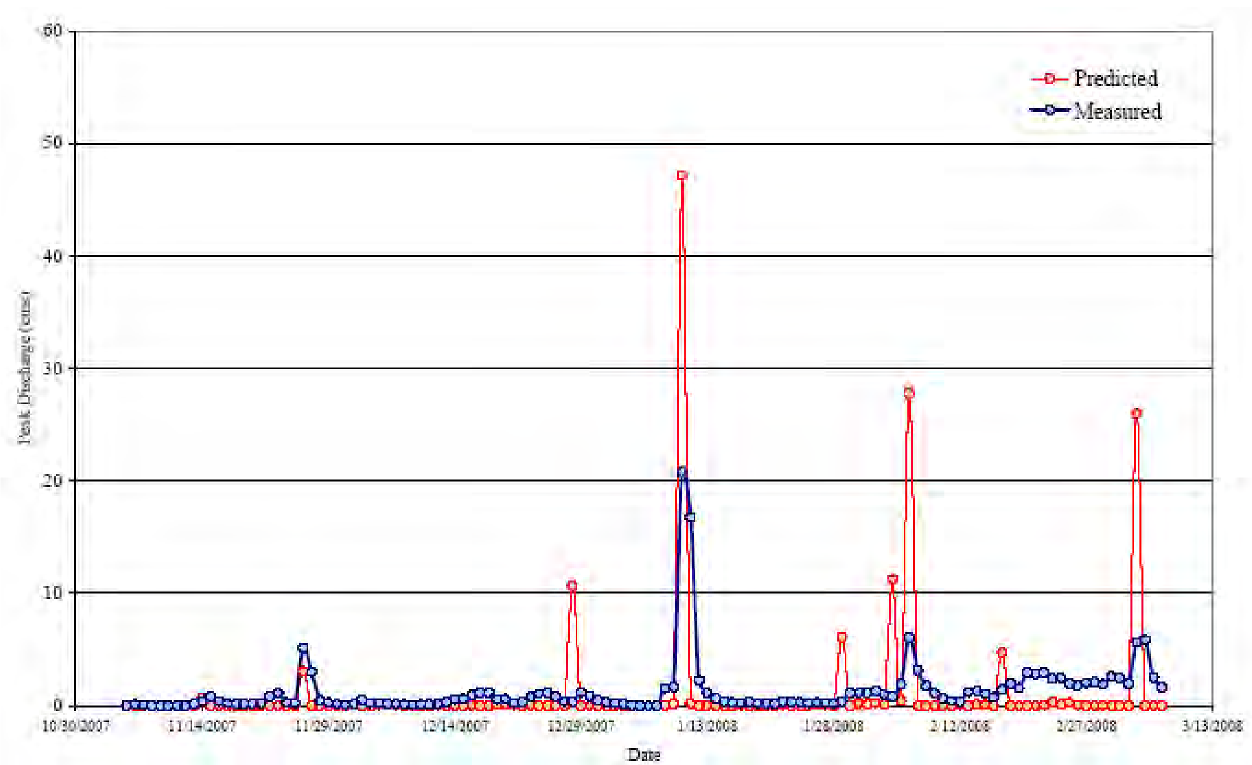


Figure C.13. Brimstone Creek modeled vs measured peak discharge.

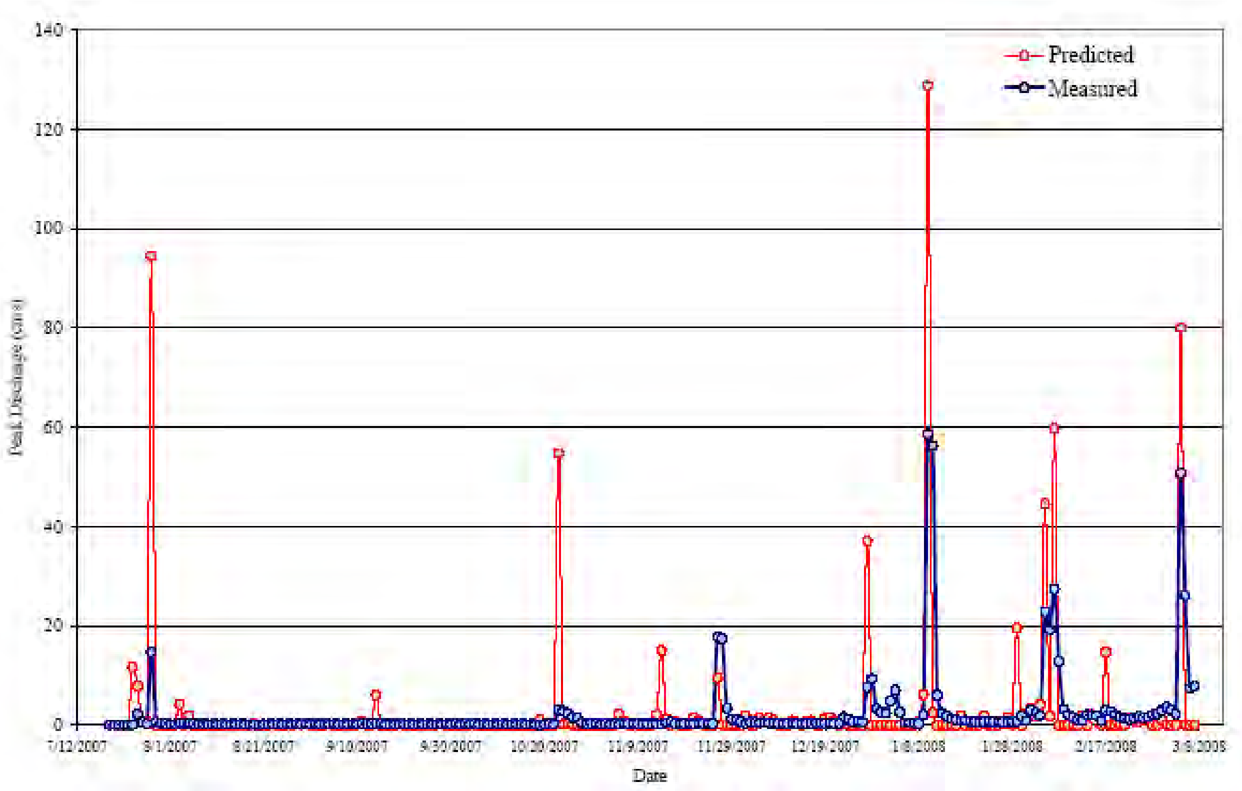


Figure C.14. Ligias Fork modeled vs measured peak discharge.

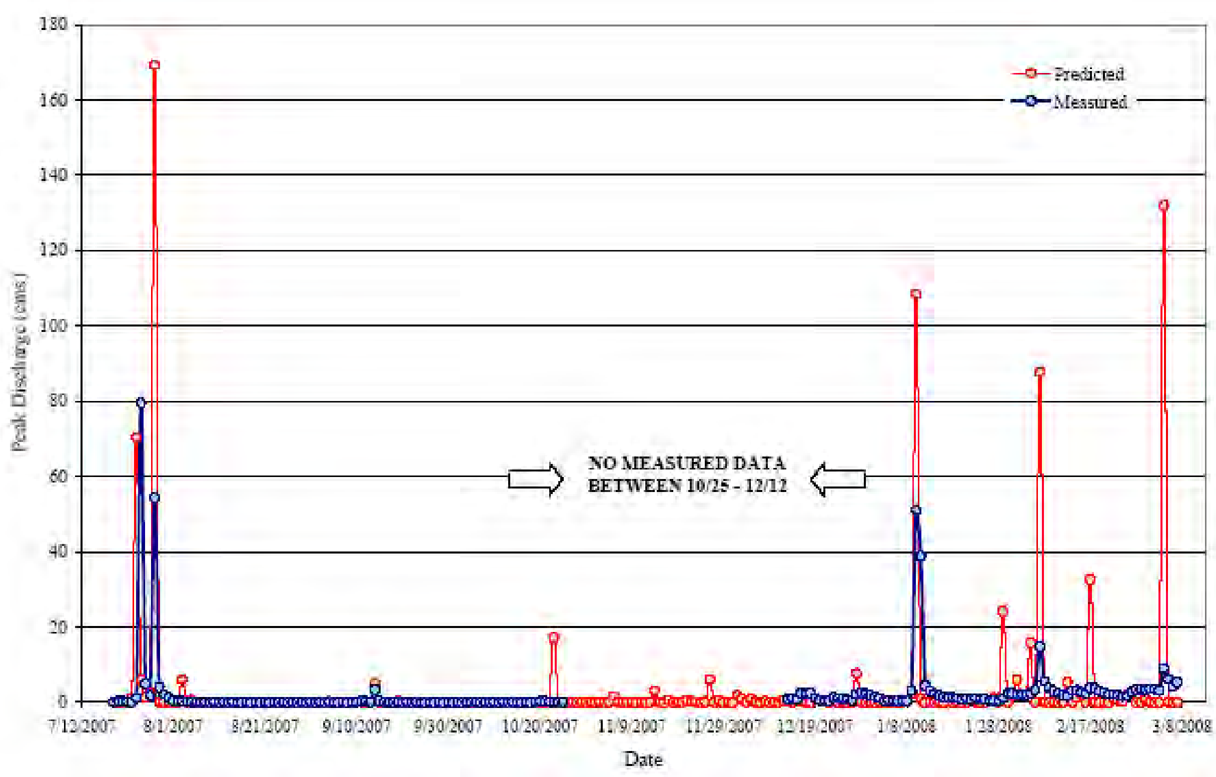


Figure C.15. Montgomery Fork modeled vs measured peak discharge.

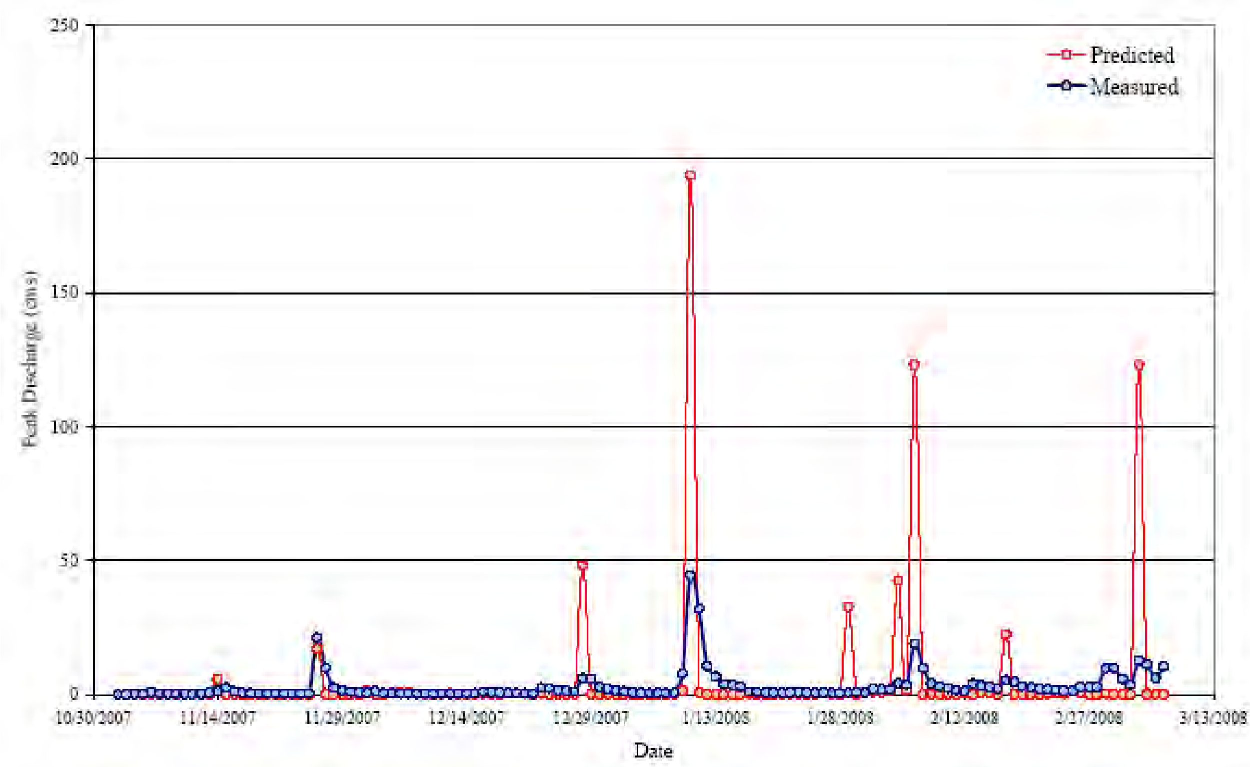


Figure C.16. Smokey Creek modeled vs measured peak discharge.

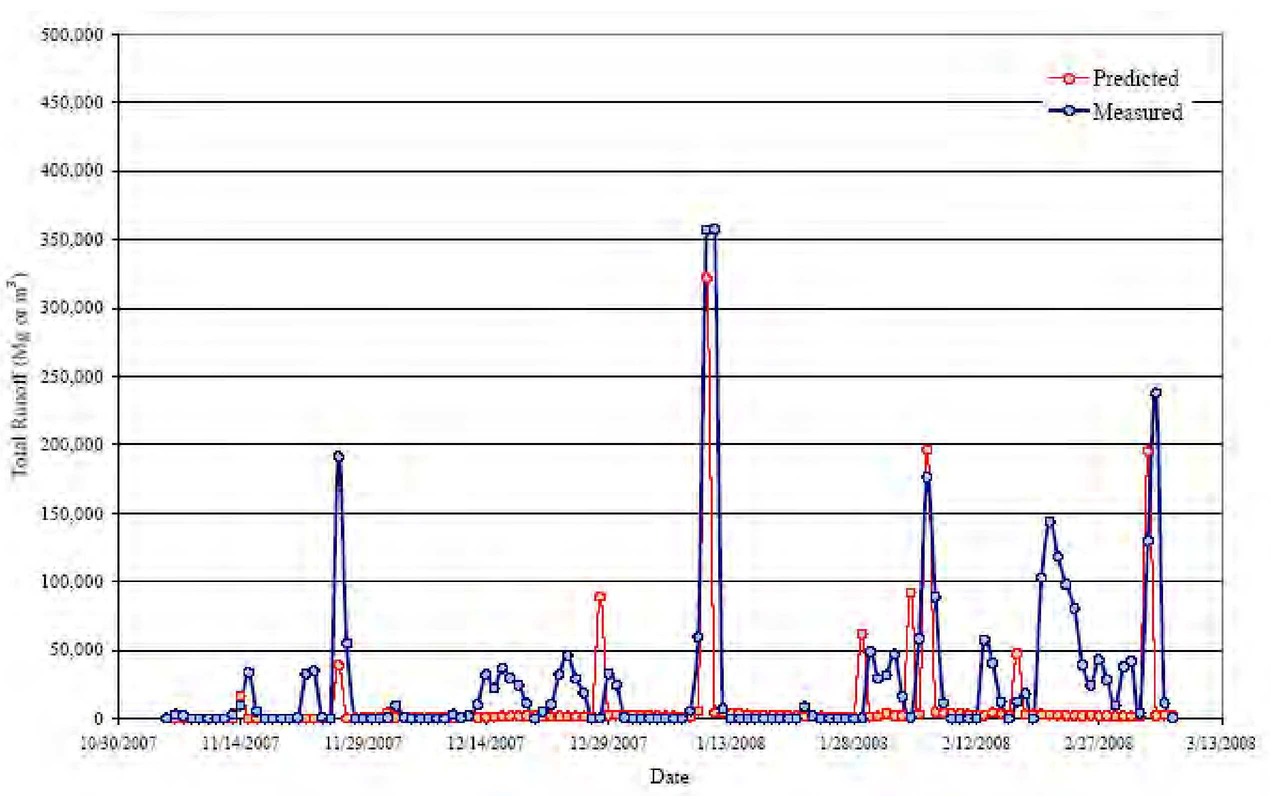


Figure C.17. Brimstone Creek modeled vs measured total daily runoff.

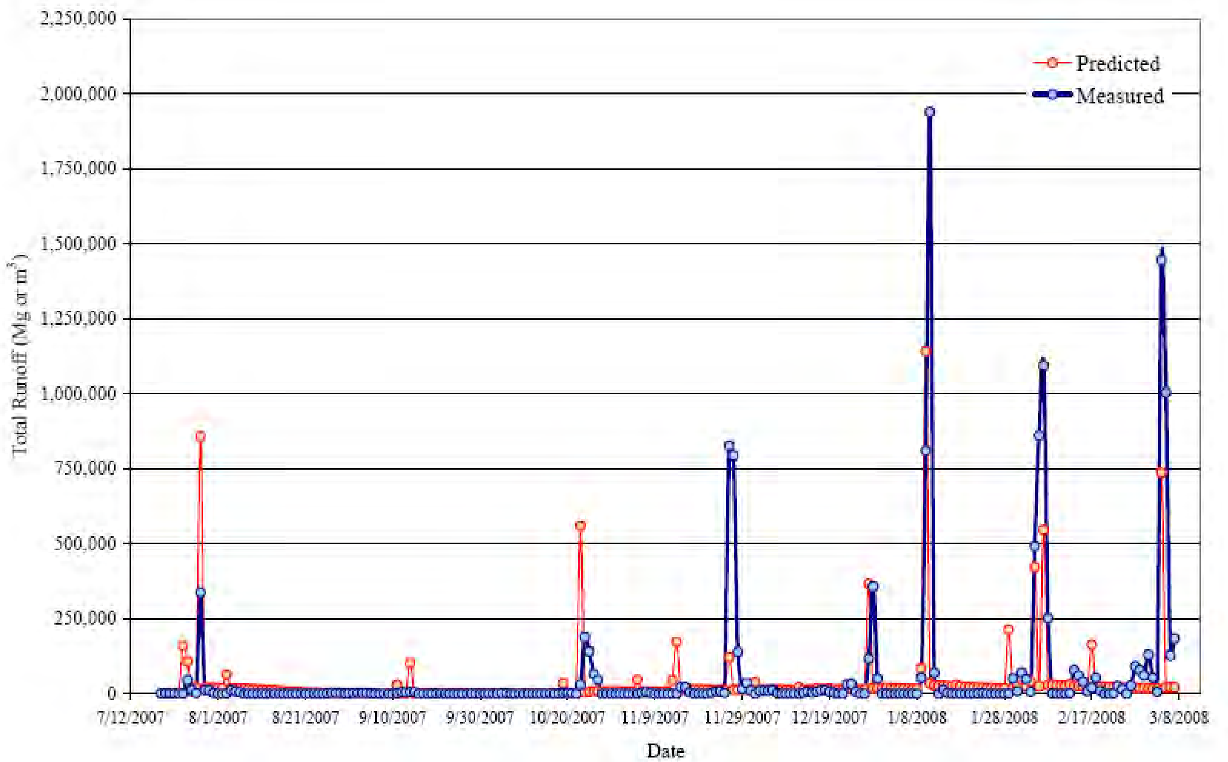


Figure C.18. Ligias Fork modeled vs measured total daily runoff.

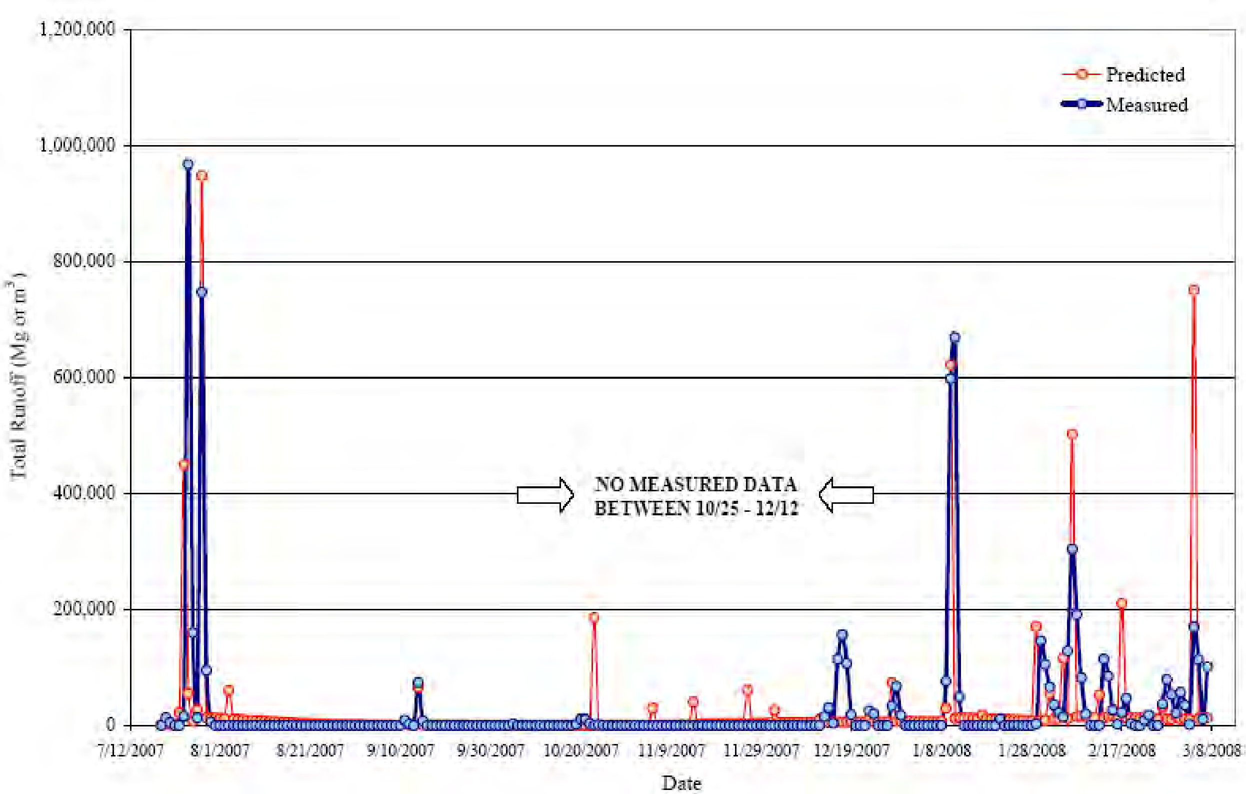


Figure C.19. Montgomery Fork modeled vs measured total daily runoff.

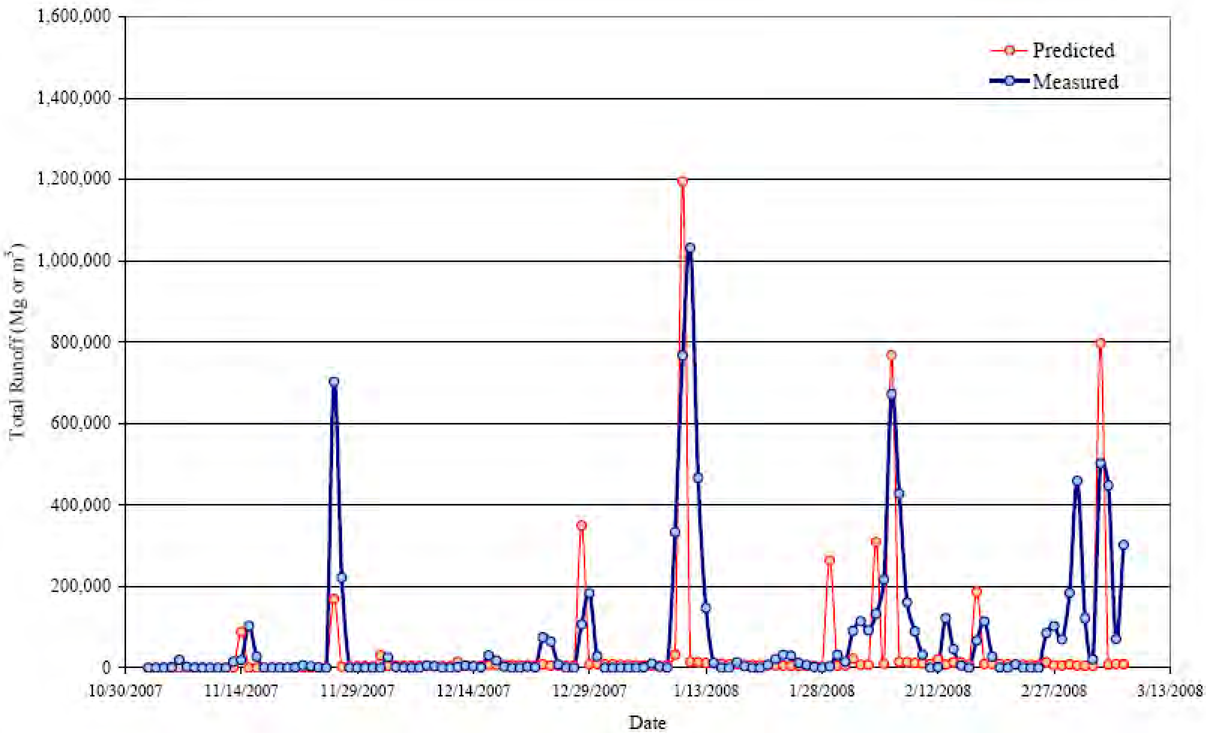


Figure C.20. Smokey Creek modeled vs measured total daily runoff.

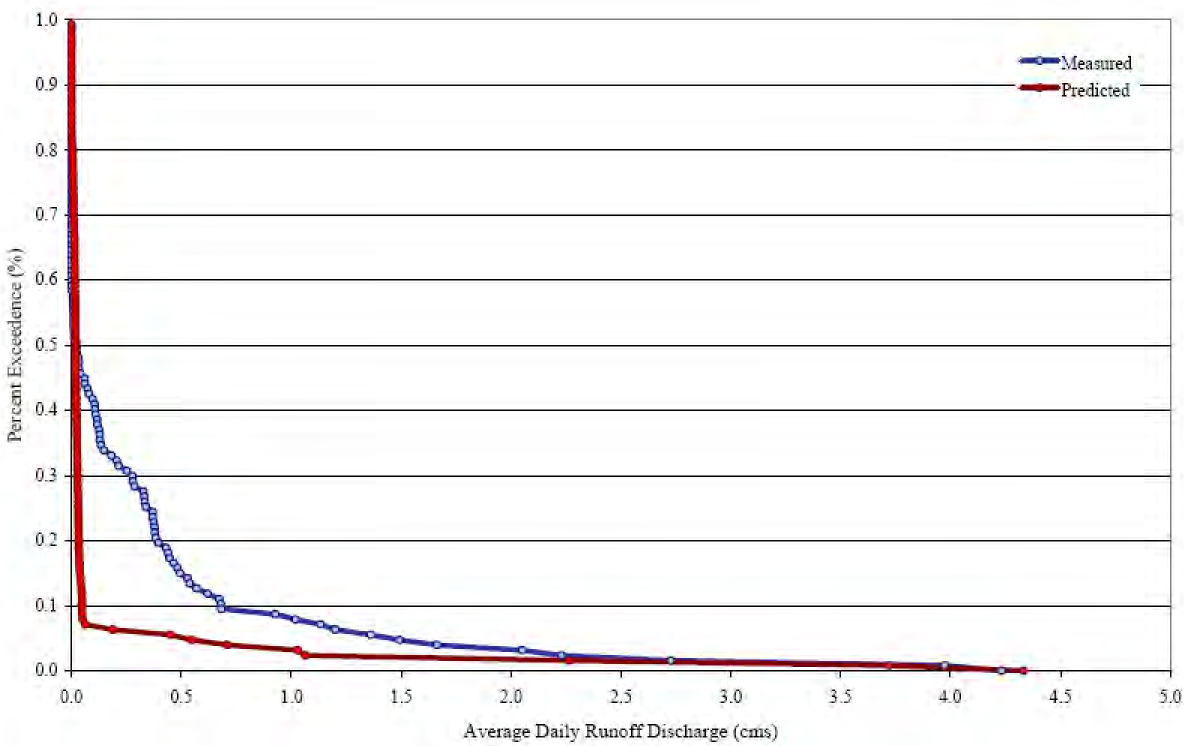


Figure C.21. Brimstone Creek modeled vs measured discharge frequency curve.

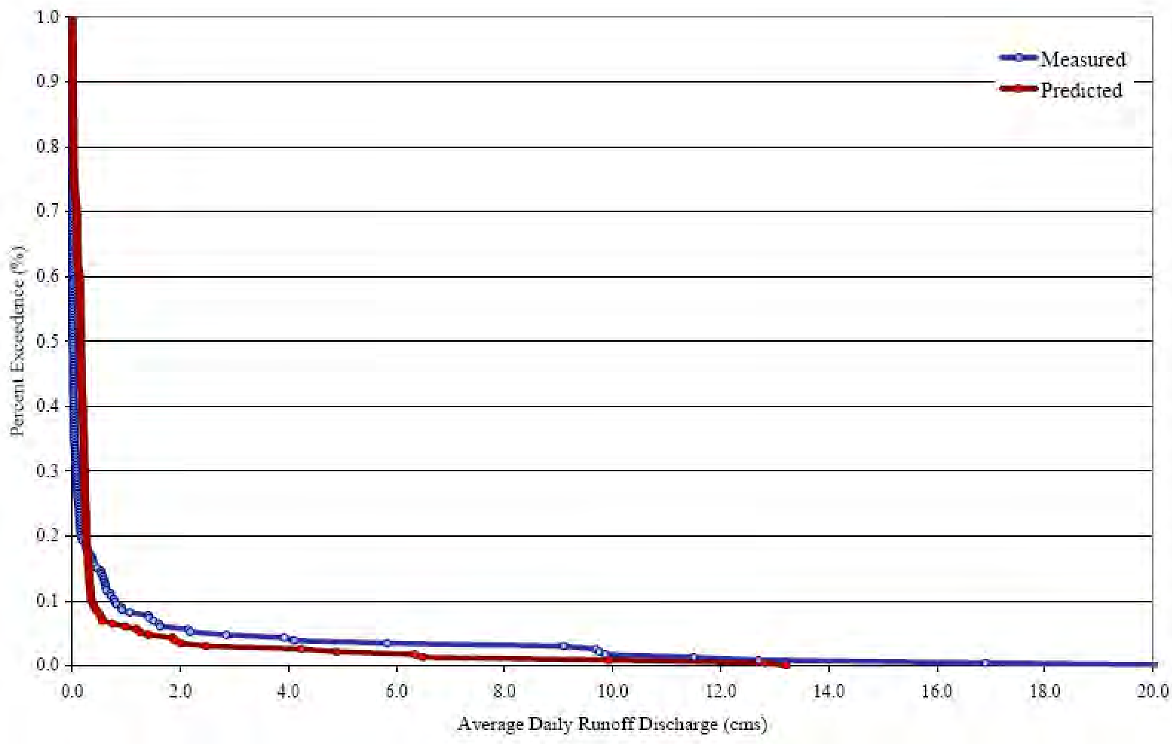


Figure C.22. Ligias Fork modeled vs measured discharge frequency curve.

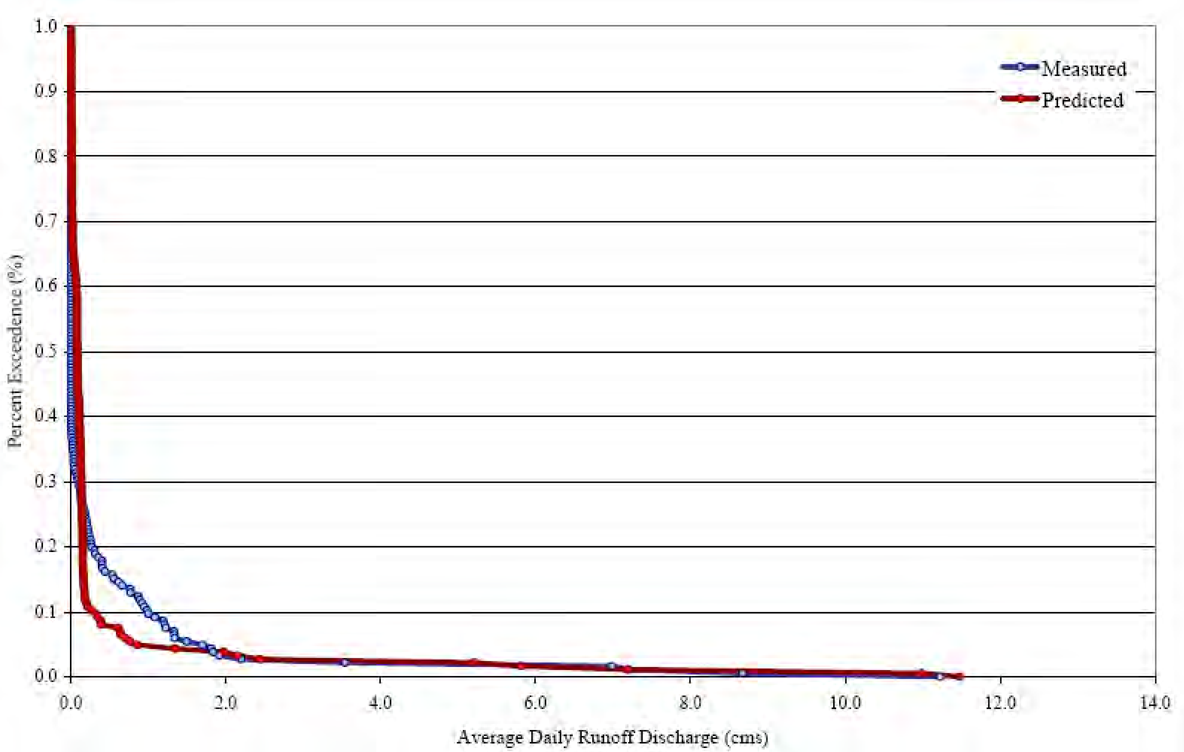


Figure C.23. Montgomery Fork modeled vs measured discharge frequency curve.

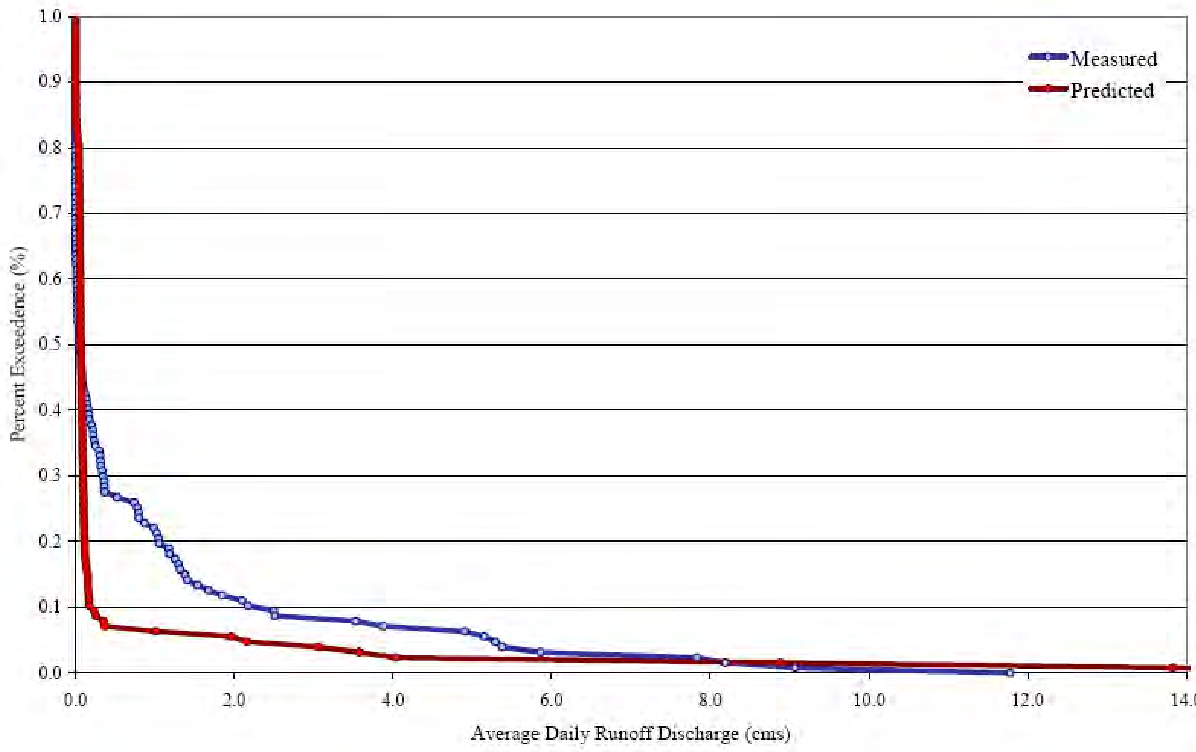


Figure C.24. Smokey Creek modeled vs measured discharge frequency curve.

runoff amount also contains some error, which is likely due to inadequate weather data available and the daily time step of the AnnAGNPS model which does not carry a continuous storm event over into the next day. In addition, the lack of measured discharges above waist deep, relying on the HEC-RAS model for estimating discharges likely also contributed to the differences between modeled and measured discharges in the mid ranges.

C.3. AnnAGNPS Model Calibrations: Sediment Yield Calibration

After the AnnAGNPS model produced satisfactory storm water runoff results with the limited amount of time and weather data available for all four study subwatersheds in the New River Basin, the calibration of the sediment yield was initiated. The AnnAGNPS model uses the RUSLE variables to estimate the daily sediment yield of a drainage area. RUSLE C and P factors are defined by the user for different land use activities in a designated area. To properly calibrate each subwatershed's sediment yield through the RUSLE C and P factors, a set of TSS samples was obtained at the outlet of each subwatershed for a variety of different storm events.

Using the TSS data collected from a single grab sample using a DH-48 sampler, AnnAGNPS models could generally be calibrated to match current sediment yields occurring from each subwatersheds (Section 5.6). The AnnAGNPS model uses flow cells to group large areas with homogeneous land use and soil data to make computations easier and quicker. By grouping a dominant land use and soil type for a large area for erosion and sediment yield computations, many of the smaller, yet larger sediment-contributing sources, like dirt roads, will likely not be detected.

From several visits throughout the New River area, the dirt roads were a significant source of sedimentation into the streams (Figure C.25). The dirt roads in the region were usually associated with surface mining activities, forest logging, or various alternative terrain vehicle (ATV) trails. From field observations, the dirt roads used for travel to logged areas, mined areas, and other locations often contained drainage ditches and culverts that created gullies down to the local streams. By taking flow measurements and grab samples from different dirt road gullies during several storm events, the sediment yield from dirt roads was analyzed through the TSS analysis. By summarizing the daily flow rate within a road drainage way, its TSS concentration, and the amount of runoff contributing from this roadway, a relationship could be derived to represent the amount of sediment yield (Qs) for an estimated storm water runoff (Qw) amount.

Figure C.25. Photo of instream stream from dirt road sources on Montgomery Fork after a rain event.

The AnnAGNPS model uses an exponential relationship between Qs and Qw to provide an amount of sediment being contributed from a flow cell in addition to the amount generated from the defined dominant land use and soil type (Qs & Qw units: m^3/day). From a small set of different grab samples from dirt roads from different subwatersheds, the following equation was derived to represent all the dirt roads in each subwatershed of the New River area with the classical gully command in the AnnAGNPS model (Figure C.26).

$$Qs = 01.0\ Qw^{0.67}$$

Note that the exponential relationship for the sediment yield produced as a function of from dirt roads was estimated on only seven sets of grab samples for a variety of soil and limestone gravel based roads with different degrees of usage. Therefore, this set of data is very approximate and just provides a general means of accounting for the un-paved road systems within the sediment budget of the New River subwatersheds.

From the relationship established with the amount of runoff from a dirt road area and the amount of sediment yield produced, the AnnAGNPS classical gully command was used to identify each cell in each sub-watershed that had a large road drainage area. Since some of the flow cells only contained a few small pieces of dirt roads, the flow cells that had a dirt road network of 5% of the cell's total area, or 0.5 hectares of area, were selected for the classical gully command. A summary of the number of flow cells that were identified to have dirt roads in each subwatershed for the AnnAGNPS model can be seen in Table C.3.

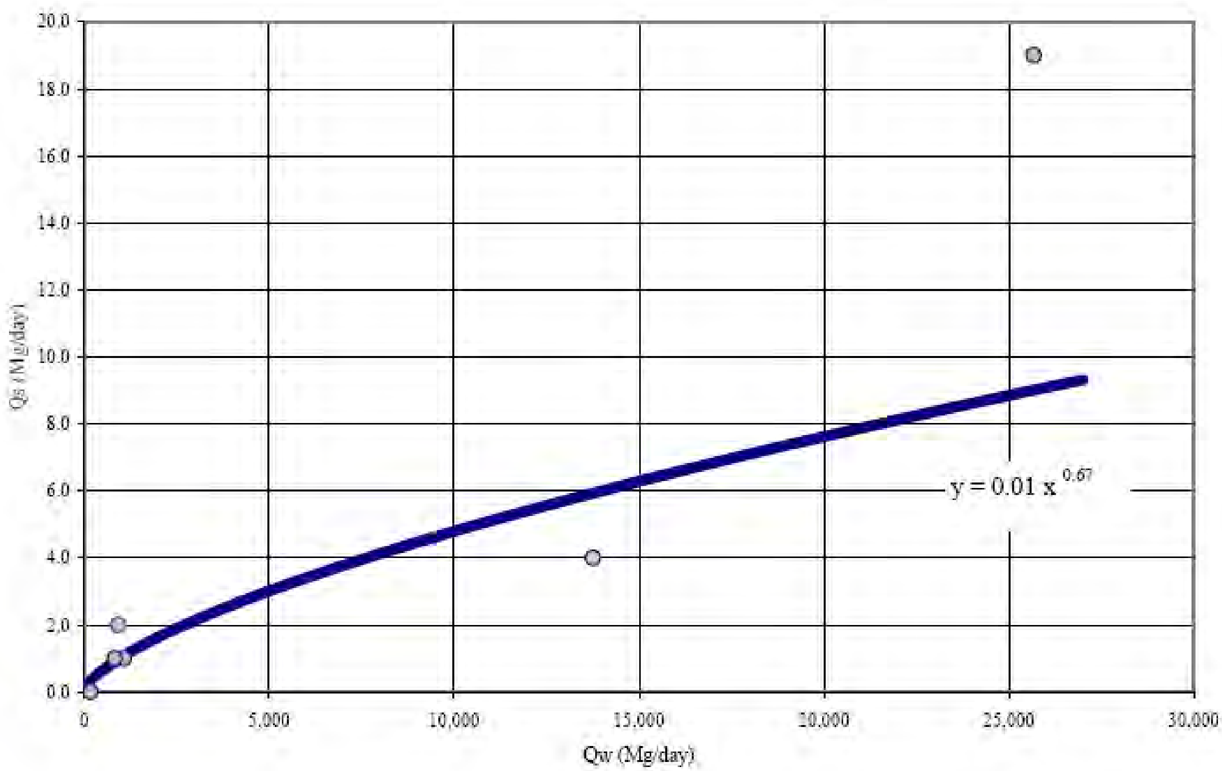


Figure C.26. Relationship for sediment erosion for dirt road sources in the New River basin.

Table C.3. Summary of AnnAGNPS flow cells with dirt roads.

Watershed	**Number of Cells with Dirt Roads** (---)	**Total Cell Area with Dirt Roads** (ha)	**Total Watershed Area** (ha)	**Percent of Watershed with Dirt Roads** (%)
Brimstone Creek	16	4.56	2,181	0.21%
Ligias Fork	56	63.81	5,218	1.22%
Montgomery Fork	57	42.68	5,748	0.74%
Smokey Creek	77	68.94	7,300	0.94%

After the dirt roads within each sub-watershed were implemented into the AnnAGNPS pollutant loading model, the next objective was to calibrate the RUSLE C and P factors for the different land uses found. From a series of trial and error analyses in the range of common text book values and previous AnnAGNPS modeling studies, the RUSLE C and P factors were adjusted for a variety of different land use features until a satisfactory sediment yield was produced to provide a similar value to that measured in the field. A summary of the RUSLE C and P factors used for a variety of different land use applications for each subwatershed can be seen in Tables C.4 and C.5. The RUSLE C-factors for root mass, cover ratio, rainfall height and residue cover are described in detail in Renard *et al*. (1997).

Table C.4. Non-crop data values used to estimate RUSLE C-factor.

Non-Crop ID	Non-Crop Description	Annual Root Mass (kg/ha)	Annual Cover Ratio (0-1)	Annual Rain Fall Height (m)	Surface Residue Cover (%)
2	Developed Open Space	0	1.00	0.00	0
3	Developed, Low Intensity	3000	0.80	0.03	40
4	Developed, Medium Intensity	2000	0.90	0.03	40
5	Developed, High Intensity	1000	0.90	0.03	40
6	Barren Land (Rock/Sand/Clay)	0	0.00	0.00	0
7	Deciduous Forest	7000	0.95	4.57	85
8	Evergreen Forest	6500	0.95	4.57	80
9	Mixed Forest	6750	0.95	4.57	80
10	Shrub/Scrub	6500	0.95	1.22	60
11	Grassland/Herbaceous	3000	0.90	0.03	80
12	Pasture/Hay	3500	0.95	0.03	80
13	Cultivated Crops	4000	0.80	0.03	50
14	Woody Wetlands	6500	0.95	4.57	80
101	25% Logged	1700	0.70	4.57	45
102	50% Logged	1200	0.45	4.57	40
103	75% Logged	800	0.30	4.57	20
104	100% Logged	350	0.05	4.57	10
201	Active Surface Mining	250	0.20	0.03	5
202	Abandoned Surface Mining	900	0.25	1.00	15
301	Dirt Roads	0	0.00	0.00	0

Once several suspended sediment samples were captured in the outlet of each sub-watershed, the TSS value for a given time and day were multiplied by the total measured runoff to estimate a suspended solids content that would be comparable to the AnnAGNPS's daily sediment yield value. To check the acceptability of TSS measurements found for this study, in each of the four subwatersheds, the suspended sediment samples taken by the USGS in the New River Basin area were used to compare with the samples collected by The University of Tennessee, Knoxville. From Table C.6, the TSS results taken by the USGS at two different gauging stations located on the New River stream for 2006 through 2008 contain similar concentrations to the TSS measurements taken at the four subwatersheds used in this study. Table C.6 is presented to show that the TSS concentrations determined for this study are in agreement with typical suspended sediment concentrations currently found by others in the New River Basin. The suspended sediment data collected by the USGS for the two different gauging stations located on the New River was provided to the OSM on February 28, 2008 from the Tennessee Water Science Center at the Knoxville, TN Field Office.

Tables C.7 through C.10 summarize the TSS analysis as well as the multiple measured versus predicted suspended solids concentration by the AnnAGNPS model after being calibrated. As can be seen from many of the discrepancies between the measured and predicted suspended solids contents, it should be noted that many of the measured TSS samples were not collected

Table C.5. Management field data values used in the AnnAGNPS model.

Management Field ID	Land use Description	Field Land use Type	Percent Rock Cover (%)	RUSLE Sub P-Factor (0-1)	Interrill Erosion Code (1-4)
2	Developed Open Space	URBAN	0	1	2
3	Developed, Low Intensity	URBAN	30	1	3
4	Developed, Medium Intensity	URBAN	55	1	3
5	Developed, High Intensity	URBAN	80	1	3
6	Barren Land (Rock/Sand/Clay)	URBAN	50	1	2
7	Deciduous Forest	FOREST	25	1	4
8	Evergreen Forest	FOREST	25	1	4
9	Mixed Forest	FOREST	25	1	4
10	Shrub/Scrub	FOREST	25	1	4
11	Grassland/Herbaceous	PASTURE	20	1	3
12	Pasture/Hay	PASTURE	20	1	3
13	Cultivated Crops	PASTURE	15	1	2
14	Woody Wetlands	FOREST	25	1	4
101	25% Logged	FOREST	25	1	4
102	50% Logged	FOREST	25	1	4
103	75% Logged	FOREST	25	1	4
104	100% Logged	FOREST	25	1	4
201	Active Surface Mining	URBAN	85	1	4
202	Abandoned Surface Mining	URBAN	50	1	4
301	Dirt Roads	URBAN	80	1	4

Table C.6. Comparison of USGS TSS samples per study site.

Agency	Sample Site	Number of Samples Taken	Sample Period	Average TSS (mg/L)	Minimum TSS (mg/L)	Maximum TSS (mg/L)
USGS	New River at New River USGS Gauging Station	22	2006-2008	128	1	434
USGS	New River at Cordell Bridge USGS Gauging Station	22	2006-2008	197	1	624
UT	Brimstone Creek	9	2008	38	6	87
UT	Ligias Fork	9	2008	159	17	454
UT	Montgomery Fork	8	2008	143	9	564
UT	Smokey Creek	8	2008	120	1	571

USGS: TSS samples taken independent of this study by U.S. Geological Survey on the New River
UT: TSS samples taken for this study by The University of Tennessee

Table C.7. Summary of measured and modeled suspended sediment for Brimstone Creek.

Watershed:	Brimstone Creek @ BSC-1			Drainage Area (m^2):		21,810,000	
Sample No. (---)	Sample Date (mm/dd/yyyy)	Measured Suspended Solids (mg/L)	Flow Rate during Sampling (m^3/sec)	Measured Peak Flow (m^3/sec)	Measured Total Runoff (m^3)	Measured Suspended Solids (Mg/day)	Predicted Suspended Solids (Mg/day)
1	1/10/2008	78.40	1.00	11.74	360,000	28.2	38.0
2	1/11/2008	55.25	4.50	9.84	360,000	19.9	0.3
3	1/26/2008	0.00	0.27	0.27	0	0.0	0.0
4	1/29/2008	3.50	0.25	0.29	600	0.0	0.2
5	1/30/2008	5.90	0.45	0.59	50,000	0.3	0.0
6	2/1/2008	8.67	0.31	0.59	32,000	0.3	0.0
7	2/6/2008	87.33	4.54	4.77	180,000	15.7	23.6
8	2/12/2008	8.00	0.33	0.36	100	0.0	0.9
9	2/13/2008	6.00	1.07	1.23	41,000	0.2	0.0
10	2/21/2008	8.00	2.76	2.83	144,000	1.2	0.0
11	2/22/2008	11.00	2.72	2.95	118,000	1.3	0.0
12	3/4/2008	78.00	2.91	5.65	130,000	10.1	104.8

Table C.8. Summary of measured and modeled suspended sediment for Ligias Fork.

Watershed:	Ligias Fork @ LF-1			Drainage Area (m^2):		52,194,800	
Sample No. (---)	Sample Date (mm/dd/yyyy)	Measured Suspended Solids (mg/L)	Flow Rate during Sampling (m^3/sec)	Measured Peak Flow (m^3/sec)	Measured Total Runoff (m^3)	Measured Suspended Solids (Mg/day)	Predicted Suspended Solids (Mg/day)
1	1/10/2008	58.05	1.40	4.49	660,000	38.3	149.1
2	1/11/2008	32.25	1.63	4.38	1,550,000	50.0	1.2
3	1/30/2008	17.40	1.22	1.51	50,000	0.9	0.0
4	2/1/2008	252.00	1.75	1.82	70,000	17.6	3.4
5	2/6/2008	342.00	3.05	3.08	1,090,000	372.8	57.3
6	2/12/2008	28.00	0.88	0.96	1,400	0.0	1.7
7	2/13/2008	454.00	1.01	2.05	79,000	35.9	0.0
8	2/21/2008	16.00	1.17	1.31	0	0.0	0.0
9	2/22/2008	18.00	1.03	1.11	1,700	0.0	0.6
10	3/4/2008	230.00	12.75	50.73	1,450,000	333.5	159.9

during peak flow and peak suspended sediment conditions in most the streams, so it is assumed that some of the measured suspended solids concentrations are considerably lower than that of actual concentrations. It is also interesting to note that a storm that enters into a watershed from the late evening hours to the early morning hours of the next day creates some complications with the AnnAGNPS model. Looking at January 10 and 11, the measured suspended sediment concentrations summarized together are close to the value predicted by AnnAGNPS on just January 10th, since that is the day when the largest portion of the storm entered into the subwatersheds. The model did not know that this January 10th storm passed through during the late evening hours and carried over to the early morning hours of the next day; it just knew that

Table C.9. Summary of measured and modeled suspended sediment for Montgomery Fork.

Watershed:	Montgomery Fork @ MFCS-1			Drainage Area (m^2):		57,483,900	
Sample No. (---)	Sample Date (mm/dd/yyyy)	Measured Suspended Solids (mg/L)	Flow Rate during Sampling (m^3/sec)	Measured Peak Flow (m^3/sec)	Measured Total Runoff (m^3)	Measured Suspended Solids (Mg/day)	Predicted Suspended Solids (Mg/day)
1	1/10/2008	162.90	2.08	13.92	600,000	97.7	138.2
2	1/11/2008	34.50	5.98	12.01	670,000	23.1	0.0
3	1/26/2008	1.00	0.85	0.85	0	0.0	0.0
4	1/30/2008	9.07	2.34	2.54	150,000	1.4	0.0
5	2/1/2008	114.80	1.24	2.21	70,000	8.0	15.9
6	2/6/2008	564.00	7.37	8.25	310,000	174.8	113.8
7	2/12/2008	10.00	1.47	1.57	700	0.0	12.9
8	2/13/2008	66.00	2.20	3.11	115,000	7.6	0.0
9	2/21/2008	26.00	1.98	2.14	0	0.0	0.0
10	2/22/2008	49.00	1.77	2.14	10,000	0.5	1.2
11	3/4/2008	142.00	3.11	9.00	170,000	24.1	293.9

Table C.10. Summary of measured and modeled suspended sediment for Smokey Creek.

Watershed:	Smokey Creek @ SC-1			Drainage Area (m^2):		73,015,200	
Sample No. (---)	Sample Date (mm/dd/yyyy)	Measured Suspended Solids (mg/L)	Flow Rate during Sampling (m^3/sec)	Measured Peak Flow (m^3/sec)	Measured Total Runoff (m^3)	Measured Suspended Solids (Mg/day)	Predicted Suspended Solids (Mg/day)
1	1/10/2008	150.30	3.95	16.55	800,000	120.2	689.2
2	1/11/2008	134.25	8.96	13.82	1,000,000	134.2	2.4
3	1/26/2008	1.00	0.59	0.62	7,000	0.0	0.0
4	1/30/2008	32.00	0.82	0.97	30,000	1.0	0.0
5	2/1/2008	117.60	1.73	2.14	90,000	10.6	13.9
6	2/6/2008	570.67	10.55	10.95	675,000	385.2	418.0
7	2/12/2008	28.00	1.14	1.28	1,600	0.0	12.9
8	2/13/2008	19.00	3.91	3.91	120,000	2.3	0.0
9	2/21/2008	6.00	1.85	2.08	0	0.0	0.0
10	2/22/2008	8.00	1.71	1.96	9,000	0.1	3.0
11	3/4/2008	143.00	11.26	12.63	500,000	71.5	852.3

on January 10th, there was some amount of precipitation that followed a Type II distribution. Therefore, the model not appropriately reacting to an over-night storm is due to the model's daily time step computations as well as the same precipitation distribution type (from the NRCS TR-55 runoff computations) based on the location of the study.

To visually understand the measured versus predicted suspended sediment values for each sub-watershed, see Figures C.27 through C.30. It must be noted that only a few suspended sediment samples were measured in the time interval shown on the figures. Therefore, the measured suspended sediment values are not continuous in time, so there are several increases in suspended sediment shown by AnnAGNPS that were not measured in the field. To help provide insight on when the measured suspended sediment samples were taken, a numerical concentration value is shown above the measured bars.

From using the outlet of each subwatershed to calibrate the actual to predicted runoff and sediment yield values naturally occurring, each RGA point where fine bed sediment deposits were collected in the streams would be set as a different watershed outlet to provide an annual average sediment yield value in terms of clays, silts, and sands. For each sample site where suspended sediment was collected, the AnnAGNPS program would only consider the area and its contents of each subwatershed draining into that point of interest. Since the fine streambed sediment deposits were collected during the spring, summer, and fall of 2007, the AnnAGNPS model provided the sediment yield on average annual values of years 2006 and 2007 at each deposition point.

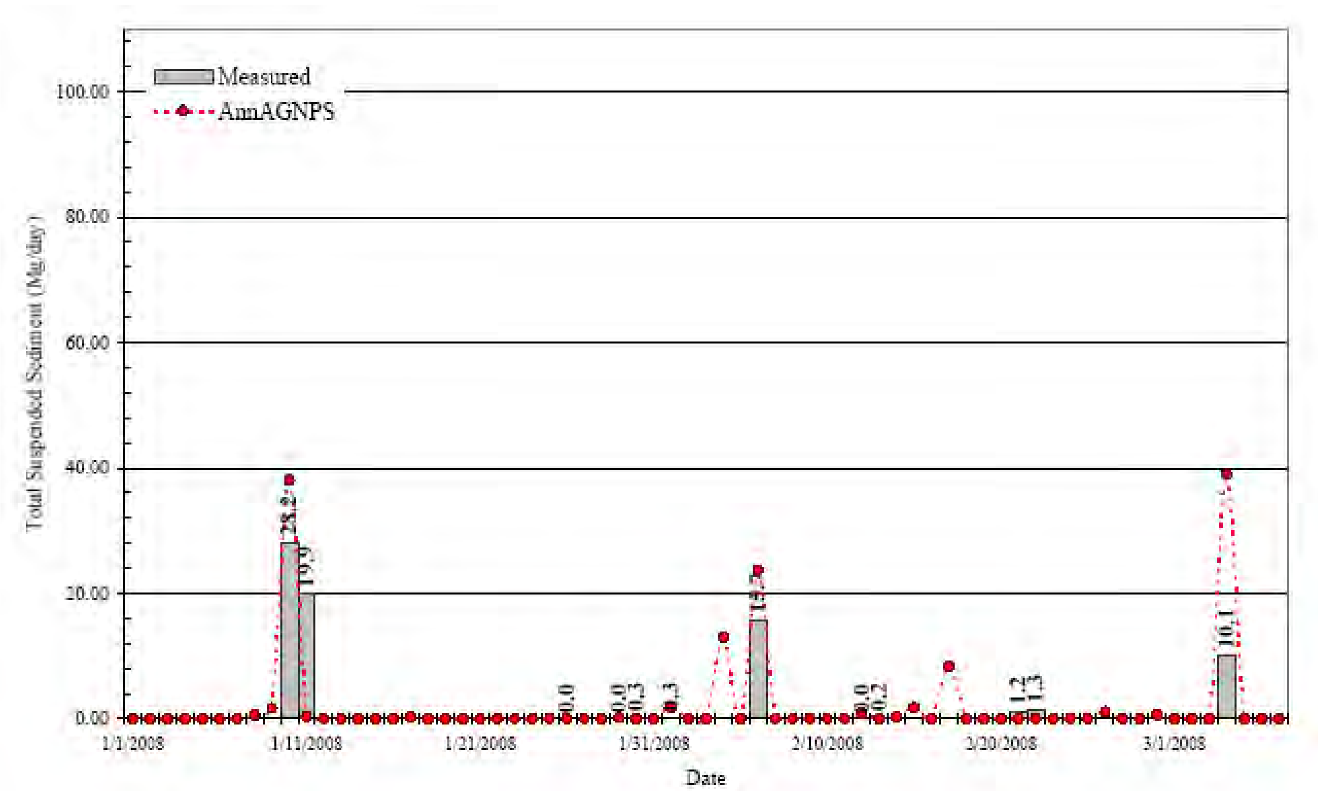


Figure C.27. Comparisons of measured and modeled suspended sediment for Brimstone Creek.

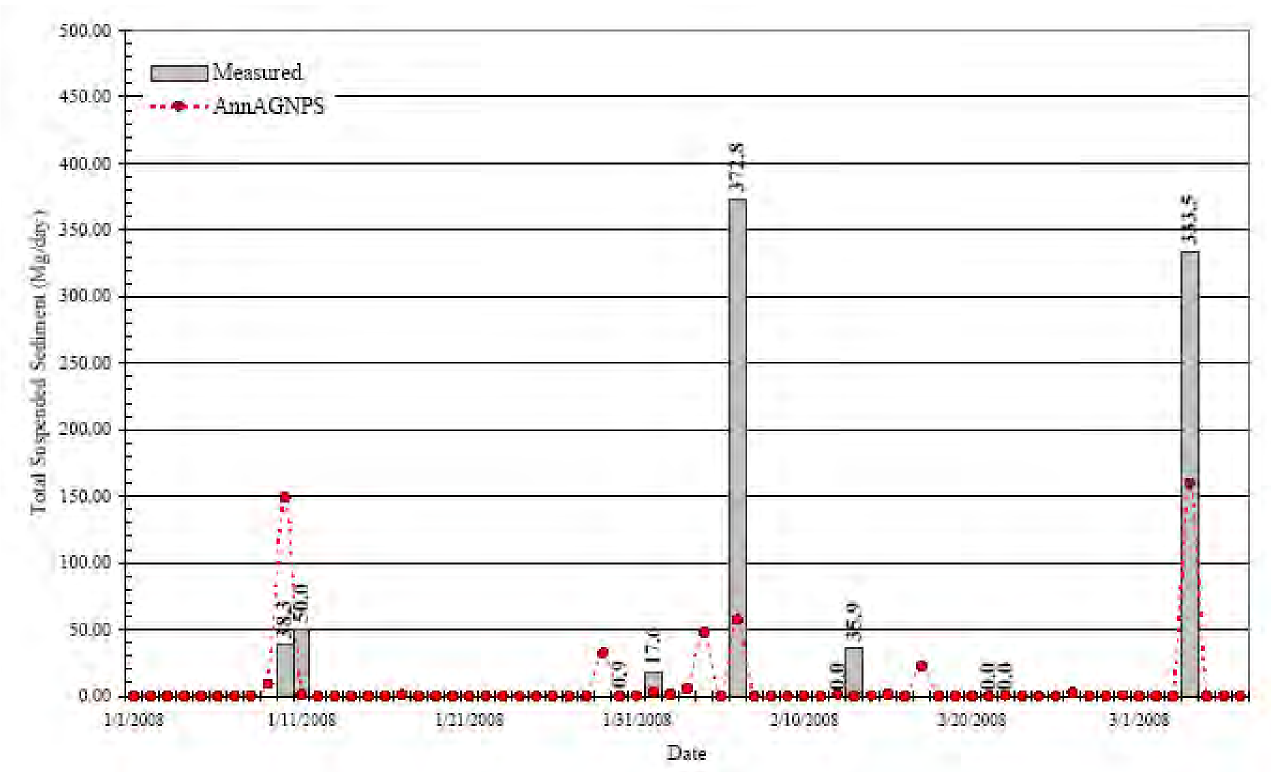


Figure C.28. Comparisons of measured and modeled suspended sediment for Ligias Fork.

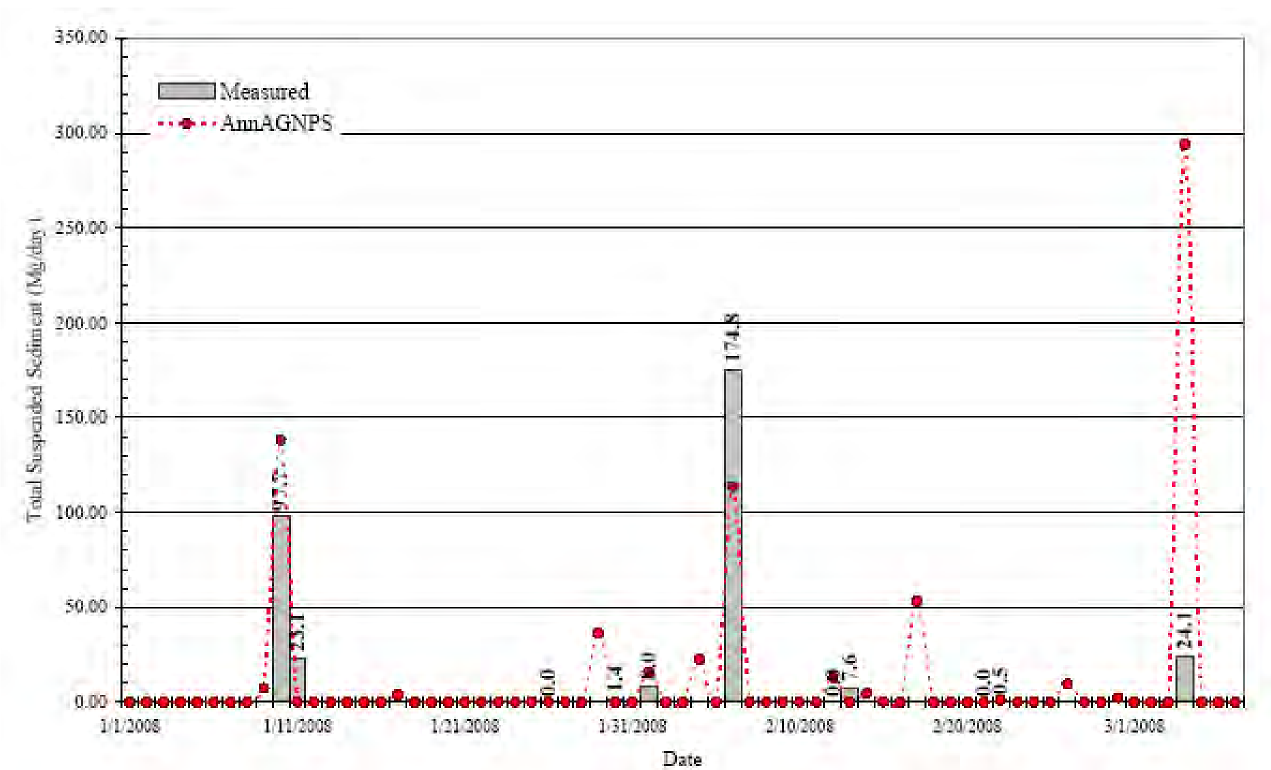


Figure C.29. Comparisons of measured and modeled suspended sediment for Montgomery Fork.

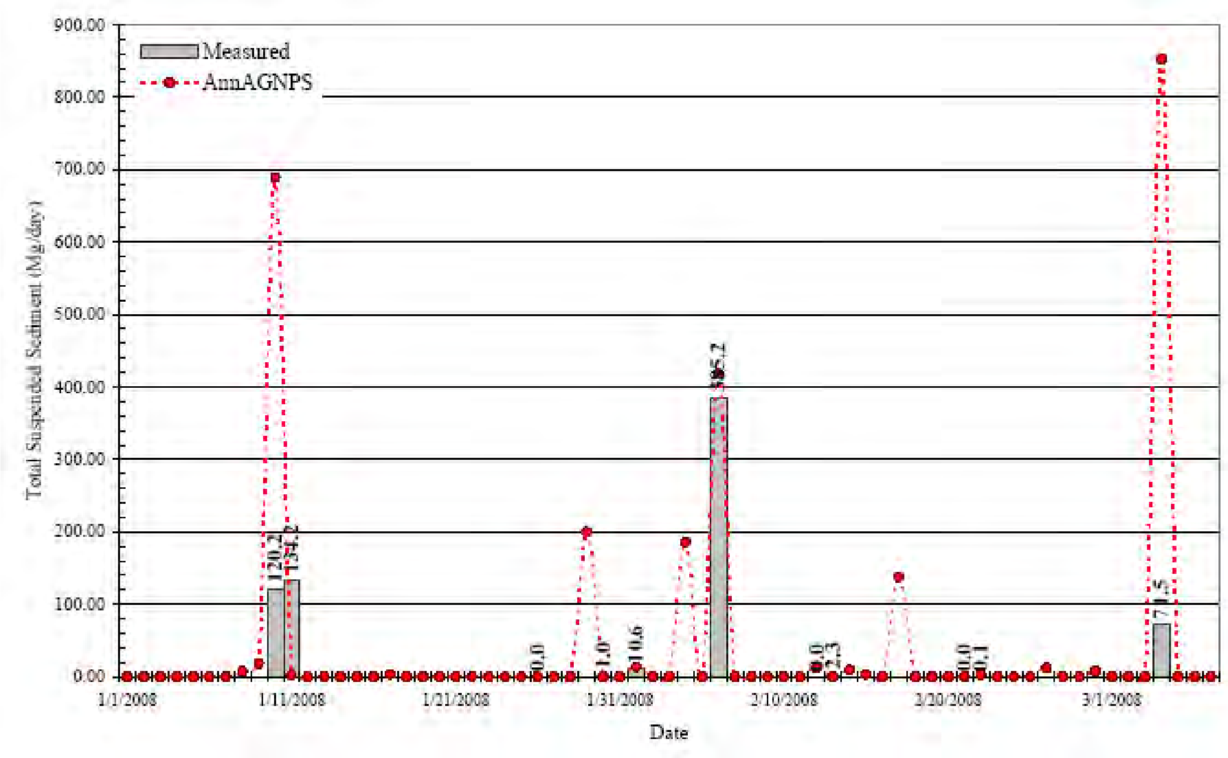


Figure C.30. Comparisons of measured and modeled suspended sediment for Smokey Creek.

APPENDIX D:

ConCEPTS Model: Data Inputs

NOTES

Note 1: CS = cross-section
Note2: If one size fraction is identified in sediment distribution - fraction is assumed as bedrock.
Note 3: 'Sediment' is bed material and 'soil' is bank material. Soil properties from banks were a reach composite as a representative estimate for the bank material.

Table D.1. Brimstone pebble count data at cross-section X6.

Number	Dia. (mm)	Dia. (mm)	Dia. (mm)	Dia. (mm)
1	90	90	230	65
2	60	70	50	140
3	50	120	70	90
4	90	150	75	65
5	85	155	110	100
6	80	80	60	100
7	40	110	150	80
8	60	50	140	50
9	50	130	65	140
10	100	20	70	60
11	75	30	130	70
12	165	40	105	200
13	135	50	130	50
14	150	200	130	70
15	70	70	140	30
16	150	90	75	130
17	80	80	140	70
18	40	220	110	90
19	80	100	170	40
20	65	220	30	110
21	200	110	65	100
22	80	250	130	80
23	100	30	75	70
24	90	100	250	100
25	115	60	140	200
Pebble Count Performed at X6				

Table D.2. Brimstone pebble count summary for cross-section X6.

Minimum Dia. (mm)	20
Maximum Dia. (mm)	250
d16 (mm)	50
d50 (mm)	90
d84 (mm)	140
d90 (mm)	165

Table D.3. Brimstone sediment grain size distribution for cross-section X6. Units in mm for sediment ranges.

	Upper	Lower Bound	%	Cummulative %
Total clay	0.002	0.001	0	0
Very fine silt	0.004	0.002	0	0
Fine silt	0.008	0.004	0	0
Medium silt	0.016	0.008	0	0
Coarse silt	0.031	0.016	0	0
Very coarse silt	0.063	0.031	0	0
Very fine sand	0.125	0.063	0	0
Fine sand	0.25	0.125	0	0
Medium sand	0.5	0.25	0	0
Coarse sand	1	0.5	0	0
Very coarse sand	2	1	0	0
Very fine gravel	4	2	0	0
Fine gravel	8	4	0	0
Medium gravel	16	8	0	0
Coarse cravel	32	16	5	5
Very coarse gravel	64	32	16	21
Small cobbles	128	64	79	100

Table D.4. Brimstone sediment profile. Units in m.

Name:	SED Profile		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	SED	0.0	100.0

Table D.5. Brimstone soil definition. Distributions expressed as cumulative percentages.

Grain size distribution	
Total clay	1.28
Very fine silt	2.51
Fine silt	2.86
Medium silt	6.20
Coarse silt	7.79
Very coarse silt	9.37
Very fine sand	39.68
Fine sand	66.57
Medium sand	82.78
Coarse sand	82.78
Very coarse sand	90.63
Very fine gravel	92.47
Fine gravel	96.67
Medium gravel	100.00
Coarse cravel	100.00
Very coarse gravel	100.00
Small cobbles	100.00

Table D.6. Brimstone left bank soil profile. Depth units in m.

Name:	Left Bank		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	SOIL	0.0	100.0

Table D.7. Brimstone cross section X8. Units in m.

Geometry				
ID	Station	Elevation	Name:	X8(Downstream)
			River station:	0.8238
1	0.00	35.00	**Indices of the toe and top of the bank**	
2	8.00	33.00	Top of left bank:	5
3	15.00	31.75	Toe of left bank:	17
4	20.00	31.50	Top of right bank:	34
5	24.00	31.00	Toe of right bank:	31
6	25.00	30.37	**Groundwater table**	
7	26.22	30.24	Left bank:	0.0
8	27.44	30.15	Right bank:	0.0
9	28.35	29.95	**Bedrock elevation**	
10	29.57	29.89	Bedrock elevation:	0.0
11	30.79	29.88	**Boundary roughness**	
12	31.40	29.87	Left floodplain:	0.05
13	32.01	29.83	Left bank:	0.04
14	32.62	29.82	Streambed:	0.035
15	33.23	29.81	Right bank:	0.04
16	33.84	29.80	Right floodplain:	0.05
17	34.45	29.52	**Boundary materials**	
18	35.06	29.51	Bed sediment profile:	SED Profile
19	35.67	29.50	Left bank soil profile:	Left Bank
20	36.28	29.49	Right bank soil profile:	Right Bank
21	36.89	29.48		
22	37.50	29.47		
23	38.11	29.46		
24	38.72	29.45		
25	39.33	29.45		
26	39.94	29.42		
27	40.55	29.31		
28	41.16	29.30		
29	41.77	29.27		
30	42.38	29.37		
31	42.99	29.41		
32	43.60	29.79		
33	44.21	30.69		
34	44.82	30.83		
35	50.00	31.00		
36	53.00	33.00		
37	60.00	35.00		

Table D.8. Brimstone cross section X7. Units in m.

Geometry				
ID	Station	Elevation	River station:	0.6957
1	-200.00	37.50	**Indices of the toe and top of the bank**	
2	-100.00	34.00	Top of left bank:	4
3	0.00	33.71	Toe of left bank:	7
4	21.34	32.49	Top of right bank:	36
5	21.35	30.96	Toe of right bank:	24
6	21.95	30.55	**Groundwater table**	
7	22.56	30.39	Left bank:	0.0
8	23.17	30.36	Right bank:	0.0
9	23.78	30.35	**Bedrock elevation**	
10	24.39	30.34	Bedrock elevation:	0.0
11	25.00	30.31	**Boundary roughness**	
12	25.61	30.24	Left floodplain:	0.05
13	26.22	30.21	Left bank:	0.04
14	26.83	30.24	Streambed:	0.035
15	27.44	30.24	Right bank:	0.04
16	28.05	30.33	Right floodplain:	0.05
17	28.66	30.34	**Boundary materials**	
18	29.27	30.37	Bed sediment profile:	SED Profile
19	29.88	30.40	Left bank soil profile:	Left Bank
20	30.49	30.41	Right bank soil profile:	Right Bank
21	31.10	30.42		
22	31.71	30.43		
23	32.32	30.44		
24	32.93	30.45		
25	33.84	30.50		
26	34.76	30.63		
27	35.37	30.68		
28	35.98	30.82		
29	36.59	30.88		
30	37.20	31.00		
31	37.81	31.04		
32	38.42	31.06		
33	38.72	31.53		
34	39.64	31.54		
35	41.16	31.69		
36	42.68	31.70		
37	73.17	32.01		
38	76.22	35.06		
39	78.00	35.50		
40	85.00	36.00		
41	100.00	37.50		

Table D.9. Brimstone cross section X6. Units in m.

Geometry				
ID	Station	Elevation	Name:	X6
			River station:	0.5329
1	-3.00	43.00	**Indices of the toe and top of the bank**	
2	0.00	41.00	Top of left bank:	2
3	0.46	32.63	Toe of left bank:	3
4	2.90	32.25	Top of right bank:	35
5	3.81	31.89	Toe of right bank:	33
6	4.42	31.63	**Groundwater table**	
7	5.03	31.57	Left bank:	0.0
8	5.64	31.51	Right bank:	0.0
9	6.25	31.45	**Bedrock elevation**	
10	6.86	31.43	Bedrock elevation:	0.0
11	7.47	31.37	**Boundary roughness**	
12	8.08	31.36	Left floodplain:	0.05
13	8.69	31.35	Left bank:	0.04
14	9.30	31.34	Streambed:	0.035
15	9.91	31.30	Right bank:	0.04
16	10.52	31.29	Right floodplain:	0.05
17	11.13	31.19	**Boundary materials**	
18	11.74	31.20	Bed sediment profile:	SED Profile
19	12.35	31.21	Left bank soil profile:	Left Bank
20	12.96	31.22	Right bank soil profile:	Right Bank
21	13.57	31.27		
22	14.18	31.31		
23	14.79	31.32		
24	15.40	31.34		
25	15.70	31.54		
26	16.31	31.65		
27	16.92	31.75		
28	17.53	31.85		
29	18.14	31.89		
30	19.06	32.08		
31	19.67	32.19		
32	20.27	32.37		
33	20.88	32.61		
34	22.87	33.37		
35	25.92	33.54		
36	28.96	35.06		
37	32.01	35.98		
38	35.06	37.50		
39	41.16	39.02		
40	44.21	41.00		
41	45.00	41.25		
42	47.00	43.00		

Table D.10. Brimstone cross section X5. Units in m.

Geometry				
ID	Station	Elevation	Name:	X5
			River station:	0.4558
1	0.00	37	**Indices of the toe and top of the bank**	
2	4.00	34.25	Top of left bank:	3
3	7.66	34.05	Toe of left bank:	4
4	8.57	31.92	Top of right bank:	29
5	9.18	31.82	Toe of right bank:	20
6	9.79	31.70	**Groundwater table**	
7	10.40	31.68	Left bank:	0.0
8	11.01	31.66	Right bank:	0.0
9	11.62	31.64	**Bedrock elevation**	
10	12.23	31.62	Bedrock elevation:	0.0
11	12.84	31.60	**Boundary roughness**	
12	13.45	31.58	Left floodplain:	0.05
13	14.06	31.53	Left bank:	0.04
14	14.67	31.51	Streambed:	0.035
15	15.28	31.47	Right bank:	0.04
16	15.89	31.45	Right floodplain:	0.05
17	16.50	31.44	**Boundary materials**	
18	17.11	31.40	Bed sediment profile:	SED Profile
19	17.72	31.45	Left bank soil profile:	Left Bank
20	18.33	31.54	Right bank soil profile:	Right Bank
21	18.63	31.85		
22	19.55	32.04		
23	21.07	32.25		
24	22.60	32.30		
25	24.12	32.42		
26	25.65	32.49		
27	29.00	32.80		
28	32.05	32.98		
29	33.57	33.10		
30	34.18	33.44		
31	34.49	33.90		
32	37.00	37.00		

Table D.11. Brimstone cross section X4. Units in m.

Geometry				
ID	Station	Elevation	Name:	X4
1	0.00	37.00	River station:	0.4101
2	2.50	36.00	**Indices of the toe and top of the bank**	
3	12.50	35.00	Top of left bank:	4
4	17.50	33.54	Toe of left bank:	11
5	20.55	32.93	Top of right bank:	33
6	21.77	32.85	Toe of right bank:	27
7	22.99	32.80	**Groundwater table**	
8	26.04	32.78	Left bank:	0.0
9	26.65	32.60	Right bank:	0.0
10	27.26	32.53	**Bedrock elevation**	
11	27.56	32.25	Bedrock elevation:	0.0
12	28.17	32.20	**Boundary roughness**	
13	28.78	32.19	Left floodplain:	0.05
14	29.39	32.18	Left bank:	0.04
15	30.00	32.17	Streambed:	0.035
16	30.61	32.16	Right bank:	0.04
17	31.22	32.15	Right floodplain:	0.05
18	31.83	32.14	**Boundary materials**	
19	32.44	32.05	Bed sediment profile:	SED Profile
20	33.05	32.03	Left bank soil profile:	Left Bank
21	33.66	31.95	Right bank soil profile:	Right Bank
22	34.27	31.98		
23	34.88	32.05		
24	35.49	32.08		
25	36.10	32.10		
26	36.71	32.15		
27	37.32	32.16		
28	37.62	32.42		
29	38.23	32.49		
30	38.84	32.64		
31	40.06	32.65		
32	41.28	32.84		
33	41.89	33.24		
34	44.50	35.00		
35	47.50	36.00		
36	62.50	37.00		

Table D.22. Brimstone cross section X3. Units in m.

Geometry				
ID	Station	Elevation	Name:	X3
			River station:	0.2463
1	-8.00	43.00	**Indices of the toe and top of the bank**	
2	-2.00	37.00	Top of left bank:	3
3	0.00	35.25	Toe of left bank:	7
4	2.13	34.25	Top of right bank:	29
5	2.74	33.93	Toe of right bank:	27
6	5.79	33.58	**Groundwater table**	
7	7.01	33.40	Left bank:	0.0
8	7.62	33.39	Right bank:	0.0
9	8.23	33.38	**Bedrock elevation**	
10	8.84	33.37	Bedrock elevation:	0.0
11	9.45	33.36	**Boundary roughness**	
12	10.06	33.35	Left floodplain:	0.05
13	10.67	33.33	Left bank:	0.04
14	11.28	33.30	Streambed:	0.035
15	11.89	33.25	Right bank:	0.04
16	12.50	33.20	Right floodplain:	0.05
17	13.11	33.17	**Boundary materials**	
18	13.72	33.10	Bed sediment profile:	SED Profile
19	14.33	33.06	Left bank soil profile:	Left Bank
20	14.94	32.84	Right bank soil profile:	Right Bank
21	15.55	33.10		
22	16.16	33.12		
23	16.77	33.13		
24	17.38	33.14		
25	18.60	33.15		
26	19.21	33.16		
27	19.82	33.17		
28	20.43	34.52		
29	22.87	35.21		
30	40.00	35.30		
31	50.00	40.00		
32	60.00	43.00		

Table D.13. Brimstone cross section X2. Units in m.

Geometry				
ID	Station	Elevation	Name:	X2
			River station:	0.122
1	-3.00	39.00	**Indices of the toe and top of the bank**	
2	-1.00	37.00	Top of left bank:	3
3	0.00	36.59	Toe of left bank:	4
4	0.61	34.27	Top of right bank:	27
5	1.52	34.20	Toe of right bank:	23
6	3.96	34.11	**Groundwater table**	
7	5.18	34.08	Left bank:	0.0
8	6.40	34.05	Right bank:	0.0
9	7.01	33.93	**Bedrock elevation**	
10	7.62	33.87	Bedrock elevation:	0.0
11	8.23	33.84	**Boundary roughness**	
12	8.84	33.72	Left floodplain:	0.05
13	9.45	33.70	Left bank:	0.04
14	10.06	33.68	Streambed:	0.035
15	10.67	33.58	Right bank:	0.04
16	11.28	33.60	Right floodplain:	0.05
17	11.89	33.61	**Boundary materials**	
18	12.50	33.67	Bed sediment profile:	SED Profile
19	13.11	33.68	Left bank soil profile:	Left Bank
20	13.72	33.69	Right bank soil profile:	Right Bank
21	14.33	33.70		
22	14.94	33.73		
23	15.40	33.85		
24	15.85	34.36		
25	16.46	34.77		
26	17.07	35.23		
27	18.60	35.84		
28	23.17	36.28		
29	25.00	37.00		
30	27.00	39.00		

Table D.14. Brimstone cross section X1. Units in m.

Geometry				
ID	Station	Elevation	Name:	X1(upstream)
			River station:	0.0
1	-70	39.5	**Indices of the toe and top of the bank**	
2	-62	38.75	Top of left bank:	4
3	-60.00	36.75	Toe of left bank:	8
4	2.75	36.50	Top of right bank:	29
5	3.05	36.37	Toe of right bank:	24
6	4.57	35.88	**Groundwater table**	
7	5.18	35.78	Left bank:	0.0
8	5.79	35.60	Right bank:	0.0
9	6.40	35.60	**Bedrock elevation**	
10	7.01	35.51	Bedrock elevation:	0.0
11	7.62	35.46	**Boundary roughness**	
12	8.23	35.38	Left floodplain:	0.05
13	8.84	35.28	Left bank:	0.04
14	9.45	35.26	Streambed:	0.035
15	10.06	35.24	Right bank:	0.04
16	10.67	35.22	Right floodplain:	0.05
17	11.28	35.20	**Boundary materials**	
18	11.89	35.19	Bed sediment profile:	SED Profile
19	13.11	35.16	Left bank soil profile:	Left Bank
20	13.72	35.28	Right bank soil profile:	Right Bank
21	14.33	35.34		
22	14.94	35.38		
23	15.55	35.42		
24	16.16	35.55		
25	16.62	36.05		
26	17.07	36.08		
27	17.68	36.22		
28	18.29	36.42		
29	18.40	36.50		
30	21.34	37.95		
31	23.50	38.75		
32	30.00	39.50		

Table D.15. Brimstone sediment transport options.

Sediment transport options	
% fines for cohesion	100
Downstream grade control	0
Upstream capacity weighting	0
Upstream boundary condition	AnnAGNPS
Class	Fraction
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0
11	0.0
12	100.0
13	100.0
14	100.0
15	100.0
16	100.0
17	100.0

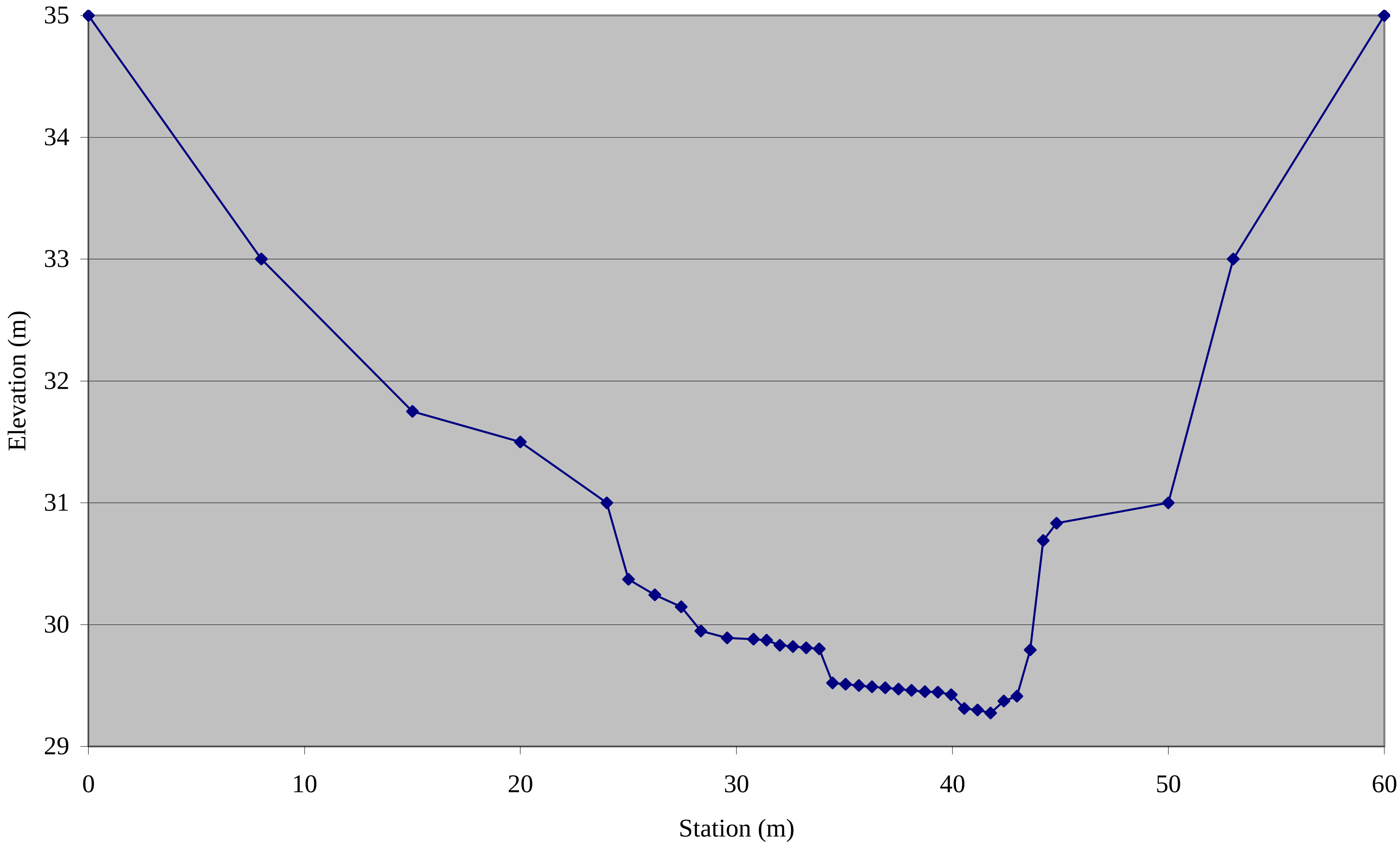


Figure D.1. Brimstone cross section X8.

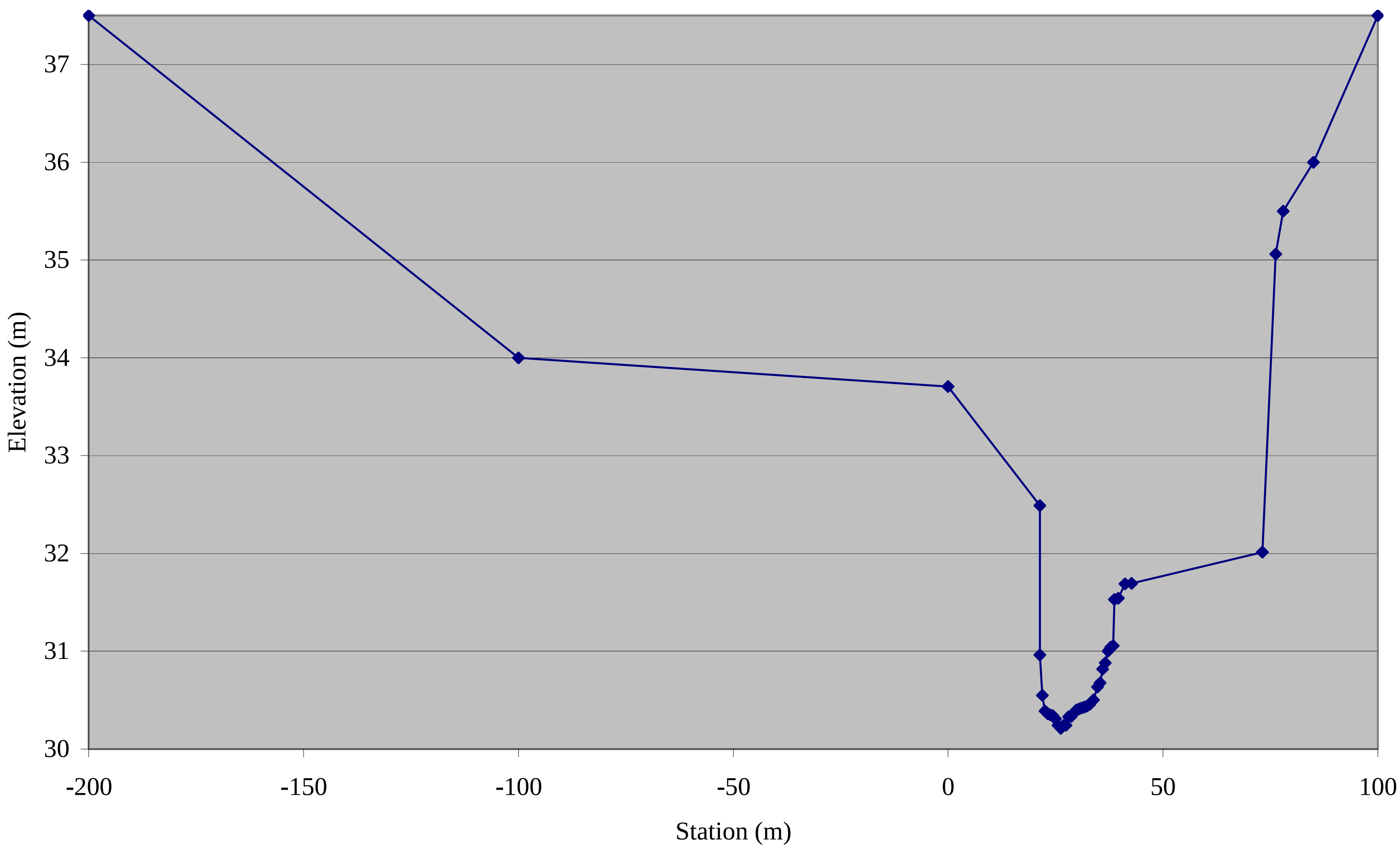


Figure D.2. Brimstone cross section X7.

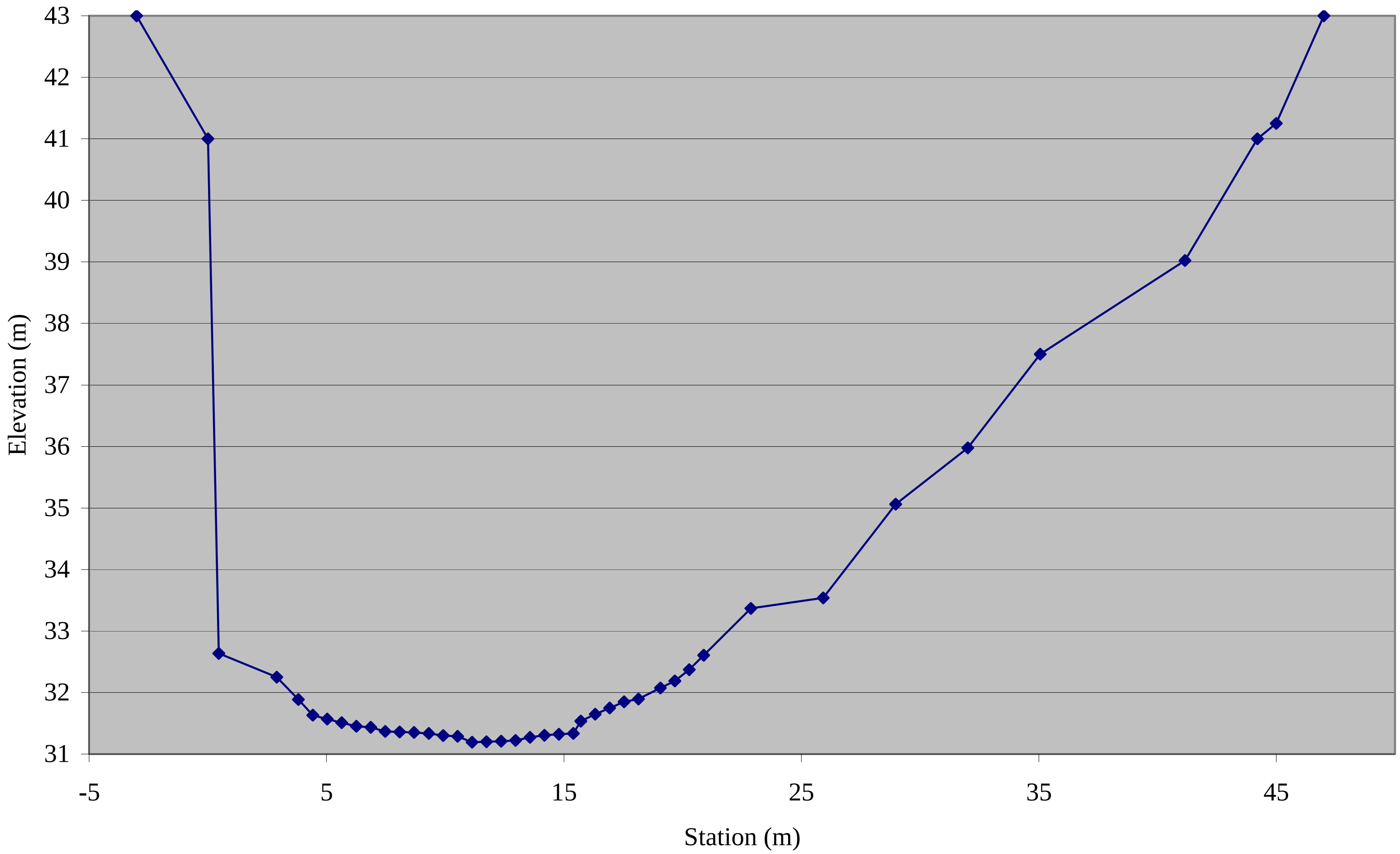


Figure D.3. Brimstone cross section X6.

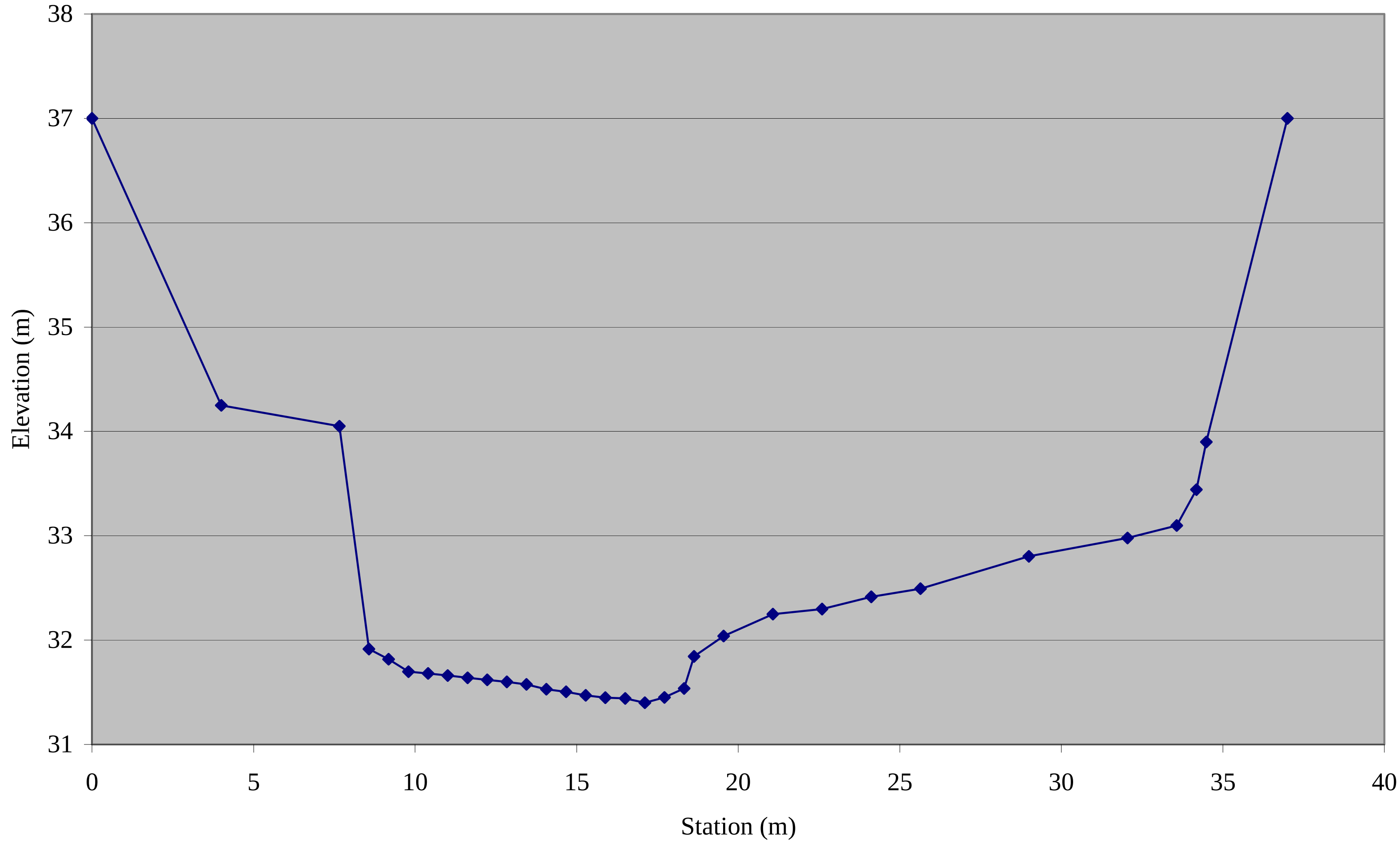


Figure D.4. Brimstone cross section X5.

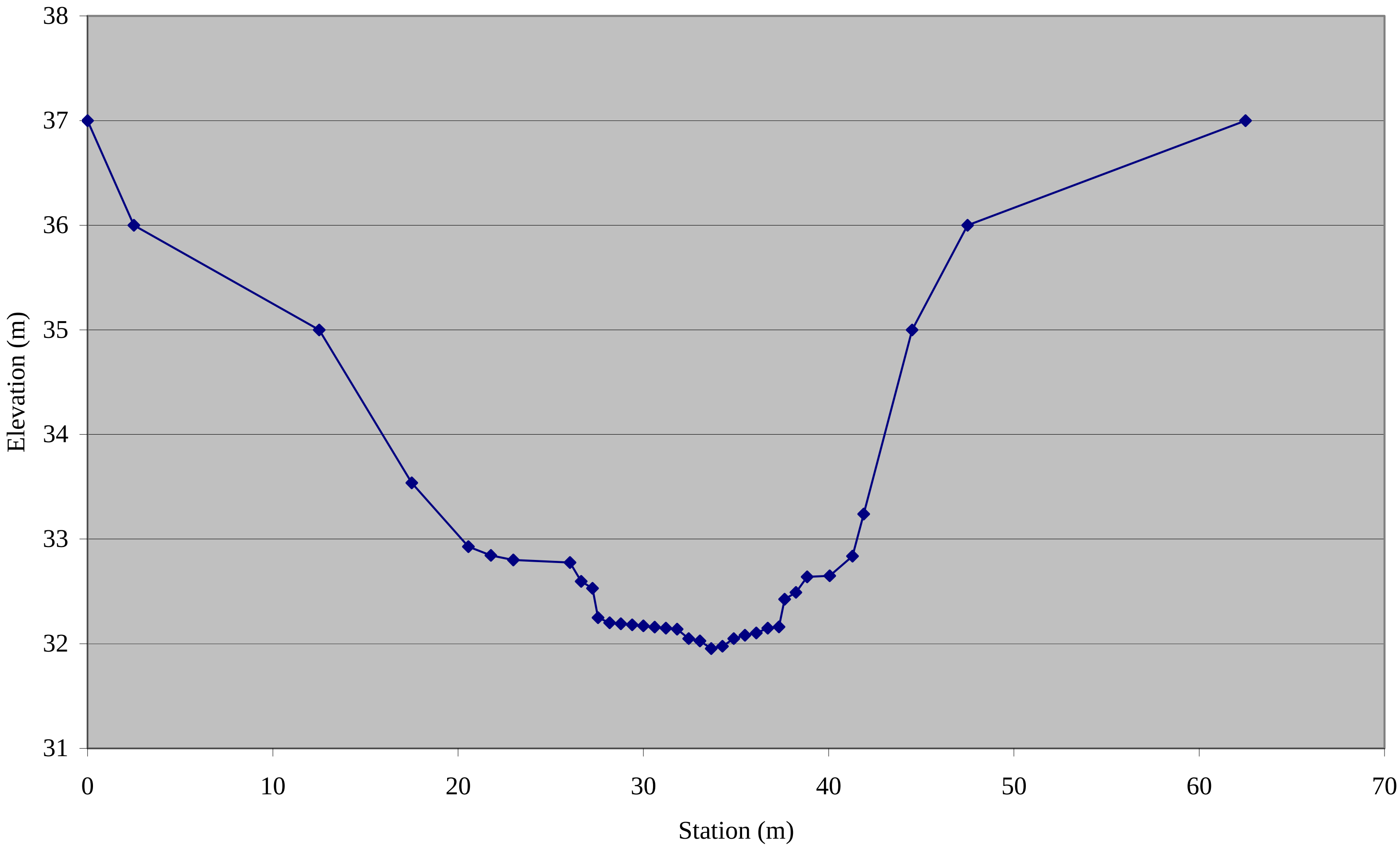


Figure D.5. Brimstone cross section X4.

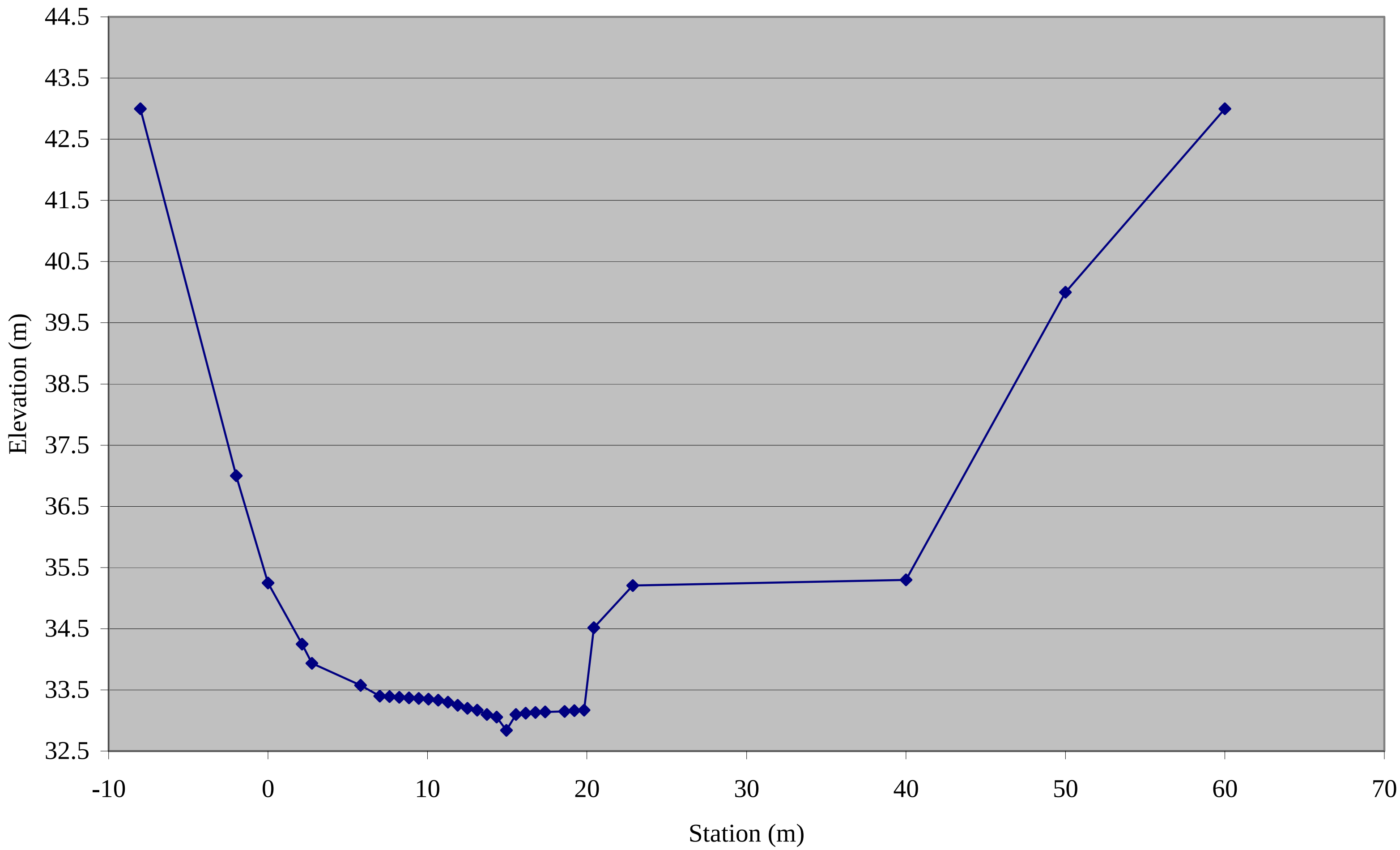


Figure D.6. Brimstone cross section X3.

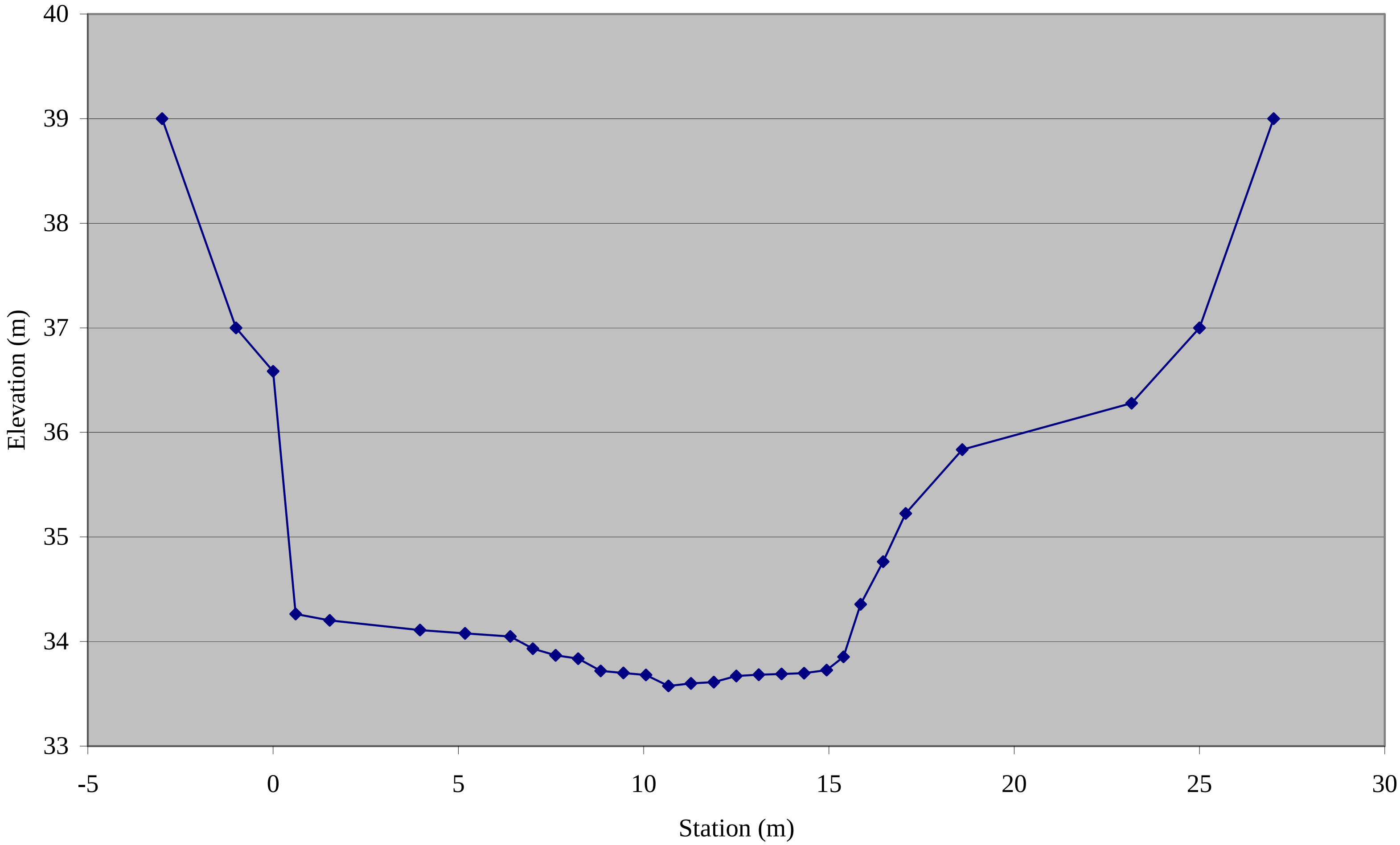


Figure D.7. Brimstone cross section X2.

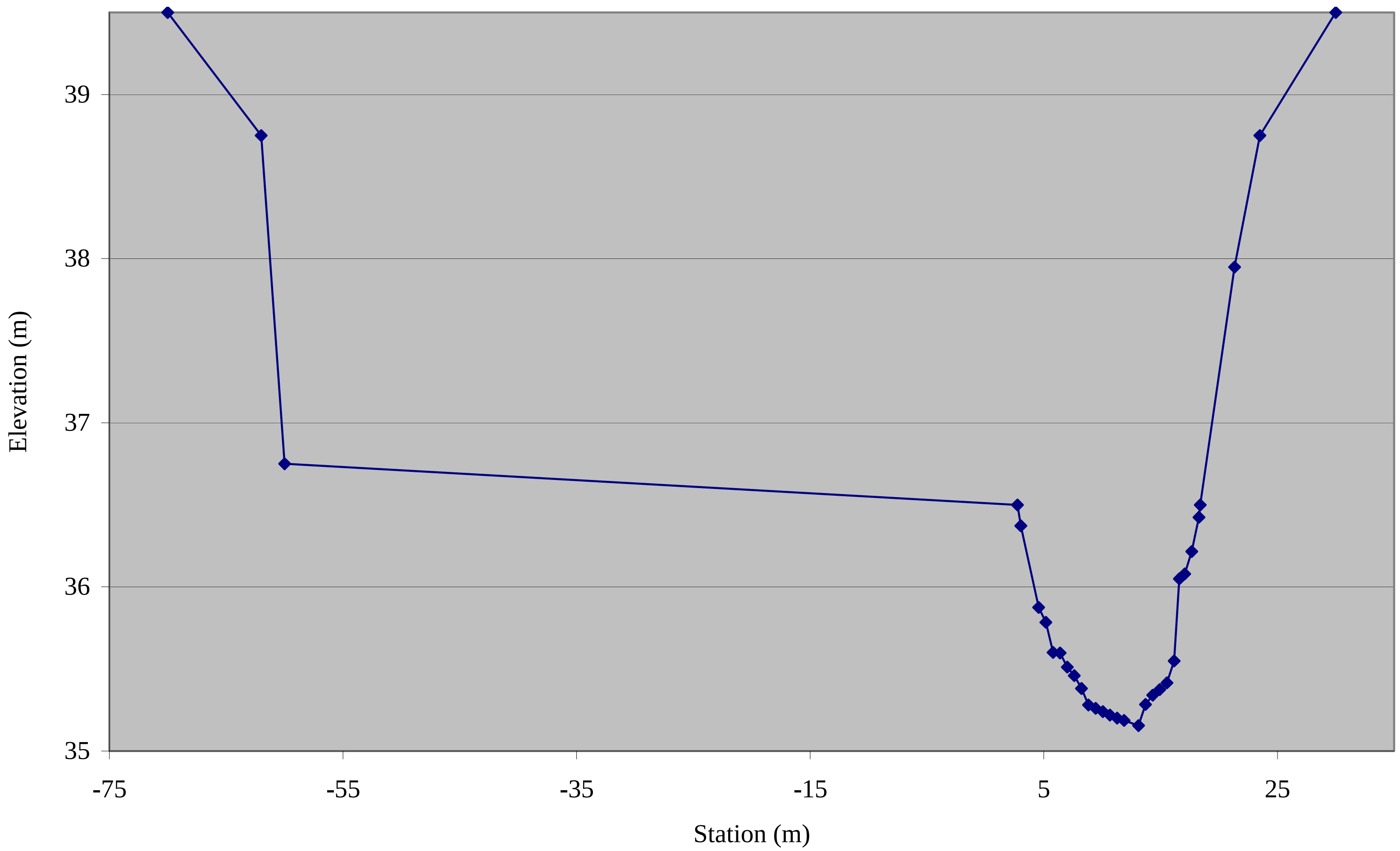


Figure D.8. Brimstone cross section X1.

Table D.16. Ligias Fork pebble count data for cross-section X3.

Number	Dia. (mm)	Dia. (mm)	Dia. (mm)	Dia. (mm)
1	75	108	35	12
2	45	144	62	180
3	40	45	66	55
4	62	52	4	22
5	69	64	54	25
6	129	84	59	107
7	78	100	77	137
8	100	72	70	16
9	72	82	85	115
10	80	12	66	20
11	74	22	80	15
12	110	35	94	30
13	45	98	32	28
14	70	64	28	18
15	28	60	60	2
16	26	92	70	100
17	32	104	120	28
18	155	98	94	144
19	114	60	130	84
20	112	65	97	52
21	71	80	80	66
22	35	105	115	95
23	40	12	48	92
24	52	63	92	72
25	35	52	118	36

Table D.17. Ligias Fork pebble count summary for cross-section X3.

Minimum Dia. (mm)	2
Maximum Dia. (mm)	180
d16 (mm)	28
d50 (mm)	66
d84 (mm)	105
d90 (mm)	115

Table D.18. Ligias Fork sediment grain size distribution for cross-section X3. Units in mm.

	Upper	Lower Bound	%	Cummulative %
Total clay	0.002	0.001	0	0
Very fine silt	0.004	0.002	0	0
Fine silt	0.008	0.004	0	0
Medium silt	0.016	0.008	0	0
Coarse silt	0.031	0.016	0	0
Very coarse silt	0.063	0.031	0	0
Very fine sand	0.125	0.063	0	0
Fine sand	0.25	0.125	0	0
Medium sand	0.5	0.25	0	0
Coarse sand	1	0.5	0	0
Very coarse sand	2	1	0	0
Very fine gravel	4	2	1	1
Fine gravel	8	4	1	2
Medium gravel	16	8	4	6
Coarse cravel	32	16	12	18
Very coarse gravel	64	32	26	44
Small cobbles	128	64	56	100

Table D.19. Ligias Fork sediment profile. Units in m.

Name:	SED Profile		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	SED	0.0	100.0

Table D.20. Ligias Fork bank sieve analysis results (non-eroding bank).

ASTM Sieve Number	Sieve Opening (mm)	Mass Reatained (g)	% Passing
3/4	19	0.00	100.00
3/8	9.525	17.74	100.00
4	4.75	7.60	96.67
8	2.36	6.15	92.47
10	2	2.70	90.63
40	0.425	11.53	82.78
60	0.25	23.77	66.57
100	0.15	23.47	50.58
200	0.075	15.98	39.68
H-1	0.0341	--	9.37
H-2	0.0222	--	7.79
H-3	0.0131	--	6.20
H-4	0.0095	--	4.97
H-5	0.0069	--	2.86
H-6	0.0034	--	2.51
H-7	0.0014	--	1.28

Table D.21. Ligias Fork bank sieve analysis results (eroding bank).

ASTM Sieve Number	Sieve Opening (mm)	Mass Reatained (g)	% Passing
3/4	19	0.00	100
3/8	9.525	0.00	100
4	4.75	0.00	100
8	2.36	0.00	100
10	2	0.00	100
40	0.425	0.64	99.33
60	0.25	9.34	91.47
100	0.15	27.94	67.98
200	0.075	13.15	56.92
H-1	0.0300	--	23.55
H-2	0.0196	--	21.63
H-3	0.0119	--	18.76
H-4	0.0087	--	16.36
H-5	0.0063	--	14.20
H-6	0.0033	--	10.12
H-7	0.0014	--	6.04

Table D.22. Ligias Fork soil grain size distribution (non-eroding bank). Units in mm for sediment classes and distributions expressed as cumulative percentages.

CONCEPTS		
Total Clay	0-0.002	1.28
Very Fine Silt	0.002-0.004	2.51
Fine Silt	0.004-0.008	2.86
Medium Silt	0.008-0.016	6.20
Coarse Silt	0.016-0.031	7.79
Very Coarse Silt	0.031-0.063	9.37
Very Fine Sand	0.063-0.125	39.68
Fine Sand	0.125-0.25	66.57
Medium Sand	0.25-0.5	82.78
Coarse Sand	0.5-1.0	82.78
Very Coarse Sand	1.0-2.0	90.6
Very Fine Gravel	2.0-4.0	92.5
Fine Gravel	4.0-8.0	96.7
Medium Gravel	8.0-16.0	100.0
Coarse Gravel	16.0-32.0	100.0
Very Coarse Gravel	32.0-64.0	100.0
Small Cobbles	> 64.0	100.0

Table D.23. Ligias Fork bank soil grain size distribution. Units in mm for sediment classes and distributions expressed as cumulative percentages.

CONCEPTS		
Total Clay	0-0.002	6.04
Very Fine Silt	0.002-0.004	10.12
Fine Silt	0.004-0.008	14.20
Medium Silt	0.008-0.016	18.76
Coarse Silt	0.016-0.031	23.55
Very Coarse Silt	0.031-0.063	56.92
Very Fine Sand	0.063-0.125	56.92
Fine Sand	0.125-0.25	91.47
Medium Sand	0.25-0.5	99.33
Coarse Sand	0.5-1.0	99.33
Very Coarse Sand	1.0-2.0	100.00
Very Fine Gravel	2.0-4.0	100.00
Fine Gravel	4.0-8.0	100.00
Medium Gravel	8.0-16.0	100.00
Coarse Gravel	16.0-32.0	100.00
Very Coarse Gravel	32.0-64.0	100.00
Small Cobbles	> 64.0	100.00

Table D.24. Ligias Fork left bank soil profile. Units in m.

Name:	Left Bank		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	SOIL	0.0	100.0

Table D.25. Ligias Fork right bank soil profile. Units in m.

Name:	Right Bank		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	SOIL	0.0	100.0

Table D.26. Ligias Fork eroding bank soil profile. Units in m.

Name:	Eroding Bank		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	Eroding Bank	0.0	100.0

Table D.27. Ligias Fork cross section X1. Units in m.

Geometry			Name:	X1_(downstream)
ID	Station (m)	Elevation (m)	River station:	0.5177
1	-25.00	35.54	**Indices of the toe and top of the bank**	
2	-10.00	33.50	Top of left bank:	5
3	0.00	32.59	Toe of left bank:	15
4	5.18	31.89	Top of right bank:	27
5	10.37	31.84	Toe of right bank:	25
6	11.89	30.59	**Groundwater table**	
7	13.42	30.28	Left bank:	29.86
8	16.16	30.25	Right bank:	29.86
9	17.07	30.22	**Bedrock elevation**	
10	18.29	30.21	Bedrock elevation:	0.0
11	19.51	30.20	**Boundary roughness**	
12	20.73	30.14	Left floodplain:	0.05
13	21.95	30.14	Left bank:	0.04
14	22.41	30.10	Streambed:	0.035
15	25.15	29.62	Right bank:	0.04
16	25.76	29.41	Right floodplain:	0.05
17	26.37	29.31	**Boundary materials**	
18	27.13	29.17	Bed sediment profile:	SED Profile
19	27.44	29.14	Left bank soil profile:	Left Bank
20	28.05	29.11	Right bank soil profile:	Right Bank
21	28.66	29.12		
22	29.27	29.29		
23	29.88	29.36		
24	30.49	29.48		
25	30.79	29.49		
26	31.10	30.14		
27	32.62	32.15		
28	40.55	32.49		
29	43.60	35.54		

Table D.28. Ligias Fork cross section X2. Units in m.

Geometry				
ID	Station	Elevation	Name:	X2
			River station:	0.461
1	-30.00	35.36	**Indices of the toe and top of the bank**	
2	-15.00	34.25	Top of left bank:	6
3	-10.00	34.00	Toe of left bank:	7
4	0.00	32.93	Top of right bank:	29
5	17.38	32.50	Toe of right bank:	24
6	78.35	32.47	**Groundwater table**	
7	80.79	30.40	Left bank:	30.72
8	87.20	30.37	Right bank:	30.72
9	87.81	30.32	**Bedrock elevation**	
10	88.41	30.18	Bedrock elevation:	0.0
11	89.02	30.14	**Boundary roughness**	
12	90.24	30.13	Left floodplain:	0.05
13	91.16	30.12	Left bank:	0.04
14	93.29	30.11	Streambed:	0.035
15	94.51	30.10	Right bank:	0.04
16	95.73	30.09	Right floodplain:	0.05
17	96.95	30.08	**Boundary materials**	
18	98.48	30.01	Bed sediment profile:	SED Profile
19	99.39	29.97	Left bank soil profile:	Left Bank
20	100.31	30.03	Right bank soil profile:	Right Bank
21	101.22	30.10		
22	101.83	30.17		
23	102.44	30.38		
24	102.74	30.49		
25	103.96	30.55		
26	106.10	30.60		
27	108.23	30.70		
28	110.37	30.74		
29	113.11	32.11		
30	121.95	32.30		
31	125.61	32.31		
32	128.66	35.36		

Table D.29. Ligias Fork cross section X3. Units in m.

Geometry			Name:	X3
ID	Station	Elevation	River station:	0.3268
1	-15.00	35.00	**Indices of the toe and top of the bank**	
2	-10.00	34.00	Top of left bank:	3
3	-2.50	33.76	Toe of left bank:	10
4	0.00	33.21	Top of right bank:	34
5	6.71	32.62	Toe of right bank:	27
6	8.23	32.54	**Groundwater table**	
7	9.45	32.42	Left bank:	31.55
8	11.59	31.53	Right bank:	31.55
9	13.11	31.40	**Bedrock elevation**	
10	14.33	31.04	Bedrock elevation:	0.0
11	15.85	31.01	**Boundary roughness**	
12	17.07	31.00	Left floodplain:	0.05
13	18.29	30.99	Left bank:	0.04
14	19.51	30.98	Streambed:	0.035
15	20.73	30.97	Right bank:	0.04
16	21.95	30.96	Right floodplain:	0.05
17	23.17	30.95	**Boundary materials**	
18	24.39	30.94	Bed sediment profile:	SED Profile
19	25.61	30.93	Left bank soil profile:	Left Bank
20	26.83	30.92	Right bank soil profile:	Right Bank
21	28.05	30.91		
22	28.96	30.80		
23	30.18	30.81		
24	31.40	30.85		
25	33.84	30.92		
26	35.67	30.92		
27	37.20	30.93		
28	38.42	31.17		
29	39.02	31.36		
30	39.94	31.58		
31	40.85	32.02		
32	41.77	32.18		
33	42.68	32.24		
34	45.73	33.76		
35	50.00	34.25		
36	52.50	35.00		

Table D.30. Ligias Fork cross section X4. Units in m.

Geometry			Name:	X4
ID	Station	Elevation	River station:	0.1744
1	-3.00	37.00	**Indices of the toe and top of the bank**	
2	-2.50	36.00	Top of left bank:	6
3	0.00	35.35	Toe of left bank:	9
4	1.53	33.82	Top of right bank:	35
5	12.20	33.40	Toe of right bank:	18
6	15.24	33.35	**Groundwater table**	
7	17.38	32.44	Left bank:	30.82
8	18.90	32.07	Right bank:	30.82
9	19.51	30.37	**Bedrock elevation**	
10	19.97	30.13	Bedrock elevation:	0.0
11	20.58	30.10	**Boundary roughness**	
12	21.19	30.09	Left floodplain:	0.05
13	21.80	30.08	Left bank:	0.04
14	22.41	30.07	Streambed:	0.035
15	23.02	30.17	Right bank:	0.04
16	23.63	30.19	Right floodplain:	0.05
17	24.24	30.27	**Boundary materials**	
18	24.85	30.50	Bed sediment profile:	SED Profile
19	25.46	30.68	Left bank soil profile:	Left Bank
20	26.07	30.91	Right bank soil profile:	Right Bank
21	26.68	31.05		
22	26.98	31.27		
23	28.20	31.46		
24	29.42	31.60		
25	30.64	31.67		
26	31.86	31.81		
27	33.08	31.92		
28	34.30	31.93		
29	35.52	31.94		
30	36.13	31.95		
31	36.43	31.96		
32	38.26	31.97		
33	38.87	31.98		
34	39.18	31.99		
35	41.31	33.87		
36	100.15	35.06		
37	105.00	35.35		
38	110.00	36.00		
39	115.00	37.00		

Table D.31. Ligias Fork cross section X5. Units in m.

Geometry			Name:	X5
ID	Station	Elevation	River station:	0.0872
1	-10.00	37.00	**Indices of the toe and top of the bank**	
2	-2.00	36.00	Top of left bank:	4
3	0.00	35.37	Toe of left bank:	14
4	0.91	35.12	Top of right bank:	39
5	3.05	33.14	Toe of right bank:	34
6	14.94	33.12	**Groundwater table**	
7	17.07	33.10	Left bank:	32.03
8	20.12	32.92	Right bank:	32.03
9	23.17	32.80	**Bedrock elevation**	
10	25.61	32.77	Bedrock elevation:	0.0
11	28.05	32.62	**Boundary roughness**	
12	29.27	31.87	Left floodplain:	0.05
13	30.49	31.64	Left bank:	0.04
14	31.10	31.60	Streambed:	0.035
15	32.01	31.59	Right bank:	0.04
16	32.62	31.58	Right floodplain:	0.05
17	33.23	31.52	**Boundary materials**	
18	33.84	31.51	Bed sediment profile:	SED Profile
19	34.15	31.43	Left bank soil profile:	Left Bank
20	34.45	31.42	Right bank soil profile:	Right Bank
21	34.76	31.37		
22	35.06	31.34		
23	35.37	31.32		
24	35.98	31.31		
25	36.28	31.30		
26	36.89	31.29		
27	37.50	31.28		
28	37.81	31.29		
29	38.11	31.30		
30	38.42	31.31		
31	38.72	31.46		
32	39.63	31.62		
33	40.55	31.65		
34	42.07	31.67		
35	42.68	33.27		
36	43.90	33.52		
37	45.73	33.59		
38	106.71	34.15		
39	114.33	35.37		
40	120.00	36.00		
41	140.00	37.00		

Table D.32. Ligias Fork cross section X6. Units in m.

Geometry			Name:	X6_(upstream)
ID	Station	Elevation	River station:	0
1	-10.00	37.00	**Indices of the toe and top of the bank**	
2	-5.00	36.00	Top of left bank:	4
3	0.00	35.37	Toe of left bank:	7
4	2.13	35.08	Top of right bank:	33
5	4.88	34.06	Toe of right bank:	27
6	7.32	33.31	**Groundwater table**	
7	8.54	32.63	Left bank:	32.83
8	9.76	32.60	Right bank:	32.83
9	10.98	32.59	**Bedrock elevation**	
10	12.20	32.58	Bedrock elevation:	0.0
11	13.41	32.57	**Boundary roughness**	
12	14.63	32.56	Left floodplain:	0.05
13	15.85	32.55	Left bank:	0.04
14	17.07	32.50	Streambed:	0.035
15	18.29	32.48	Right bank:	0.04
16	19.51	32.43	Right floodplain:	0.05
17	20.73	32.35	**Boundary materials**	
18	21.95	32.28	Bed sediment profile:	SED Profile
19	23.17	32.16	Left bank soil profile:	Left Bank
20	24.39	32.15	Right bank soil profile:	Right Bank
21	25.61	32.14		
22	26.83	32.11		
23	28.05	32.08		
24	29.27	32.13		
25	30.49	32.13		
26	31.71	32.25		
27	32.93	32.39		
28	34.15	32.91		
29	37.50	33.71		
30	42.07	33.82		
31	48.00	34.05		
32	82.32	34.15		
33	89.94	35.37		
34	100.00	37.00		

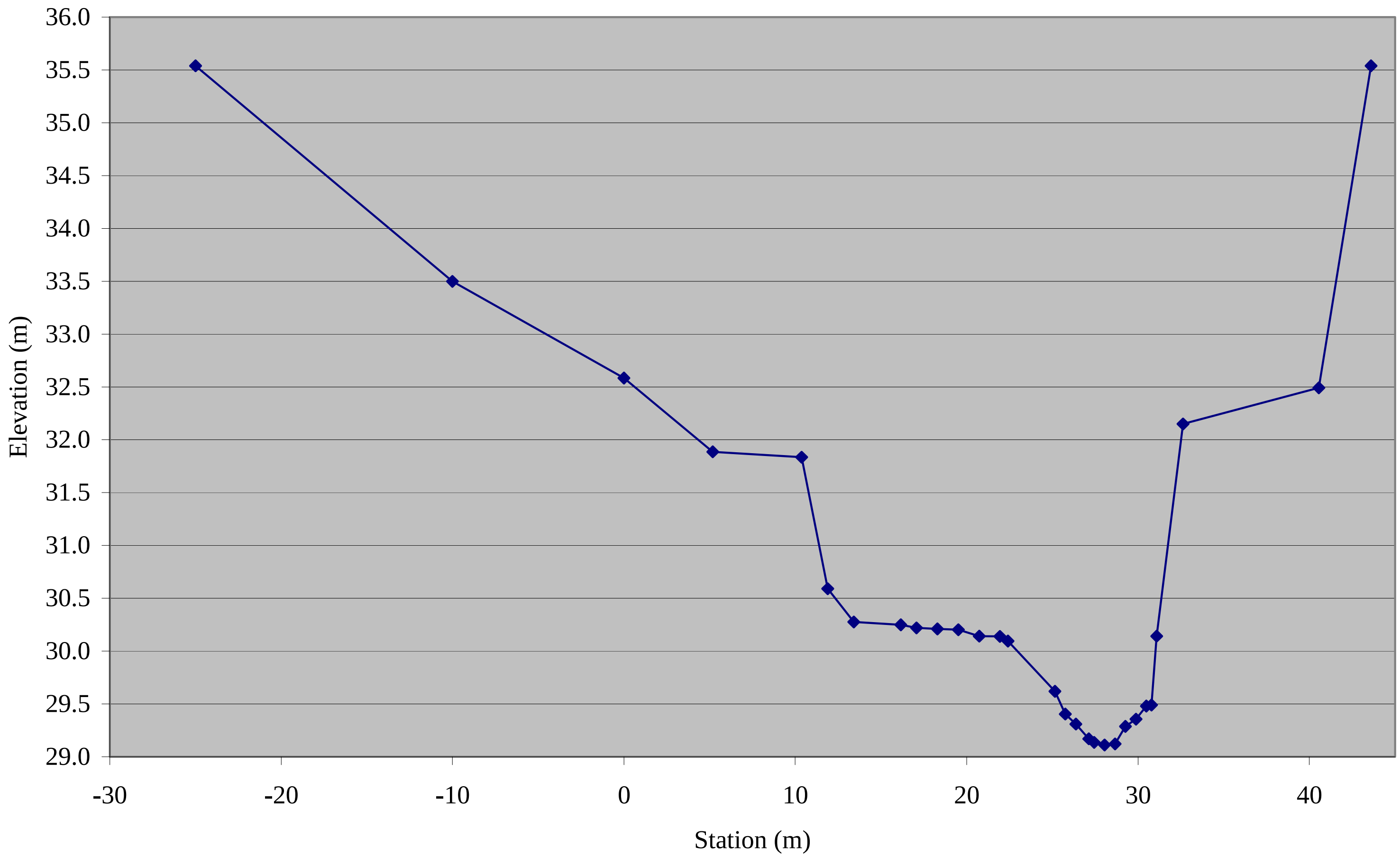


Figure D.9. Ligias Fork cross section X1.

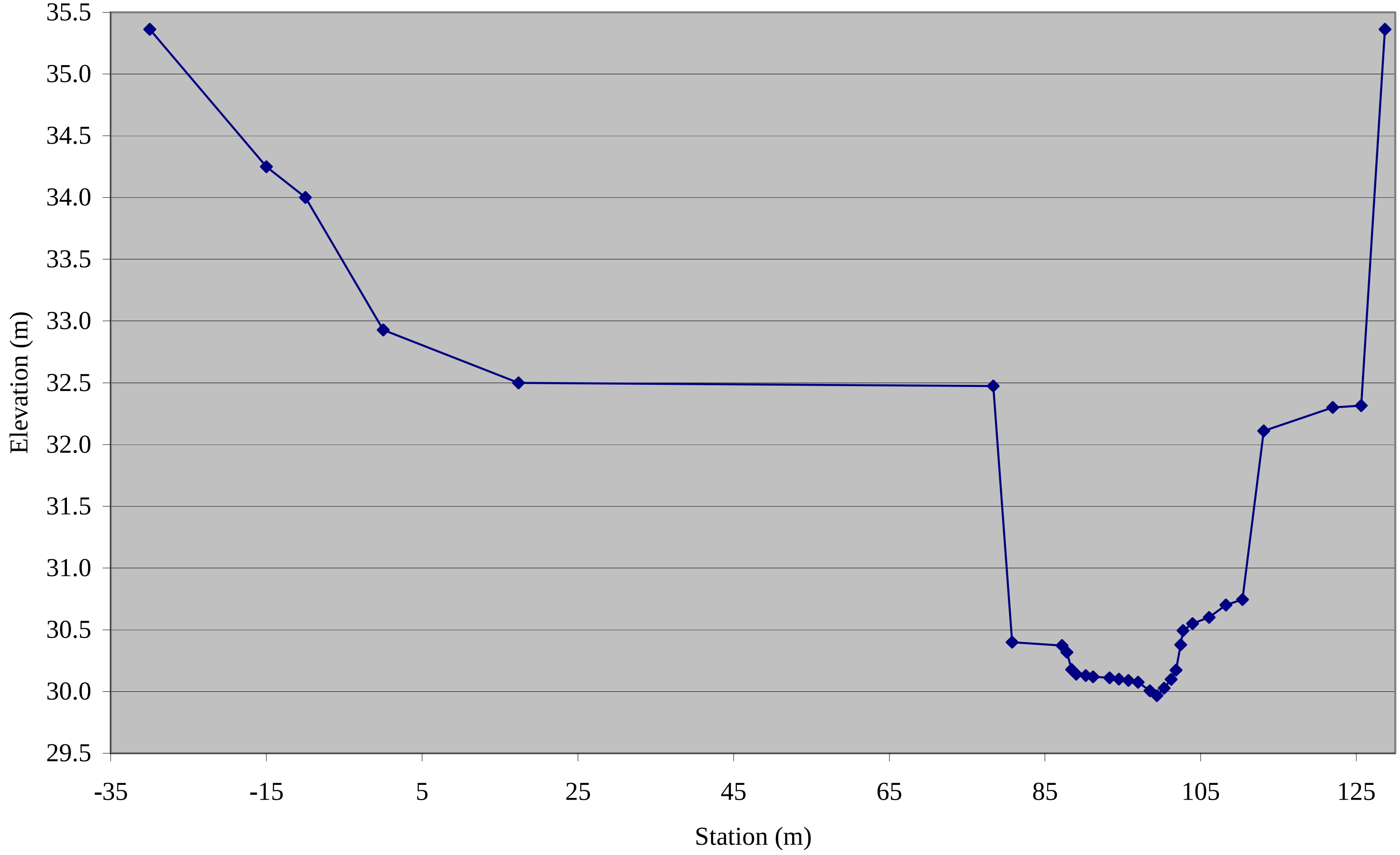


Figure D.10. Ligias Fork cross section X2.

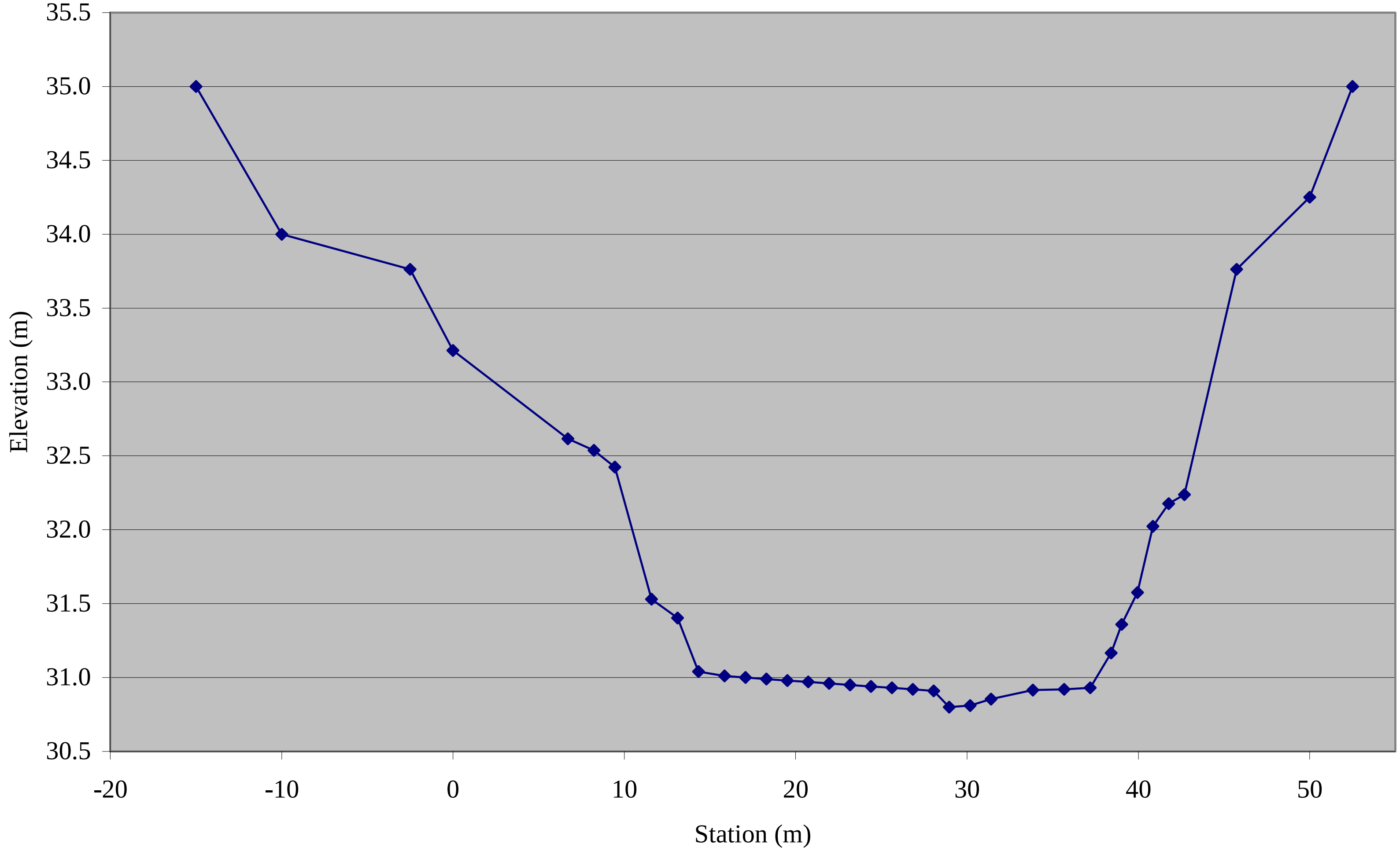


Figure D.11. Ligias Fork cross section X3.

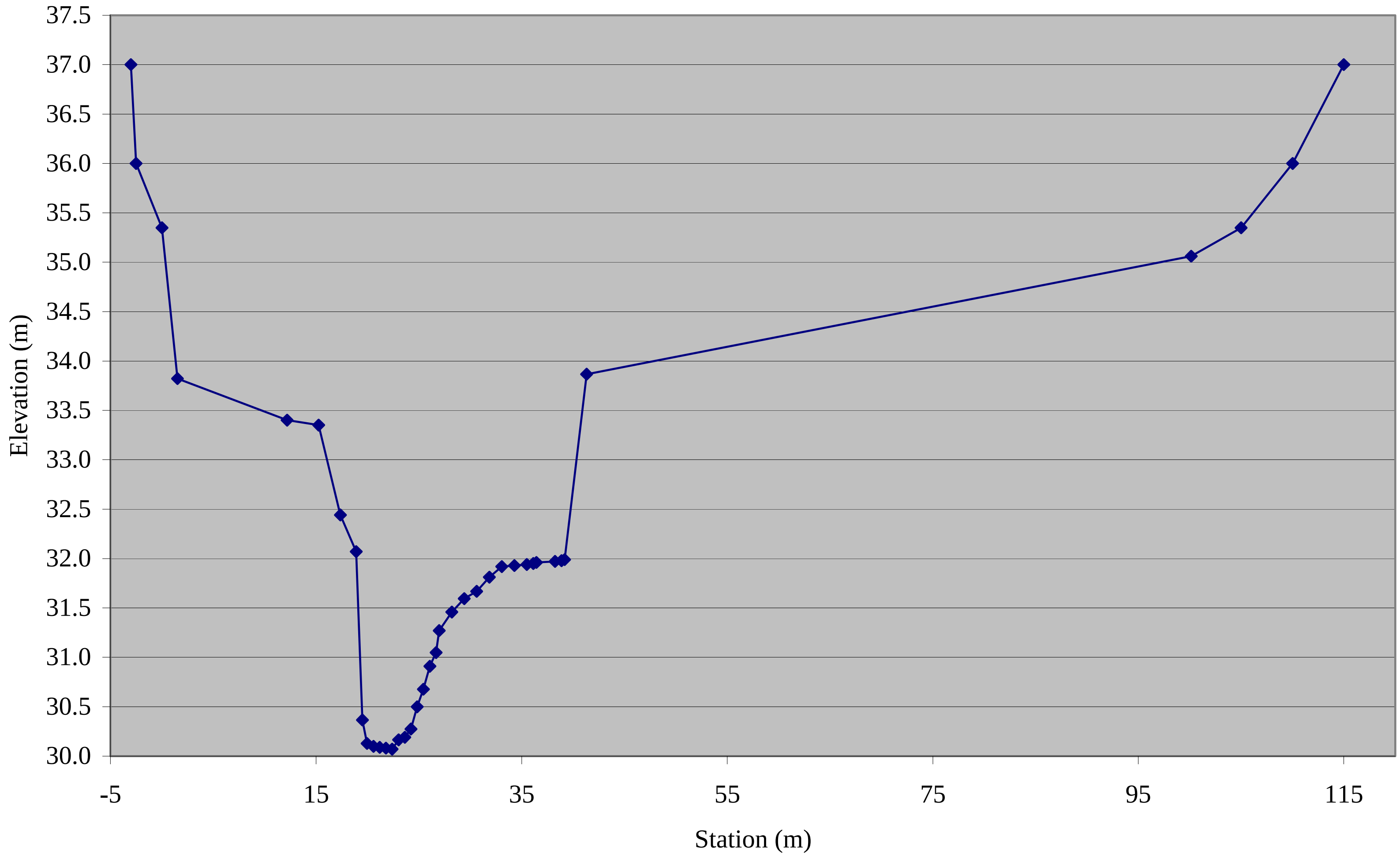


Figure D.12. Ligias Fork cross section X4.

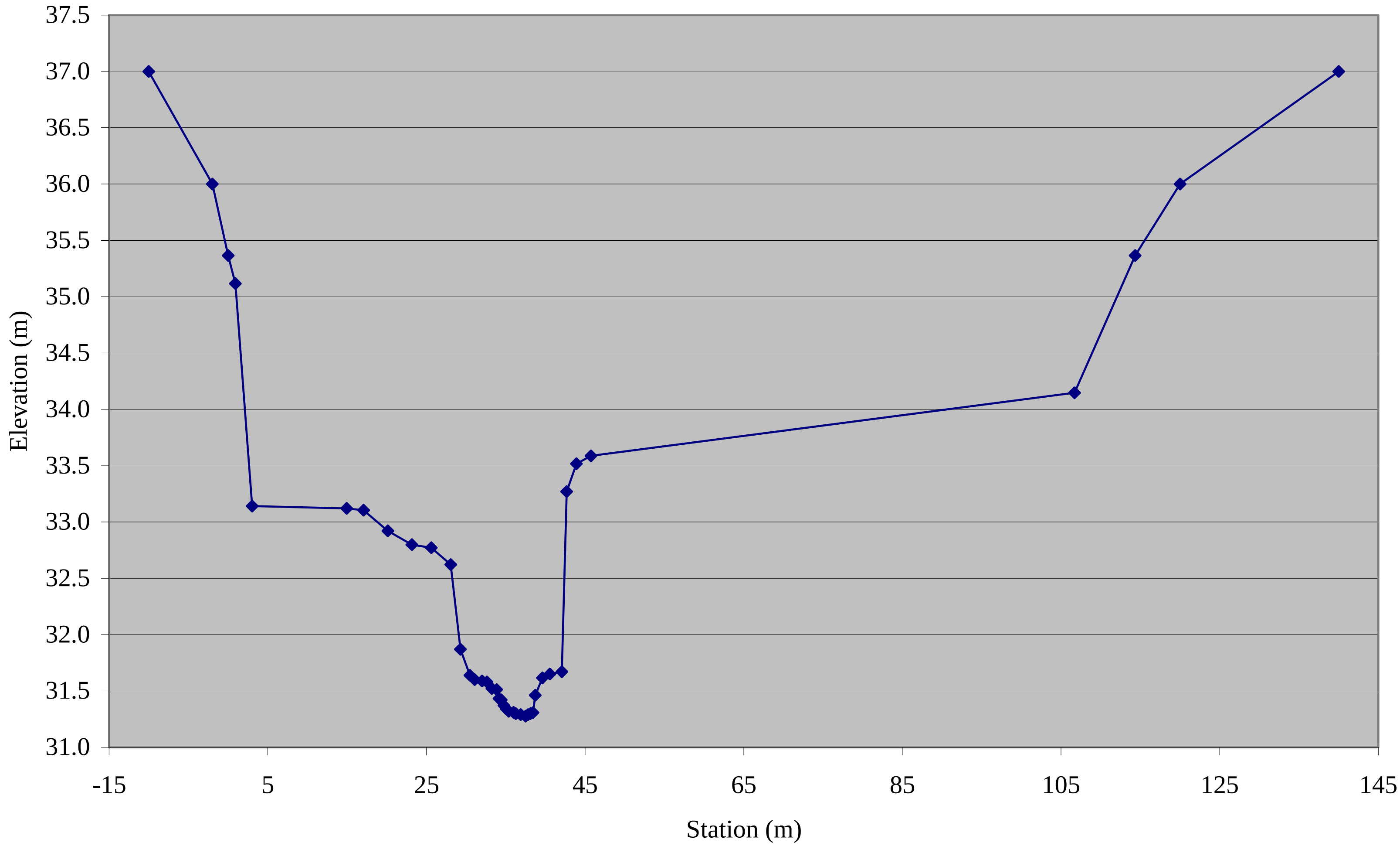


Figure D.13. Ligias Fork cross section X5.

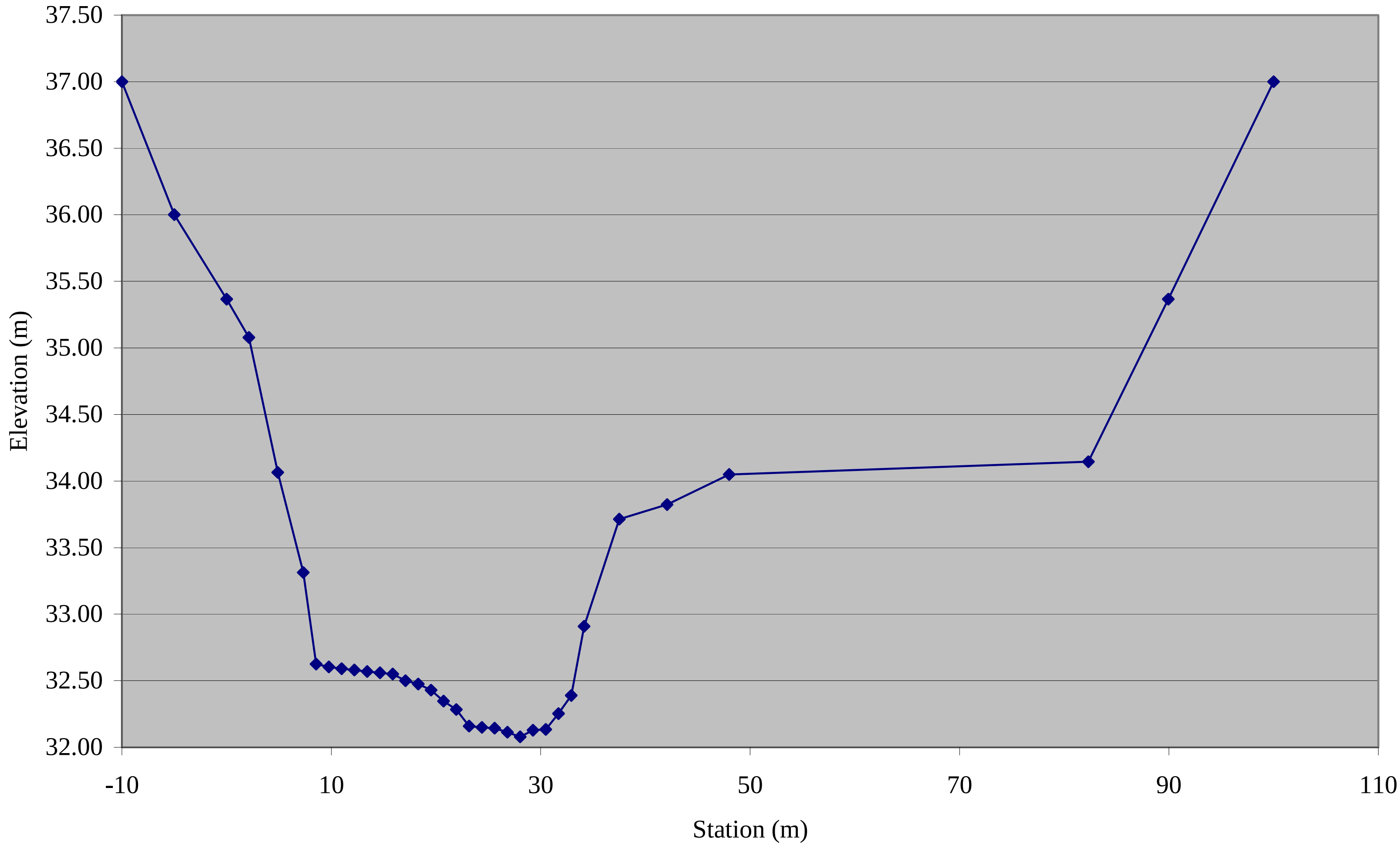


Figure D.14. Ligias Fork cross section X6.

Table D.33. Montgomery Fork pebble count data MFCS-X1.

Number	Dia. (mm)	Dia. (mm)	Dia. (mm)	Dia. (mm)
1	125	39	86	68
2	35	24	36	73
3	78	31	72	31
4	92	22	54	80
5	44	6	65	125
6	8	11	29	77
7	52	10	82	156
8	16	12	30	85
9	22	34	25	78
10	63	4	18	23
11	28	2	6	124
12	14	6	10	152
13	38	9	4	136
14	42	1	7	80
15	34	110	4	42
16	25	22	2	48
17	30	18	3	110
18	40	115	12	38
19	26	60	6	26
20	14	126	2	18
21	22	50	2	10
22	34	145	22	6
23	30	75	113	8
24	6	130	132	6
25	28	88	178	4
Pebble Count Performed at MFCS1				

Table D.34. Montgomery Fork pebble count data MFCS-X3.

Number	Dia. (mm)	Dia. (mm)	Dia. (mm)	Dia. (mm)
1	200	28	32	80
2	160	56	122	92
3	134	6	158	122
4	54	200	98	57
5	51	130	133	43
6	32	300	75	81
7	83	82	58	22
8	48	59	26	44
9	29	4	95	110
10	32	24	85	66
11	10	30	96	71
12	19	64	56	16
13	8	108	56	18
14	8	74	40	32
15	4	16	44	33
16	6	60	8	19
17	2	12	10	57
18	2	102	68	118
19	164	6	90	95
20	124	62	18	81
21	98	107	12	42
22	83	11	40	77
23	104	4	6	154
24	92	5	70	2
25	58	2	82	24
Pebble Count Performed at MFCS3				

Table D.35. Montgomery Fork pebble count data MFCS-X4.

Number	Dia. (mm)	Dia. (mm)	Dia. (mm)	Dia. (mm)
1	220	173	100	43
2	44	25	108	56
3	265	85	54	32
4	62	55	90	46
5	142	52	47	139
6	48	61	20	84
7	8	66	12	75
8	98	29	21	79
9	133	56	35	88
10	56	154	34	112
11	104	17	82	42
12	107	80	98	26
13	133	79	46	115
14	38	21	16	106
15	58	41	22	15
16	66	16	2	11
17	140	22	4	8
18	122	4	85	58
19	33	6	32	62
20	12	25	84	26
21	185	33	45	82
22	74	66	109	116
23	210	131	224	4
24	28	2	124	18
25	112	46	138	39
Pebble Count Performed at MFCS4				

Table D.36. Montgomery Fork pebble count data MFCS-X7.

Number	Dia. (mm)	Dia. (mm)	Dia. (mm)	Dia. (mm)
1	8	85	16	18
2	85	10	110	70
3	140	1	118	14
4	30	44	63	12
5	80	340	92	49
6	70	152	36	21
7	4	1	123	106
8	270	62	108	2
9	15	285	54	16
10	114	12	102	34
11	32	164	112	2
12	152	2	52	38
13	98	1	42	26
14	66	8	4	18
15	220	148	104	132
16	39	39	59	60
17	1	160	80	128
18	78	158	17	104
19	18	56	198	212
20	160	6	85	36
21	83	85	100	75
22	166	8	2	94
23	40	175	13	126
24	2	42	3	68
25	51	108	62	20
Pebble Count Performed at MFCS7				

Table D.37. Montgomery Fork pebble count data MFCS-X9.

Number	Dia. (mm)	Dia. (mm)	Dia. (mm)	Dia. (mm)
1	12	122	160	48
2	4	198	132	226
3	2	104	102	182
4	1	6	105	270
5	1	31	284	190
6	2	56	214	112
7	4	58	80	244
8	12	160	236	290
9	6	10	42	87
10	6	420	42	68
11	2	344	242	24
12	3	152	198	34
13	220	112	222	252
14	15	108	288	218
15	50	118	364	166
16	18	89	125	74
17	26	168	158	108
18	51	262	6	178
19	46	32	146	194
20	188	215	52	104
21	135	20	68	112
22	55	18	146	82
23	260	148	158	44
24	68	54	124	28
25	154	23	132	262
Pebble Count Performed at MFCS9				

Table D.38. Montgomery Fork pebble count data MFCS-X10.

Number	Dia. (mm)	Dia. (mm)	Dia. (mm)	Dia. (mm)
1	104	50	34	16
2	102	24	48	40
3	110	29	24	12
4	6	25	2	18
5	6	10	42	108
6	10	26	45	25
7	19	21	37	14
8	15	24	14	12
9	22	16	96	8
10	17	41	74	18
11	18	55	12	14
12	21	42	26	14
13	28	22	21	26
14	41	51	22	2
15	13	39	24	48
16	26	30	30	20
17	28	16	154	12
18	16	23	12	92
19	30	36	10	128
20	22	62	10	64
21	16	18	18	32
22	49	32	2	12
23	43	38	17	13
24	36	42	2	60
25	50	33	20	21
Pebble Count Performed at MFCS10				

Table D.39. Summary of pebble count data (MFCS-X1).

Minimum Dia. (mm)	1
Maximum Dia. (mm)	178
d16 (mm)	6
d50 (mm)	30
d84 (mm)	88
d90 (mm)	124
Pebble Count Performed at MFCS1	

Table D.40. Summary of pebble count data (MFCS-X3).

Minimum Dia. (mm)	2
Maximum Dia. (mm)	300
d16 (mm)	10
d50 (mm)	56
d84 (mm)	107
d90 (mm)	124
Pebble Count Performed at MFCS3	

Table D.41. Summary of pebble count data (MFCS-X4).

Minimum Dia. (mm)	2
Maximum Dia. (mm)	265
d16 (mm)	18
d50 (mm)	56
d84 (mm)	116
d90 (mm)	138
Pebble Count Performed at MFCS4	

Table D.42. Summary of pebble count data (MFCS-X7).

Minimum Dia. (mm)	1
Maximum Dia. (mm)	340
d16 (mm)	8
d50 (mm)	60
d84 (mm)	132
d90 (mm)	160
Pebble Count Performed at MFCS7	

Table D.43. Summary of pebble count data (MFCS-X9).

Minimum Dia. (mm)	1
Maximum Dia. (mm)	420
d16 (mm)	15
d50 (mm)	105
d84 (mm)	220
d90 (mm)	252
Pebble Count Performed at MFCS9	

Table D.44. Summary of pebble count data (MFCS-X10).

Minimum Dia. (mm)	2
Maximum Dia. (mm)	154
d16 (mm)	12
d50 (mm)	24
d84 (mm)	49
d90 (mm)	62
Pebble Count Performed at MFCS10	

Table D.45. Sediment grain size distribution (MFCS-X1). Units in mm.

	Upper	Lower Bound	%	Cummulative %
Total clay	0.002	0.001	0	0
Very fine silt	0.004	0.002	0	0
Fine silt	0.008	0.004	0	0
Medium silt	0.016	0.008	0	0
Coarse silt	0.031	0.016	0	0
Very coarse silt	0.063	0.031	0	0
Very fine sand	0.125	0.063	0	0
Fine sand	0.25	0.125	0	0
Medium sand	0.5	0.25	0	0
Coarse sand	1	0.5	1	1
Very coarse sand	2	1	4	5
Very fine gravel	4	2	5	10
Fine gravel	8	4	10	20
Medium gravel	16	8	10	30
Coarse cravel	32	16	22	52
Very coarse gravel	64	32	18	70
Small cobbles	128	64	30	100
Pebble Count Performed at MFCS1				

Table D.46. Sediment grain size distribution (MFCS-X3). Units in mm.

	Upper	Lower Bound	%	Cummulative %
Total clay	0.002	0.001	0	0
Very fine silt	0.004	0.002	0	0
Fine silt	0.008	0.004	0	0
Medium silt	0.016	0.008	0	0
Coarse silt	0.031	0.016	0	0
Very coarse silt	0.063	0.031	0	0
Very fine sand	0.125	0.063	0	0
Fine sand	0.25	0.125	0	0
Medium sand	0.5	0.25	0	0
Coarse sand	1	0.5	0	0
Very coarse sand	2	1	4	4
Very fine gravel	4	2	3	7
Fine gravel	8	4	8	15
Medium gravel	16	8	7	22
Coarse cravel	32	16	15	37
Very coarse gravel	64	32	21	58
Small cobbles	128	64	42	100
Pebble Count Performed at MFCS3				

Table D.47. Sediment grain size distribution (MFCS-X4). Units in mm.

	Upper	Lower Bound	%	Cummulative %
Total clay	0.002	0.001	0	0
Very fine silt	0.004	0.002	0	0
Fine silt	0.008	0.004	0	0
Medium silt	0.016	0.008	0	0
Coarse silt	0.031	0.016	0	0
Very coarse silt	0.063	0.031	0	0
Very fine sand	0.125	0.063	0	0
Fine sand	0.25	0.125	0	0
Medium sand	0.5	0.25	0	0
Coarse sand	1	0.5	0	0
Very coarse sand	2	1	2	2
Very fine gravel	4	2	3	5
Fine gravel	8	4	3	8
Medium gravel	16	8	6	14
Coarse cravel	32	16	15	29
Very coarse gravel	64	32	27	56
Small cobbles	128	64	44	100
Pebble Count Performed at MFCS4				

Table D.48. Sediment grain size distribution (MFCS-X7). Units in mm.

	Upper	Lower Bound	%	Cummulative %
Total clay	0.002	0.001	0	0
Very fine silt	0.004	0.002	0	0
Fine silt	0.008	0.004	0	0
Medium silt	0.016	0.008	0	0
Coarse silt	0.031	0.016	0	0
Very coarse silt	0.063	0.031	0	0
Very fine sand	0.125	0.063	0	0
Fine sand	0.25	0.125	0	0
Medium sand	0.5	0.25	0	0
Coarse sand	1	0.5	4	4
Very coarse sand	2	1	5	9
Very fine gravel	4	2	3	12
Fine gravel	8	4	4	16
Medium gravel	16	8	8	24
Coarse cravel	32	16	9	33
Very coarse gravel	64	32	20	53
Small cobbles	128	64	47	100
Pebble Count Performed at MFCS7				

Table D.49. Sediment grain size distribution (MFCS-X9). Units in mm.

	Upper	Lower Bound	%	Cummulative %
Total clay	0.002	0.001	0	0
Very fine silt	0.004	0.002	0	0
Fine silt	0.008	0.004	0	0
Medium silt	0.016	0.008	0	0
Coarse silt	0.031	0.016	0	0
Very coarse silt	0.063	0.031	0	0
Very fine sand	0.125	0.063	0	0
Fine sand	0.25	0.125	0	0
Medium sand	0.5	0.25	0	0
Coarse sand	1	0.5	2	2
Very coarse sand	2	1	3	5
Very fine gravel	4	2	3	8
Fine gravel	8	4	4	12
Medium gravel	16	8	4	16
Coarse cravel	32	16	9	25
Very coarse gravel	64	32	13	38
Small cobbles	128	64	62	100
Pebble Count Performed at MFCS9				

Table D.50. Sediment grain size distribution (MFCS-X10). Units in mm.

	Upper	Lower Bound	%	Cummulative %
Total clay	0.002	0.001	0	0
Very fine silt	0.004	0.002	0	0
Fine silt	0.008	0.004	0	0
Medium silt	0.016	0.008	0	0
Coarse silt	0.031	0.016	0	0
Very coarse silt	0.063	0.031	0	0
Very fine sand	0.125	0.063	0	0
Fine sand	0.25	0.125	0	0
Medium sand	0.5	0.25	0	0
Coarse sand	1	0.5	0	0
Very coarse sand	2	1	4	4
Very fine gravel	4	2	0	4
Fine gravel	8	4	3	7
Medium gravel	16	8	22	29
Coarse cravel	32	16	37	66
Very coarse gravel	64	32	25	91
Small cobbles	128	64	9	100
Pebble Count Performed at MFCS10				

Table D.51. Montgomery Fork sediment profile (typical). Units in m.

Name:	MFCS1_SEDIMENT		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	MFC1	0.0	1000.0

Table D.52. Montgomery Fork bank soil profile (MFCS-X1). Distributions expressed as cumulative percentages.

Grain size distribution	
Total clay	1.45
Very fine silt	2.12
Fine silt	3.17
Medium silt	4.34
Coarse silt	5.51
Very coarse silt	6.18
Very fine sand	20.99
Fine sand	33.39
Medium sand	38.30
Coarse sand	38.30
Very coarse sand	58.98
Very fine gravel	66.44
Fine gravel	85.50
Medium gravel	93.02
Coarse cravel	100.0
Very coarse gravel	100.0
Small cobbles	100.0

Table D.53. Montgomery Fork bank soil profile (MFCS-X10). Distributions expressed as cumulative percentages.

Grain size distribution	
Total clay	0.05
Very fine silt	0.09
Fine silt	0.09
Medium silt	0.12
Coarse silt	0.15
Very coarse silt	0.19
Very fine sand	2.95
Fine sand	4.26
Medium sand	5.74
Coarse sand	5.74
Very coarse sand	42.11
Very fine gravel	46.73
Fine gravel	58.25
Medium gravel	67.26
Coarse cravel	100.0
Very coarse gravel	100.0
Small cobbles	100.0

Table D.54. Montgomery Fork bank soil profile (MFCS-X1). Units in m.

Name:	MFCS1-Soil_Profile		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	SOIL	0.0	100.0

Table D.55. Montgomery Fork cross section (CS) X1. Units in m.

Geometry			Name:	X1 (Downstream)
ID	Station (m)	Elevation (m)	River station:	0.6889
1	-25.00	366.00	**Indices of the toe and top of the bank**	
2	-15.00	364.00	Top of left bank:	4
3	0.00	362.70	Toe of left bank:	14
4	1.30	362.69	Top of right bank:	29
5	3.40	362.31	Toe of right bank:	23
6	6.00	361.81	**Groundwater table**	
7	7.40	361.79	Left bank:	0.0
8	7.75	361.51	Right bank:	0.0
9	8.30	361.02	**Bedrock elevation**	
10	9.35	360.52	Bedrock elevation:	358.50
11	10.90	360.42	**Boundary roughness**	
12	11.40	360.22	Left floodplain:	0.05
13	12.30	360.17	Left bank:	0.04
14	13.10	359.98	Streambed:	0.035
15	14.20	359.55	Right bank:	0.04
16	15.50	359.49	Right floodplain:	0.05
17	17.00	359.53	**Boundary materials**	
18	18.20	359.63	Bed sediment profile:	MFCS1_SEDIMENT
19	19.80	359.67	Left bank soil profile:	MFCS1-Soil_profile
20	21.20	359.68	Right bank soil profile:	MFCS1-Soil_profile
21	22.85	359.72		
22	24.00	359.74		
23	25.60	359.90		
24	27.60	360.39		
25	27.65	360.40		
26	28.80	361.23		
27	29.20	361.48		
28	31.10	361.72		
29	33.80	362.06		
30	37.60	362.12		
31	50.00	363.00		
32	65.00	365.00		
33	70.00	366.00		

Table D.56. Montgomery Fork cross section X2. Units in m.

Geometry				
ID	Station	Elevation	Name:	X2
1	-75.00	366.00	River station:	0.6192
2	-50.00	365.00	**Indices of the toe and top of the bank**	
3	-25.00	363.00	Top of left bank:	8
4	0.00	362.65	Toe of left bank:	20
5	2.50	362.64	Top of right bank:	34
6	5.50	362.60	Toe of right bank:	26
7	7.30	362.55	**Groundwater table**	
8	10.70	362.51	Left bank:	0.0
9	12.30	362.31	Right bank:	0.0
10	15.30	361.97	**Bedrock elevation**	
11	18.20	361.94	Bedrock elevation:	358.50
12	19.70	361.67	**Boundary roughness**	
13	21.00	361.15	Left floodplain:	0.05
14	21.50	361.09	Left bank:	0.04
15	23.00	360.97	Streambed:	0.035
16	24.60	360.56	Right bank:	0.04
17	25.60	360.42	Right floodplain:	0.05
18	26.50	360.32	**Boundary materials**	
19	27.90	360.21	Bed sediment profile:	MFCS1_SEDIMENT
20	28.90	360.09	Left bank soil profile:	MFCS1-Soil_profile
21	30.30	359.82	Right bank soil profile:	MFCS1-Soil_profile
22	31.50	359.63		
23	32.10	359.52		
24	32.20	359.70		
25	33.00	359.96		
26	33.80	360.18		
27	34.70	360.24		
28	35.20	360.87		
29	36.10	360.91		
30	36.90	360.99		
31	37.40	361.68		
32	38.40	361.70		
33	38.50	361.72		
34	39.60	362.57		
35	41.40	362.64		
36	43.30	362.72		
37	46.50	363.03		
38	50.00	363.50		
39	65.00	365.00		
40	70.00	366.00		

Table D.57. Montgomery Fork cross section X3. Units in m.

Geometry			Name:	X3
ID	Station	Elevation	River station:	0.5637
1	-65.00	367.00	**Indices of the toe and top of the bank**	
2	-35.00	363.00	Top of left bank:	3
3	0.00	362.72	Toe of left bank:	6
4	3.10	362.48	Top of right bank:	25
5	4.50	361.69	Toe of right bank:	21
6	5.65	360.68	**Groundwater table**	
7	6.50	360.54	Left bank:	0.0
8	7.70	360.62	Right bank:	0.0
9	9.20	360.70	**Bedrock elevation**	
10	10.40	360.72	Bedrock elevation:	359.5
11	11.50	360.74	**Boundary roughness**	
12	12.60	360.80	Left floodplain:	0.05
13	13.60	360.82	Left bank:	0.04
14	14.50	360.84	Streambed:	0.035
15	15.50	360.86	Right bank:	0.04
16	16.50	360.88	Right floodplain:	0.05
17	17.35	360.90	**Boundary materials**	
18	18.60	360.92	Bed sediment profile:	MFCS3_SEDIMENT
19	19.50	360.94	Left bank soil profile:	MFCS1-Soil_profile
20	20.40	361.00	Right bank soil profile:	MFCS1-Soil_profile
21	22.20	361.15		
22	23.00	361.36		
23	23.30	361.59		
24	25.30	362.16		
25	28.20	363.49		
26	30.00	363.56		
27	45.00	364.00		
28	70.00	367.00		

Table D.58. Montgomery Fork cross section X4. Units in m.

Geometry				
ID	Station	Elevation	Name:	X4
			River station:	0.4729
1	-30.00	367.00	**Indices of the toe and top of the bank**	
2	-15.00	366.00	Top of left bank:	4
3	0.00	363.03	Toe of left bank:	8
4	4.15	362.81	Top of right bank:	23
5	5.30	362.14	Toe of right bank:	19
6	7.05	361.91	**Groundwater table**	
7	8.30	361.61	Left bank:	0.0
8	9.00	361.48	Right bank:	0.0
9	10.10	361.45	**Bedrock elevation**	
10	11.50	361.43	Bedrock elevation:	360.0
11	12.70	361.41	**Boundary roughness**	
12	14.00	361.38	Left floodplain:	0.05
13	15.30	361.35	Left bank:	0.04
14	19.35	361.32	Streambed:	0.035
15	20.50	361.21	Right bank:	0.04
16	21.60	361.06	Right floodplain:	0.05
17	22.65	360.95	**Boundary materials**	
18	23.50	360.97	Bed sediment profile:	MFCS4_SEDIMENT
19	24.70	361.17	Left bank soil profile:	MFCS1-Soil_profile
20	25.30	361.55	Right bank soil profile:	MFCS1-Soil_profile
21	27.35	362.01		
22	29.60	362.02		
23	34.00	362.64		
24	40.00	364.00		
25	50.00	367.00		

Table D.59. Montgomery Fork cross section X5. Units in m.

Geometry				
ID	Station	Elevation	Name:	X5
1	-25.00	367.00	River station:	0.3972
2	-10.00	365.00	**Indices of the toe and top of the bank**	
3	0.00	362.89	Top of left bank:	4
4	2.92	362.39	Toe of left bank:	17
5	4.46	362.35	Top of right bank:	26
6	6.57	362.26	Toe of right bank:	22
7	8.13	361.90	**Groundwater table**	
8	9.42	361.78	Left bank:	0.0
9	10.68	361.66	Right bank:	0.0
10	11.99	361.50	**Bedrock elevation**	
11	12.93	361.44	Bedrock elevation:	359.6
12	13.85	361.40	**Boundary roughness**	
13	14.75	361.29	Left floodplain:	0.05
14	15.75	361.19	Left bank:	0.04
15	16.76	361.07	Streambed:	0.035
16	17.50	360.94	Right bank:	0.04
17	18.24	360.83	Right floodplain:	0.05
18	19.07	360.74	**Boundary materials**	
19	19.72	360.70	Bed sediment profile:	MFCS4_SEDIMENT
20	20.59	360.63	Left bank soil profile:	MFCS1-Soil_profile
21	21.13	360.60	Right bank soil profile:	MFCS1-Soil_profile
22	21.48	360.77		
23	22.01	361.44		
24	22.52	361.83		
25	23.34	362.34		
26	24.61	362.93		
27	27.41	363.32		
28	31.41	363.72		
29	35.00	364.50		
30	37.00	365.75		
31	45.00	367.00		

Table D.60. Montgomery Fork cross section X6. Units in m.

Geometry			Name:	X6
ID	Station	Elevation	River station:	0.3145
1	-15.00	367.00	**Indices of the toe and top of the bank**	
2	-10.00	366.00	Top of left bank:	6
3	0.00	364.53	Toe of left bank:	10
4	2.22	364.06	Top of right bank:	36
5	4.23	363.69	Toe of right bank:	27
6	7.08	363.63	**Groundwater table**	
7	8.52	363.18	Left bank:	0.0
8	9.97	362.55	Right bank:	0.0
9	10.36	362.24	**Bedrock elevation**	
10	10.67	361.89	Bedrock elevation:	360.4
11	11.22	361.88	**Boundary roughness**	
12	11.88	361.86	Left floodplain:	0.05
13	12.84	361.84	Left bank:	0.04
14	13.78	361.82	Streambed:	0.035
15	14.73	361.80	Right bank:	0.04
16	15.58	361.78	Right floodplain:	0.05
17	16.12	361.76	**Boundary materials**	
18	17.69	361.74	Bed sediment profile:	MFCS7_SEDIMENT
19	18.78	361.72	Left bank soil profile:	MFCS10-Soil_profile
20	19.78	361.70	Right bank soil profile:	MFCS10-Soil_profile
21	20.71	361.65		
22	21.72	361.59		
23	22.72	361.56		
24	23.83	361.49		
25	24.63	361.41		
26	25.30	361.37		
27	26.26	361.35		
28	26.82	361.56		
29	27.24	361.58		
30	27.39	361.99		
31	28.06	362.28		
32	28.61	362.53		
33	30.18	363.33		
34	31.70	363.46		
35	35.61	363.51		
36	45.97	363.98		
37	80.00	364.50		
38	100.00	367.00		

Table D.61. Montgomery Fork cross section X7. Units in m.

Geometry				
ID	Station	Elevation	River station:	0.2091
1	0.00	371.25	**Indices of the toe and top of the bank**	
2	5.80	369.61	Top of left bank:	2
3	6.70	368.63	Toe of left bank:	7
4	10.05	364.87	Top of right bank:	38
5	12.10	363.22	Toe of right bank:	23
6	12.77	362.68	**Groundwater table**	
7	13.07	362.04	Left bank:	0.0
8	13.48	361.90	Right bank:	0.0
9	14.11	361.84	**Bedrock elevation**	
10	14.70	361.83	Bedrock elevation:	360.8
11	15.18	361.81	**Boundary roughness**	
12	15.87	361.77	Left floodplain:	0.05
13	16.63	361.80	Left bank:	0.04
14	17.39	361.92	Streambed:	0.035
15	18.33	361.99	Right bank:	0.04
16	19.15	362.04	Right floodplain:	0.05
17	19.82	362.07	**Boundary materials**	
18	20.66	362.08	Bed sediment profile:	MFCS7_SEDIMENT
19	21.75	362.20	Left bank soil profile:	MFCS10-Soil_profile
20	22.92	362.37	Right bank soil profile:	MFCS10-Soil_profile
21	23.99	362.42		
22	24.85	362.55		
23	25.66	362.72		
24	26.55	362.75		
25	27.67	362.80		
26	28.95	362.82		
27	29.63	362.84		
28	30.25	362.86		
29	31.07	362.88		
30	32.26	362.90		
31	33.41	362.92		
32	35.56	363.14		
33	36.75	363.26		
34	38.27	363.30		
35	39.12	363.35		
36	39.91	363.70		
37	40.73	364.37		
38	42.41	364.63		
39	47.47	364.70		
40	50.00	365.00		
41	55.00	366.00		
42	65.00	370.00		
43	70.00	371.25		

Name: X7

Table D.62. Montgomery Fork cross section X8. Units in m.

Geometry			Name:	X8
ID	Station	Elevation	River station:	0.1158
1	-15.00	371.00	**Indices of the toe and top of the bank**	
2	-10.00	369.00	Top of left bank:	8
3	0.00	366.28	Toe of left bank:	15
4	4.48	364.76	Top of right bank:	34
5	6.92	364.64	Toe of right bank:	25
6	9.45	364.52	**Groundwater table**	
7	11.82	364.42	Left bank:	0.0
8	13.71	364.36	Right bank:	0.0
9	14.80	364.20	**Bedrock elevation**	
10	15.18	363.85	Bedrock elevation:	361.4
11	15.47	363.51	**Boundary roughness**	
12	15.96	363.43	Left floodplain:	0.05
13	16.68	363.24	Left bank:	0.04
14	17.25	363.01	Streambed:	0.035
15	17.65	362.78	Right bank:	0.04
16	18.39	362.69	Right floodplain:	0.05
17	19.44	362.57	**Boundary materials**	
18	20.42	362.46	Bed sediment profile:	MFCS7_SEDIMENT
19	21.46	362.45	Left bank soil profile:	MFCS10-Soil_profile
20	22.54	362.43	Right bank soil profile:	MFCS10-Soil_profile
21	23.63	362.44		
22	24.85	362.46		
23	25.75	362.50		
24	26.67	362.59		
25	27.47	362.73		
26	28.17	362.86		
27	28.92	362.99		
28	29.96	363.01		
29	30.78	363.33		
30	31.52	363.65		
31	32.88	363.90		
32	38.42	364.09		
33	41.59	364.13		
34	44.56	364.71		
35	47.34	364.79		
36	55.00	365.50		
37	70.00	366.50		
38	80.00	368.00		
39	85.00	369.00		
40	95.00	371.00		

Table D.63. Montgomery Fork cross section X9. Units in m.

Geometry				
ID	Station	Elevation	Name:	X9
			River station:	0.0519
1	-30.00	372.00	**Indices of the toe and top of the bank**	
2	-25.00	370.00	Top of left bank:	5
3	-5.00	366.00	Toe of left bank:	11
4	0.00	365.39	Top of right bank:	33
5	6.01	365.30	Toe of right bank:	28
6	10.23	365.16	**Groundwater table**	
7	12.32	364.90	Left bank:	0.0
8	13.83	364.45	Right bank:	0.0
9	15.66	363.85	**Bedrock elevation**	
10	16.62	363.65	Bedrock elevation:	362.0
11	17.61	363.45	**Boundary roughness**	
12	18.09	363.40	Left floodplain:	0.05
13	18.75	363.34	Left bank:	0.04
14	19.72	363.30	Streambed:	0.035
15	20.53	363.22	Right bank:	0.04
16	21.23	363.18	Right floodplain:	0.05
17	21.95	363.17	**Boundary materials**	
18	22.82	363.10	Bed sediment profile:	MFCS9_SEDIMENT
19	23.92	363.08	Left bank soil profile:	MFCS10-Soil_profile
20	24.72	363.06	Right bank soil profile:	MFCS10-Soil_profile
21	25.70	363.04		
22	26.44	363.02		
23	27.21	363.05		
24	28.15	363.10		
25	28.98	363.13		
26	29.94	363.19		
27	31.40	363.29		
28	32.33	363.40		
29	32.71	363.64		
30	33.67	363.94		
31	36.13	364.17		
32	38.96	364.77		
33	43.09	365.22		
34	53.39	365.56		
35	60.00	366.00		
36	70.00	367.50		
37	90.00	369.00		
38	100.00	372.00		

Table D.64. Montgomery Fork cross section X10. Units in m.

Geometry			Name:	X10 (Upstream)
ID	Station	Elevation	River station:	0.0
1	-150.00	372.00	**Indices of the toe and top of the bank**	
2	-125.00	370.00	Top of left bank:	3
3	-100.00	368.00	Toe of left bank:	12
4	-50.00	366.00	Top of right bank:	36
5	0.00	365.90	Toe of right bank:	30
6	9.49	365.85	**Groundwater table**	
7	16.72	365.50	Left bank:	0.0
8	17.68	365.08	Right bank:	0.0
9	18.24	364.40	**Bedrock elevation**	
10	18.82	364.13	Bedrock elevation:	362.4
11	19.34	363.81	**Boundary roughness**	
12	19.82	363.65	Left floodplain:	0.05
13	20.34	363.60	Left bank:	0.04
14	21.19	363.58	Streambed:	0.035
15	22.43	363.52	Right bank:	0.04
16	23.35	363.50	Right floodplain:	0.05
17	24.37	363.48	**Boundary materials**	
18	25.34	363.46	Bed sediment profile:	MFCS10_SEDIMENT
19	26.49	363.44	Left bank soil profile:	MFCS10-Soil_profile
20	27.89	363.42	Right bank soil profile:	MFCS10-Soil_profile
21	29.09	363.40		
22	30.20	363.38		
23	31.34	363.54		
24	32.30	363.57		
25	33.18	363.60		
26	34.41	363.63		
27	35.15	363.65		
28	36.09	363.67		
29	36.99	363.69		
30	37.79	363.95		
31	38.13	364.10		
32	40.04	364.28		
33	41.51	364.79		
34	44.29	365.49		
35	47.00	367.84		
36	50.72	368.43		
37	75.00	370.00		
38	85.00	372.00		

Table D.65. Montgomery Fork sediment transport options.

Sediment transport options	
% fines for cohesion	100
Downstream grade control	0
Upstream capacity weighting	0
Upstream boundary condition	AnnAGNPS
Class	Fraction
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0
11	0.0
12	0.0
13	0.0
14	0.0
15	0.0
16	0.0
17	0.0

Table D.66. Montgomery Fork simulation period. Time in mins.

Simulation Period	
Start time:	01/01/2005 01:00:00
End Time:	12/31/2008 23:59:00
Initial time step:	10

Table D.67. Montgomery Fork streambank erosion options. Time in mins.

Streambank erosion options	
Proccesses included in bank stability analyses:	
Included	Positive pore-water pressures
Included	Matric Suction
Included	Confining pressures
Number of shear emergencies	4
Tension crack depth	-1.0
Skipped time steps	2

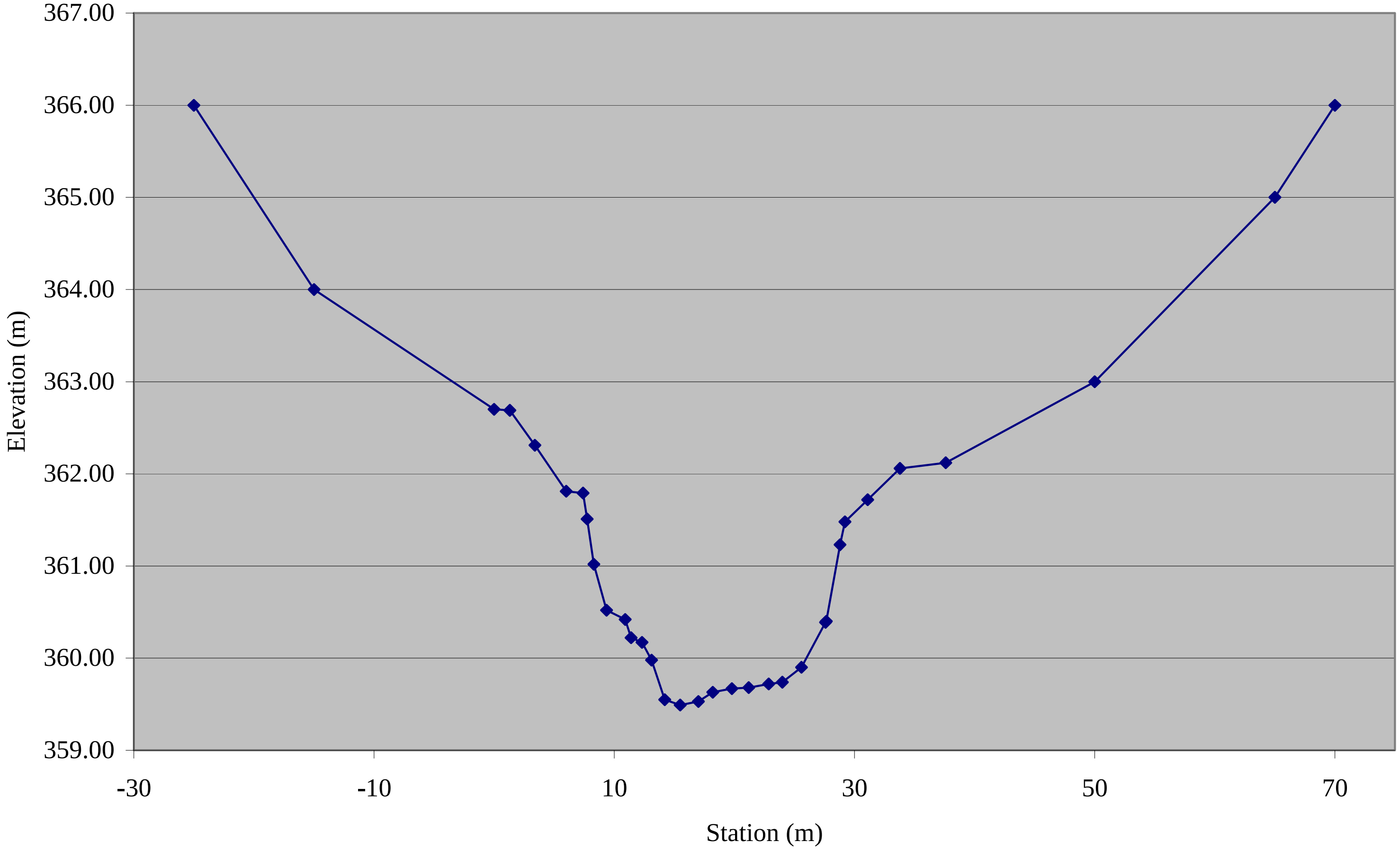


Figure D.15. Montgomery Fork cross section X1.

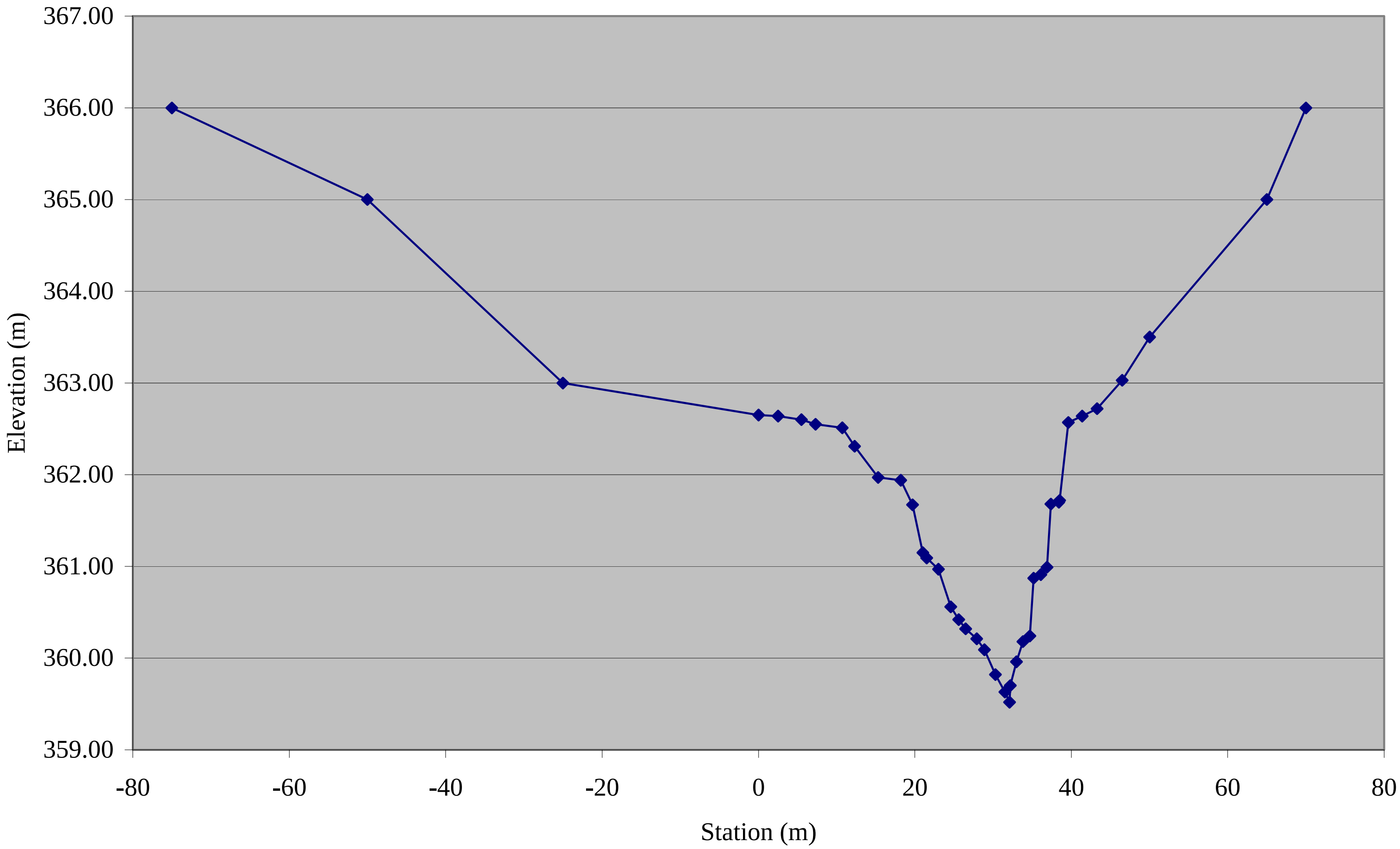


Figure D.16. Montgomery Fork cross section X2.

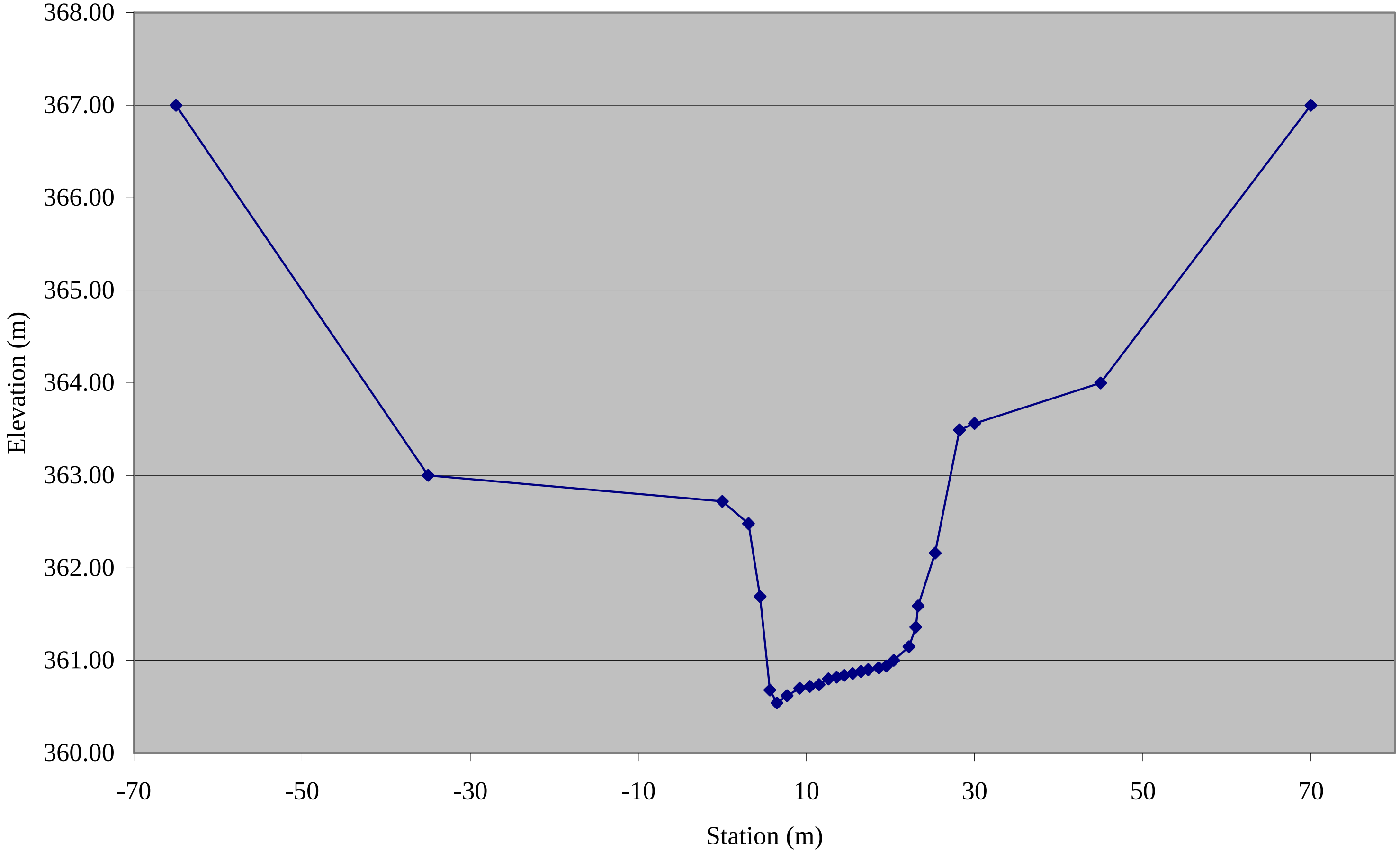


Figure D.17. Montgomery Fork cross section X3.

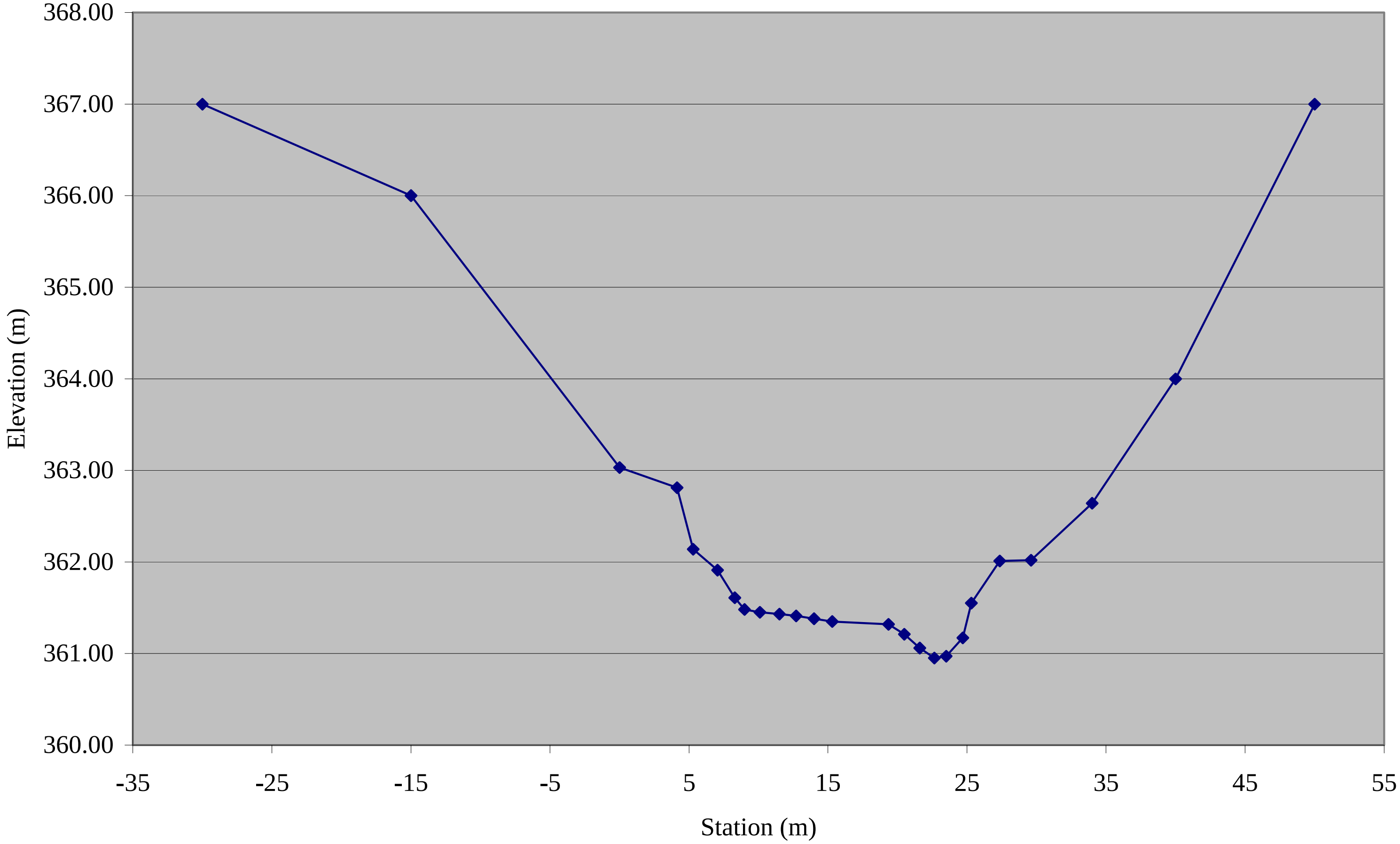


Figure D.18. Montgomery Fork cross section X4.

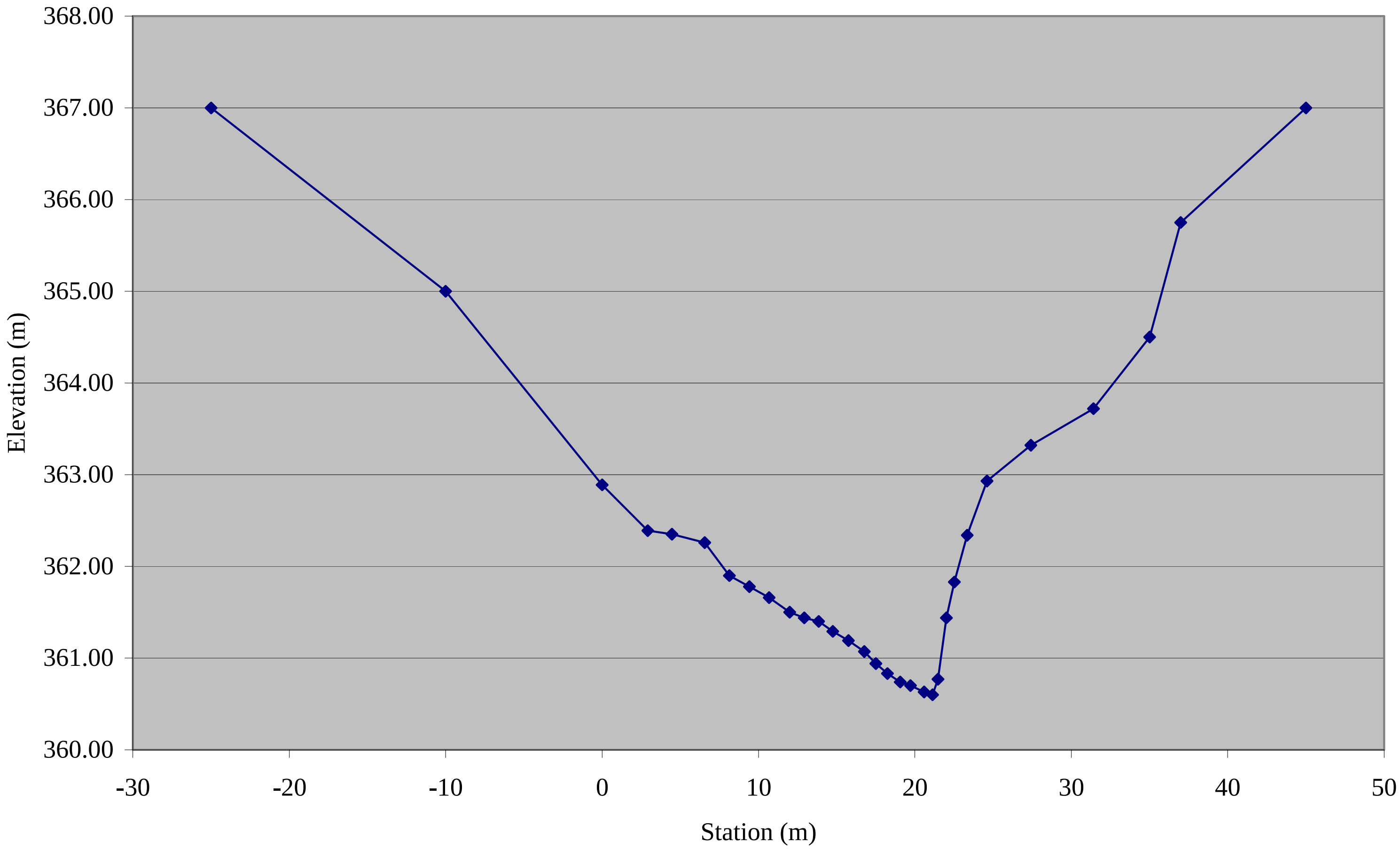


Figure D.19. Montgomery Fork cross section X5.

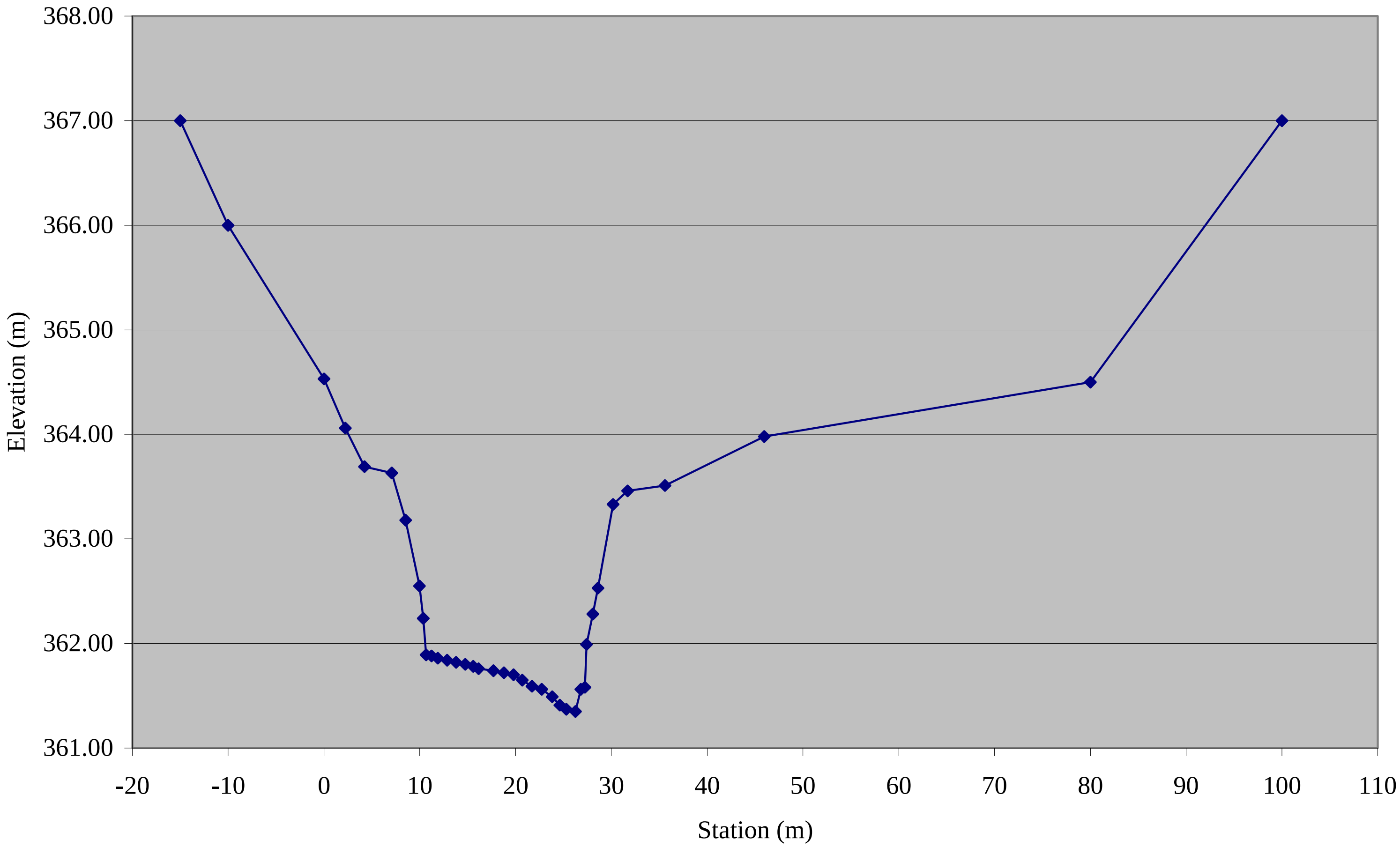


Figure D.20. Montgomery Fork cross section X6.

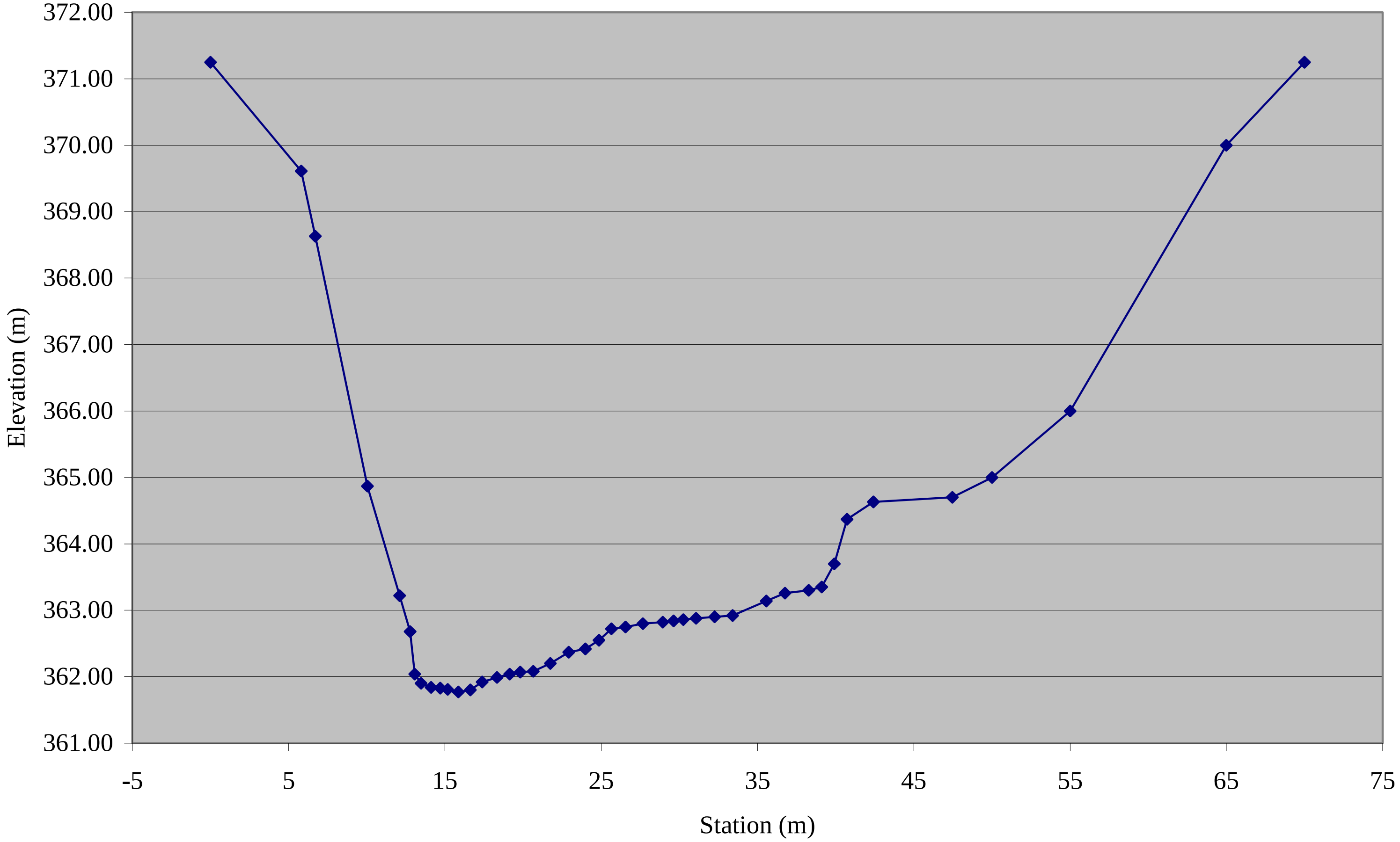


Figure D.21. Montgomery Fork cross section X7.

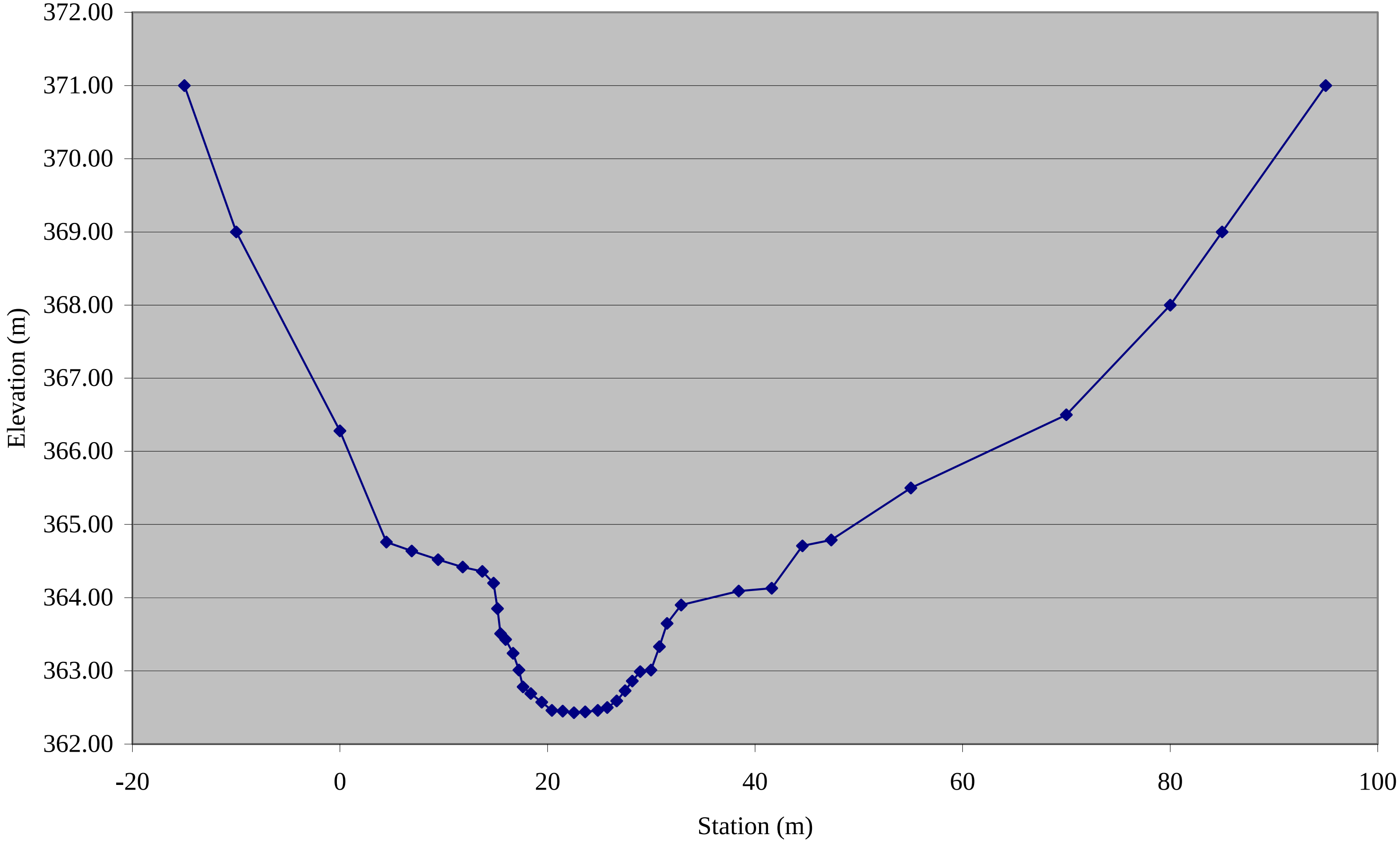


Figure D.22. Montgomery Fork cross section X8.

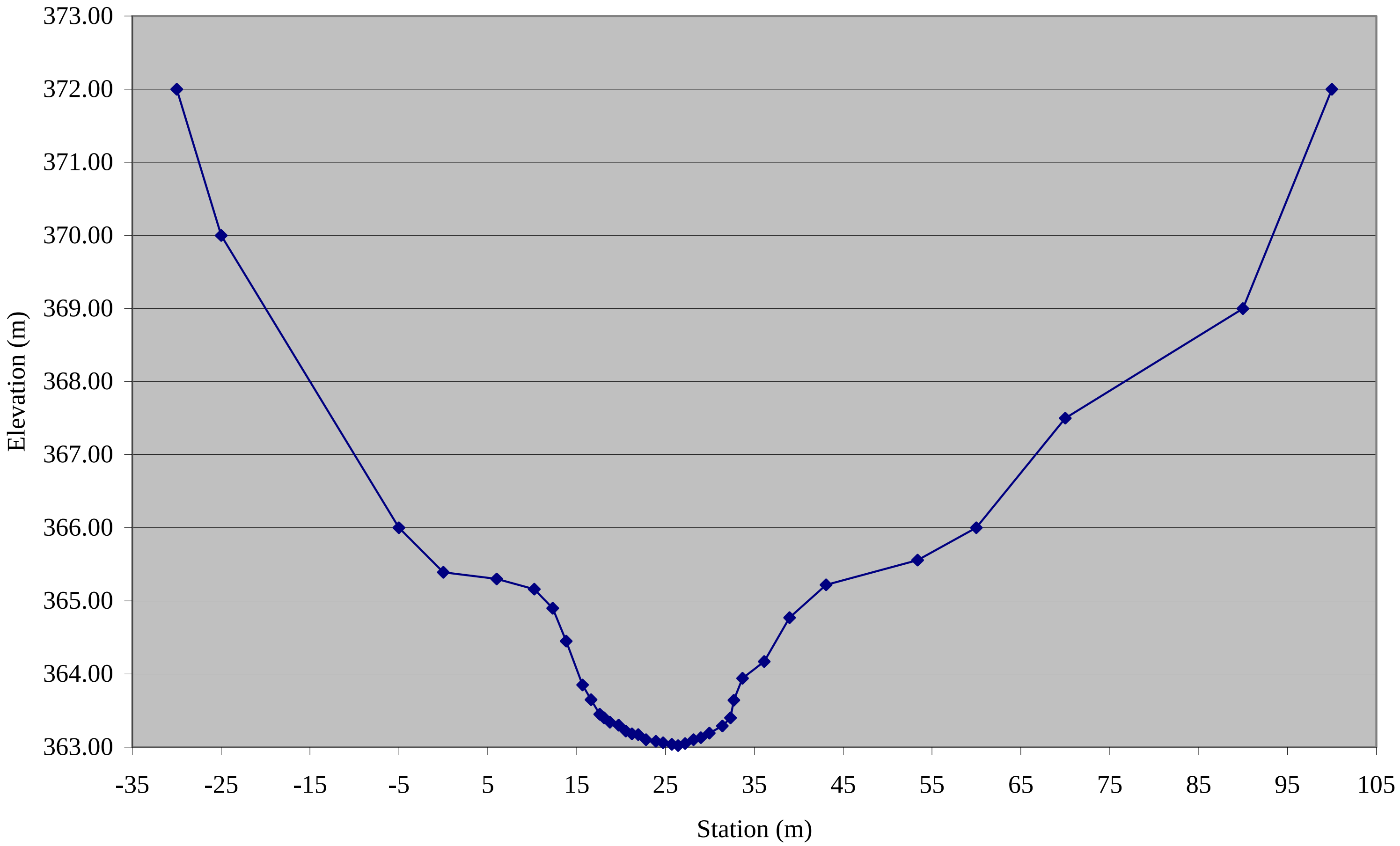


Figure D.23. Montgomery Fork cross section X9.

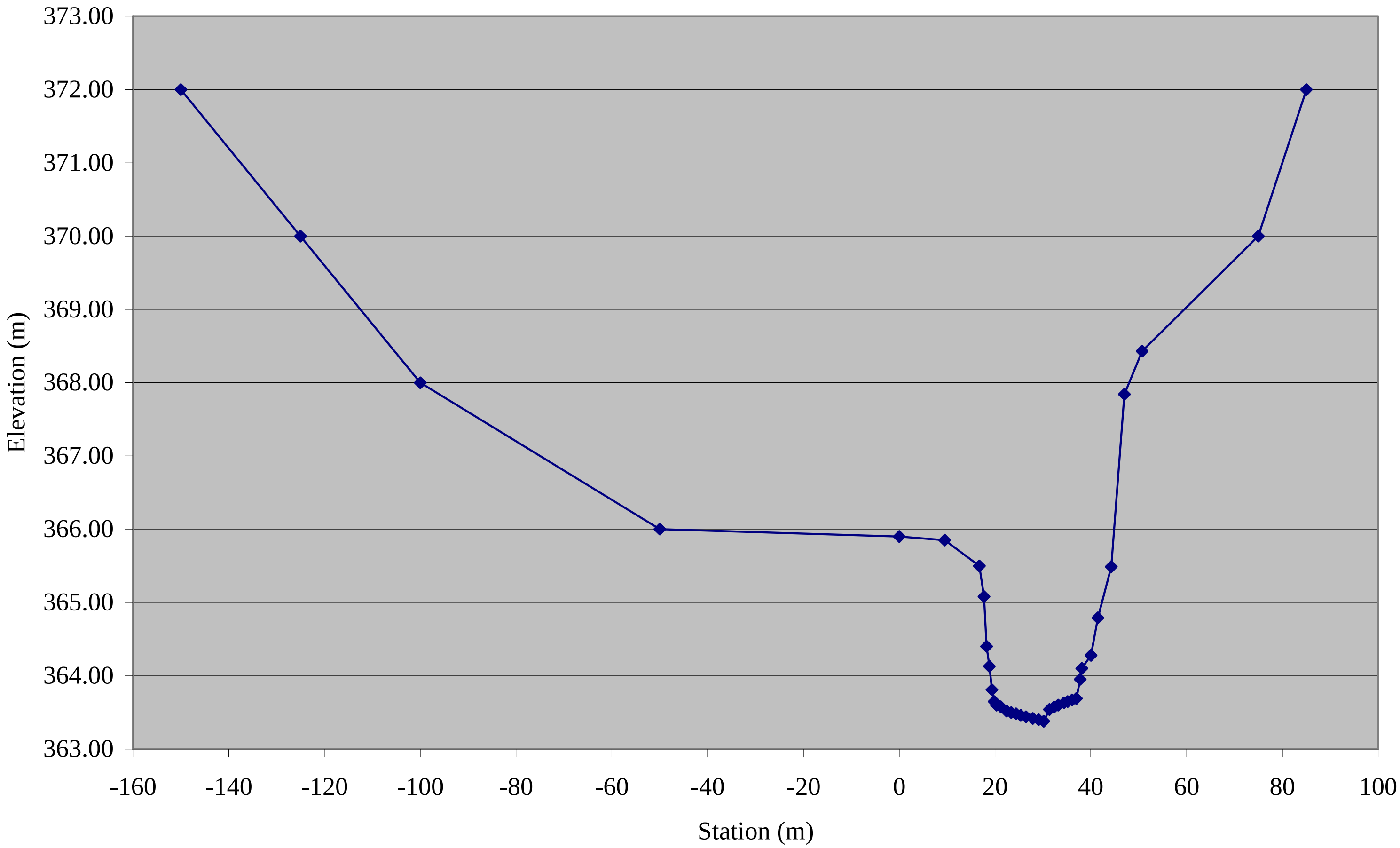


Figure D.24. Montgomery Fork cross section X10.

Table D.68. Smokey Creek pebble count data for cross-section X2.

Number	Dia. (mm)	Dia. (mm)	Dia. (mm)	Dia. (mm)
1	35	130	80	60
2	50	100	130	40
3	100	160	140	135
4	45	130	60	80
5	55	60	90	105
6	90	70	240	95
7	75	40	70	70
8	125	120	110	50
9	35	110	80	100
10	40	60	90	100
11	100	80	60	150
12	200	100	105	130
13	50	95	50	50
14	130	70	80	45
15	100	100	60	70
16	210	90	90	45
17	40	35	70	80
18	90	70	60	80
19	50	60	70	90
20	45	50	70	75
21	50	45	60	60
22	95	55	100	40
23	80	105	60	90
24	65	105	125	115
25	70	60	85	90
Pebble Count Performed at X3				

Table D.69. Smokey Creek pebble count summary for cross-section X2.

Minimum Dia. (mm)	35
Maximum Dia. (mm)	240
d16 (mm)	50
d50 (mm)	80
d84 (mm)	110
d90 (mm)	130
Pebble Count Performed at X3	

Table D.70. Smokey Creek sediment grain size distribution for cross-section X2. Sediment ranges in mm.

	Upper	Lower Bound	%	Cummulative %
Total clay	0.002	0.001	0	0
Very fine silt	0.004	0.002	0	0
Fine silt	0.008	0.004	0	0
Medium silt	0.016	0.008	0	0
Coarse silt	0.031	0.016	0	0
Very coarse silt	0.063	0.031	0	0
Very fine sand	0.125	0.063	0	0
Fine sand	0.25	0.125	0	0
Medium sand	0.5	0.25	0	0
Coarse sand	1	0.5	0	0
Very coarse sand	2	1	0	0
Very fine gravel	4	2	0	0
Fine gravel	8	4	0	0
Medium gravel	16	8	0	0
Coarse cravel	32	16	0	0
Very coarse gravel	64	32	35	35
Small cobbles	128	64	65	100
Pebble Count Performed at X3				

Table D.71. Smokey Creek sediment profile. Units in m.

Name:	SED PROFILE		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	SED	0.0	100.0

Table D.72. Smokey Creek bank soil data at cross section X2. Units in mm for sediment classes and distributions expressed as cumulative percentages.

Total Clay	0-0.002	2.78
Very Fine Silt	0.002-0.004	4.75
Fine Silt	0.004-0.008	7.10
Medium Silt	0.008-0.016	11.02
Coarse Silt	0.016-0.031	18.08
Very Coarse Silt	0.031-0.063	32.00
Very Fine Sand	0.063-0.125	51.84
Fine Sand	0.125-0.25	86.42
Medium Sand	0.25-0.5	97.08
Coarse Sand	0.5-1.0	97.08
Very Coarse Sand	1.0-2.0	100.0
Very Fine Gravel	2.0-4.0	100.0
Fine Gravel	4.0-8.0	100.0
Medium Gravel	8.0-16.0	100.0
Coarse Gravel	16.0-32.0	100.0
Very Coarse Gravel	32.0-64.0	100.0
Small Cobbles	> 64.0	100.0

Table D.73. Smokey Creek bank soil data at cross section X2.5. Units in mm for sediment classes and distributions expressed as cumulative percentages.

Total Clay	0-0.002	6.01
Very Fine Silt	0.002-0.004	10.15
Fine Silt	0.004-0.008	14.56
Medium Silt	0.008-0.016	19.74
Coarse Silt	0.016-0.031	26.47
Very Coarse Silt	0.031-0.063	63.91
Very Fine Sand	0.063-0.125	63.91
Fine Sand	0.125-0.25	92.50
Medium Sand	0.25-0.5	98.68
Coarse Sand	0.5-1.0	98.68
Very Coarse Sand	1.0-2.0	100.0
Very Fine Gravel	2.0-4.0	100.0
Fine Gravel	4.0-8.0	100.0
Medium Gravel	8.0-16.0	100.0
Coarse Gravel	16.0-32.0	100.0
Very Coarse Gravel	32.0-64.0	100.0
Small Cobbles	> 64.0	100.0

Table D.74. Smokey Creek left bank soil profile. Units in m.

Name:	Left Bank		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	SOIL_BANK-X2	0.0	100.0

Table D.75. Smokey Creek right bank soil profile. Units in m.

Name:	Right Bank		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	SOIL_BANK-X2	0.0	100.0

Table D.76. Smokey Creek eroding bank soil profile. Units in m.

Name:	SOIL_BANK-X2.5		
Profile location			
Easting:	-99.0		
Northing:	-99.0		
Elevation:	-99.0		
Profile layers			
Number of layers:	1		
	Sediment	Top depth	Bottom depth
Layer 1:	SOIL_BANK-X2.5	0.0	100.0

Table D.77. Smokey Creek cross section X0. Units in m.

Geometry			Name:	X0 (downstream)
ID	Station (m)	Elevation (m)	River station:	1.295
1	-150.00	42.00	**Indices of the toe and top of the bank**	
2	-100.00	30.75	Top of left bank:	3
3	0.00	30.43	Toe of left bank:	6
4	1.83	30.20	Top of right bank:	20
5	4.88	28.36	Toe of right bank:	17
6	6.40	28.36	**Groundwater table**	
7	7.93	28.34	Left bank:	0.0
8	9.45	28.34	Right bank:	0.0
9	10.98	28.30	**Bedrock elevation**	
10	12.50	28.28	Bedrock elevation:	0.0
11	14.02	28.04	**Boundary roughness**	
12	15.55	27.92	Left floodplain:	0.05
13	17.07	27.88	Left bank:	0.04
14	18.60	27.87	Streambed:	0.035
15	19.21	27.86	Right bank:	0.04
16	21.04	27.84	Right floodplain:	0.05
17	21.95	28.28	**Boundary materials**	
18	23.63	30.07	Bed sediment profile:	SED PROFILE
19	26.00	31.00	Left bank soil profile:	Left Bank
20	40.00	32.00	Right bank soil profile:	Right Bank
21	50.00	38.00		
22	75.00	42.00		

Table D.78. Smokey Creek cross section X0.5. Units in m.

Geometry			Name:	X0.5
ID	Station	Elevation	River station:	1.1209
1	-100	42	**Indices of the toe and top of the bank**	
2	-50	31.25	Top of left bank:	3
3	0.00	30.97	Toe of left bank:	6
4	1.52	30.74	Top of right bank:	20
5	3.05	28.62	Toe of right bank:	16
6	3.96	28.21	**Groundwater table**	
7	5.49	28.04	Left bank:	0.0
8	7.01	28.02	Right bank:	0.0
9	8.54	28.16	**Bedrock elevation**	
10	10.06	28.26	Bedrock elevation:	0.0
11	11.59	28.35	**Boundary roughness**	
12	13.11	28.46	Left floodplain:	0.05
13	14.63	28.58	Left bank:	0.04
14	16.16	28.67	Streambed:	0.035
15	17.68	28.75	Right bank:	0.04
16	19.21	28.95	Right floodplain:	0.05
17	22.26	30.15	**Boundary materials**	
18	23.48	30.21	Bed sediment profile:	SED PROFILE
19	26.22	30.76	Left bank soil profile:	Left Bank
20	32.32	31.06	Right bank soil profile:	Right Bank
21	40.00	36.00		
22	55.00	37.00		
23	75.00	42.00		

Table D.79. Smokey Creek cross section X1. Units in m.

Geometry				
ID	Station	Elevation	Name:	X1
			River station:	0.9184
1	-125.00	41.00	**Indices of the toe and top of the bank**	
2	-100.00	31.50	Top of left bank:	4
3	-25.00	31.25	Toe of left bank:	9
4	0.00	30.98	Top of right bank:	30
5	3.66	30.70	Toe of right bank:	27
6	4.88	30.41	**Groundwater table**	
7	6.10	29.53	Left bank:	0.0
8	7.32	29.03	Right bank:	0.0
9	7.93	28.99	**Bedrock elevation**	
10	8.84	28.97	Bedrock elevation:	0.0
11	9.76	28.96	**Boundary roughness**	
12	10.67	28.95	Left floodplain:	0.05
13	11.59	28.94	Left bank:	0.04
14	12.50	28.93	Streambed:	0.035
15	13.42	28.92	Right bank:	0.04
16	14.33	28.91	Right floodplain:	0.05
17	15.24	28.90	**Boundary materials**	
18	16.16	28.85	Bed sediment profile:	SED PROFILE
19	17.07	28.76	Left bank soil profile:	Left Bank
20	17.99	28.77	Right bank soil profile:	Right Bank
21	18.90	28.78		
22	19.82	28.79		
23	20.73	28.80		
24	21.65	28.81		
25	22.56	28.82		
26	23.48	28.83		
27	24.09	28.84		
28	24.70	29.10		
29	25.61	30.51		
30	27.44	31.16		
31	30.18	31.30		
32	31.40	31.33		
33	32.62	31.43		
34	33.84	31.68		
35	35.06	32.21		
36	37.20	34.41		
37	40.00	37.00		
38	55.00	38.00		
39	60.00	41.00		

Table D.80. Smokey Creek cross section X2. Units in m.

Geometry				
ID	Station	Elevation	Name:	X2
			River station:	0.7794
1	-25.00	40.00	**Indices of the toe and top of the bank**	
2	-5.00	34.13	Top of left bank:	4
3	1.52	31.25	Toe of left bank:	8
4	62.50	31.09	Top of right bank:	28
5	64.02	30.74	Toe of right bank:	22
6	65.24	29.68	**Groundwater table**	
7	66.46	29.51	Left bank:	0.0
8	67.07	29.33	Right bank:	0.0
9	67.99	29.25	**Bedrock elevation**	
10	68.90	29.26	Bedrock elevation:	0.0
11	69.82	29.27	**Boundary roughness**	
12	70.73	29.35	Left floodplain:	0.05
13	71.65	29.35	Left bank:	0.04
14	72.56	29.36	Streambed:	0.035
15	73.48	29.43	Right bank:	0.04
16	74.39	29.50	Right floodplain:	0.05
17	75.92	29.62	**Boundary materials**	
18	77.44	29.68	Bed sediment profile:	SED PROFILE
19	78.96	29.70	Left bank soil profile:	Left Bank
20	80.49	29.72	Right bank soil profile:	Right Bank
21	82.01	29.75		
22	83.54	29.79		
23	86.59	29.98		
24	89.63	30.36		
25	92.68	30.38		
26	93.29	30.40		
27	94.51	30.43		
28	96.95	31.55		
29	99.39	31.60		
30	112.81	31.65		
31	120.00	35.05		
32	140.00	40.00		

Table D.81. Smokey Creek cross section X2.5. Units in m.

Geometry				
ID	Station	Elevation	Name:	X2.5 - Eroding Bank
			River station:	0.5913
1	-100.00	40.00	**Indices of the toe and top of the bank**	
2	-75.00	32.50	Top of left bank:	3
3	0.00	32.28	Toe of left bank:	4
4	1.98	29.89	Top of right bank:	23
5	3.20	29.84	Toe of right bank:	20
6	4.42	29.85	**Groundwater table**	
7	5.64	29.86	Left bank:	0.0
8	7.47	29.87	Right bank:	0.0
9	8.69	29.88	**Bedrock elevation**	
10	9.91	29.90	Bedrock elevation:	0.0
11	11.13	30.04	**Boundary roughness**	
12	12.65	30.18	Left floodplain:	0.05
13	14.18	30.24	Left bank:	0.04
14	15.70	30.30	Streambed:	0.035
15	17.23	30.32	Right bank:	0.04
16	18.75	30.35	Right floodplain:	0.05
17	21.80	30.39	**Boundary materials**	
18	24.54	30.65	Bed sediment profile:	SED PROFILE
19	34.60	30.70	Left bank soil profile:	SOIL_BANK-X2.5
20	41.62	30.75	Right bank soil profile:	Right Bank
21	44.67	33.80		
22	50.00	35.00		
23	55.00	35.25		
24	75.00	40.00		

Table D.82. Smokey Creek cross section X3. Units in m.

Geometry				
ID	Station	Elevation	Name:	X3
			River station:	0.5008
1	-50.00	39.00	**Indices of the toe and top of the bank**	
2	-25.00	32.50	Top of left bank:	3
3	0.00	32.29	Toe of left bank:	9
4	2.74	32.09	Top of right bank:	26
5	5.49	31.78	Toe of right bank:	23
6	8.23	31.49	**Groundwater table**	
7	10.67	30.80	Left bank:	0.0
8	11.89	30.64	Right bank:	0.0
9	12.81	30.49	**Bedrock elevation**	
10	13.72	30.48	Bedrock elevation:	0.0
11	16.46	30.46	**Boundary roughness**	
12	17.38	30.44	Left floodplain:	0.05
13	18.60	30.42	Left bank:	0.04
14	19.82	30.34	Streambed:	0.035
15	21.04	30.33	Right bank:	0.04
16	22.26	30.33	Right floodplain:	0.05
17	23.48	30.37	**Boundary materials**	
18	24.70	30.39	Bed sediment profile:	SED PROFILE
19	25.92	30.40	Left bank soil profile:	Left Bank
20	27.13	30.41	Right bank soil profile:	Right Bank
21	28.35	30.42		
22	29.57	30.43		
23	30.79	30.45		
24	33.23	30.77		
25	34.45	31.24		
26	35.06	31.90		
27	41.16	31.93		
28	47.00	34.97		
29	57.00	35.00		
30	65.00	39.00		

Table D.83. Smokey Creek cross section X4. Units in m.

Geometry				
ID	Station	Elevation	Name:	X4
			River station:	0.3584
1	-40.00	40.00	**Indices of the toe and top of the bank**	
2	-15.00	37.00	Top of left bank:	6
3	-5.00	35.00	Toe of left bank:	8
4	0.00	33.47	Top of right bank:	27
5	1.52	33.07	Toe of right bank:	24
6	7.01	32.77	**Groundwater table**	
7	10.37	32.01	Left bank:	0.0
8	12.20	31.59	Right bank:	0.0
9	13.42	31.55	**Bedrock elevation**	
10	16.46	31.43	Bedrock elevation:	0.0
11	19.21	31.33	**Boundary roughness**	
12	20.43	31.24	Left floodplain:	0.05
13	21.65	31.23	Left bank:	0.04
14	22.87	31.19	Streambed:	0.035
15	24.09	31.16	Right bank:	0.04
16	25.31	31.15	Right floodplain:	0.05
17	26.52	31.14	**Boundary materials**	
18	27.74	31.10	Bed sediment profile:	SED PROFILE
19	28.96	31.13	Left bank soil profile:	Left Bank
20	30.18	31.15	Right bank soil profile:	Right Bank
21	32.01	31.16		
22	33.54	31.17		
23	34.76	31.18		
24	35.98	31.19		
25	36.89	31.70		
26	42.68	31.72		
27	46.00	33.15		
28	50.00	33.20		
29	52.13	33.22		
30	67.68	33.24		
31	75.00	34.76		
32	90.00	35.00		
33	120.00	40.00		

Table D.84. Smokey Creek cross section X5. Units in m.

Geometry			Name:	X5
ID	Station	Elevation	River station:	0.245
1	-25.00	37.00	**Indices of the toe and top of the bank**	
2	-10.00	33.50	Top of left bank:	3
3	0.00	33.02	Toe of left bank:	5
4	2.13	31.83	Top of right bank:	25
5	2.74	31.74	Toe of right bank:	17
6	3.96	31.57	**Groundwater table**	
7	5.18	31.48	Left bank:	0.0
8	6.40	31.49	Right bank:	0.0
9	7.62	31.50	**Bedrock elevation**	
10	8.84	31.51	Bedrock elevation:	0.0
11	10.06	31.60	**Boundary roughness**	
12	11.28	31.62	Left floodplain:	0.05
13	12.50	31.65	Left bank:	0.04
14	13.72	31.68	Streambed:	0.035
15	14.94	31.70	Right bank:	0.04
16	16.16	31.74	Right floodplain:	0.05
17	16.77	31.85	**Boundary materials**	
18	20.43	32.14	Bed sediment profile:	SED PROFILE
19	21.34	32.40	Left bank soil profile:	Left Bank
20	22.26	32.45	Right bank soil profile:	Right Bank
21	23.78	32.50		
22	25.92	32.55		
23	28.05	32.60		
24	28.96	32.63		
25	30.79	33.46		
26	38.00	33.60		
27	45.00	37.00		

Table D.85. Smokey Creek cross section X6. Units in m.

Geometry				
ID	Station	Elevation	Name:	X6
			River station:	0.129
1	-15.00	40.00	**Indices of the toe and top of the bank**	
2	-7.50	36.00	Top of left bank:	2
3	0.00	33.95	Toe of left bank:	5
4	1.52	33.86	Top of right bank:	27
5	6.10	32.40	Toe of right bank:	23
6	8.23	32.35	**Groundwater table**	
7	9.45	32.33	Left bank:	0.0
8	10.67	32.27	Right bank:	0.0
9	11.89	32.18	**Bedrock elevation**	
10	13.11	32.05	Bedrock elevation:	0.0
11	14.33	31.92	**Boundary roughness**	
12	15.55	31.81	Left floodplain:	0.05
13	16.77	31.75	Left bank:	0.04
14	17.99	31.69	Streambed:	0.035
15	19.21	31.67	Right bank:	0.04
16	20.43	31.69	Right floodplain:	0.05
17	21.65	31.70	**Boundary materials**	
18	22.87	31.84	Bed sediment profile:	SED PROFILE
19	23.48	31.87	Left bank soil profile:	Left Bank
20	24.09	31.95	Right bank soil profile:	Right Bank
21	24.70	32.08		
22	27.13	32.63		
23	28.35	32.72		
24	31.10	33.47		
25	32.32	33.78		
26	40.00	34.25		
27	50.00	38.00		
28	65.00	40.00		

Table D.86. Smokey Creek cross section X7. Units in m.

Geometry			Name:	X7 (upstream)
ID	Station	Elevation	River station:	0.0
1	-30.00	40.00	**Indices of the toe and top of the bank**	
2	-10.00	34.75	Top of left bank:	2
3	0.00	34.29	Toe of left bank:	7
4	2.44	34.02	Top of right bank:	25
5	4.88	33.70	Toe of right bank:	21
6	7.17	32.00	**Groundwater table**	
7	7.93	31.86	Left bank:	0.0
8	8.84	31.81	Right bank:	0.0
9	9.76	31.91	**Bedrock elevation**	
10	10.37	31.96	Bedrock elevation:	0.0
11	11.59	32.04	**Boundary roughness**	
12	12.81	32.05	Left floodplain:	0.05
13	14.02	32.09	Left bank:	0.04
14	15.24	32.12	Streambed:	0.035
15	16.77	32.14	Right bank:	0.04
16	18.29	32.16	Right floodplain:	0.05
17	19.82	32.18	**Boundary materials**	
18	21.34	32.20	Bed sediment profile:	SED PROFILE
19	22.87	32.22	Left bank soil profile:	Left Bank
20	24.39	32.25	Right bank soil profile:	Right Bank
21	26.83	32.30		
22	29.57	33.84		
23	31.40	34.09		
24	32.93	34.12		
25	40.00	34.50		
26	60.00	40.00		

Table D.87. Smokey Creek sediment transport options.

Sediment transport options	
% fines for cohesion	100
Downstream grade control	0
Upstream capacity weighting	0
Upstream boundary condition	AnnAGNPS
Class	Fraction
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0
11	0.0
12	100.0
13	100.0
14	100.0
15	100.0
16	100.0
17	100.0

Table D.88. Smokey Creek simulation period. Time in mins.

Simulation Period	
Start time:	01/01/2005 02:00:00
End Time:	12/31/2008 23:59:00
Initial time step:	10

Table D.89. Smokey Creek streambank erosion options. Time in mins.

Streambank erosion options	
Proccesses included in bank stability analyses:	
Included	Positive pore-water pressures
Included	Matric Suction
Included	Confining pressures
Number of shear emergencies	4
Tension crack depth	-1.0
Skipped time steps	2

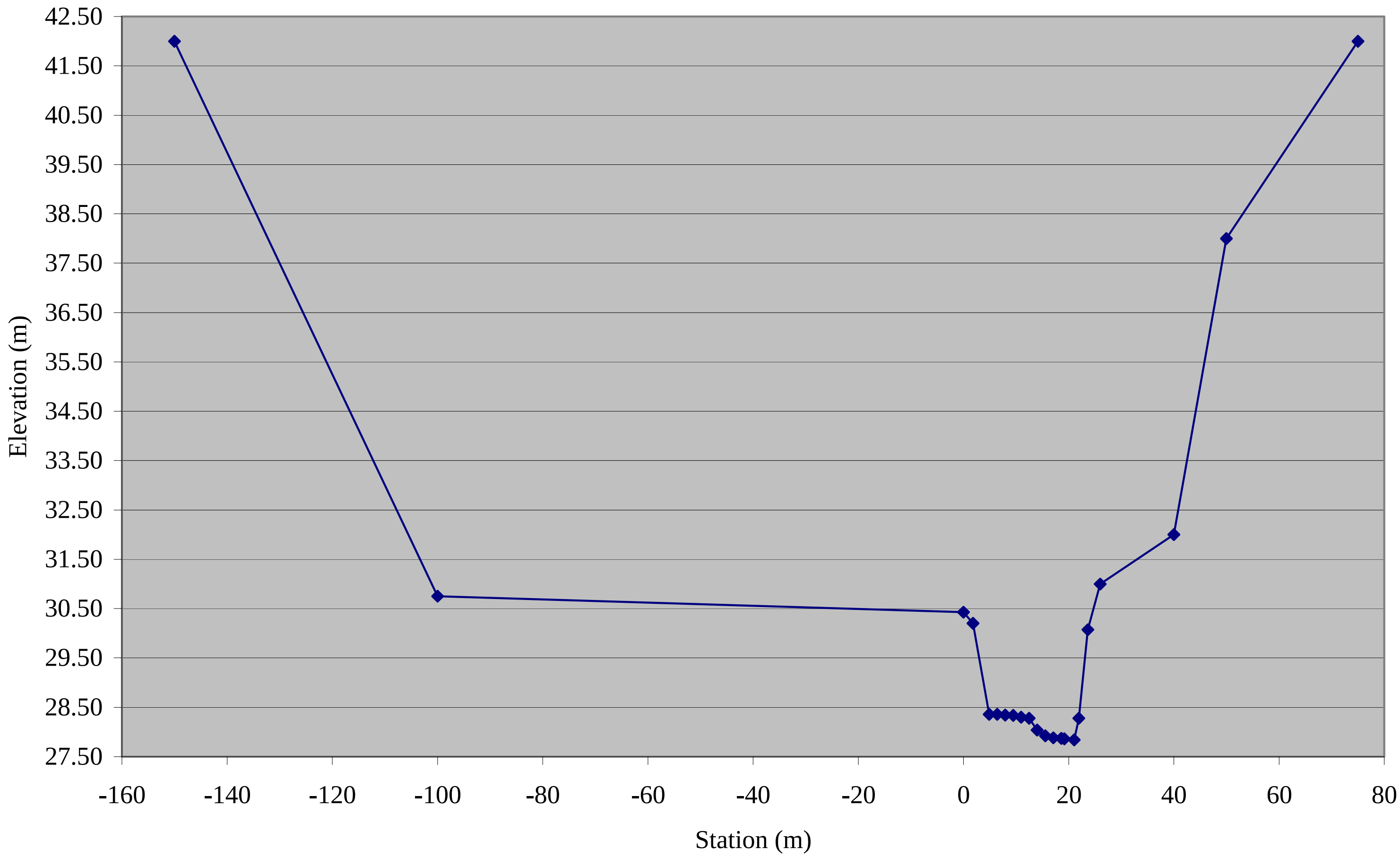


Figure D.25. Smokey Creek cross section X0.

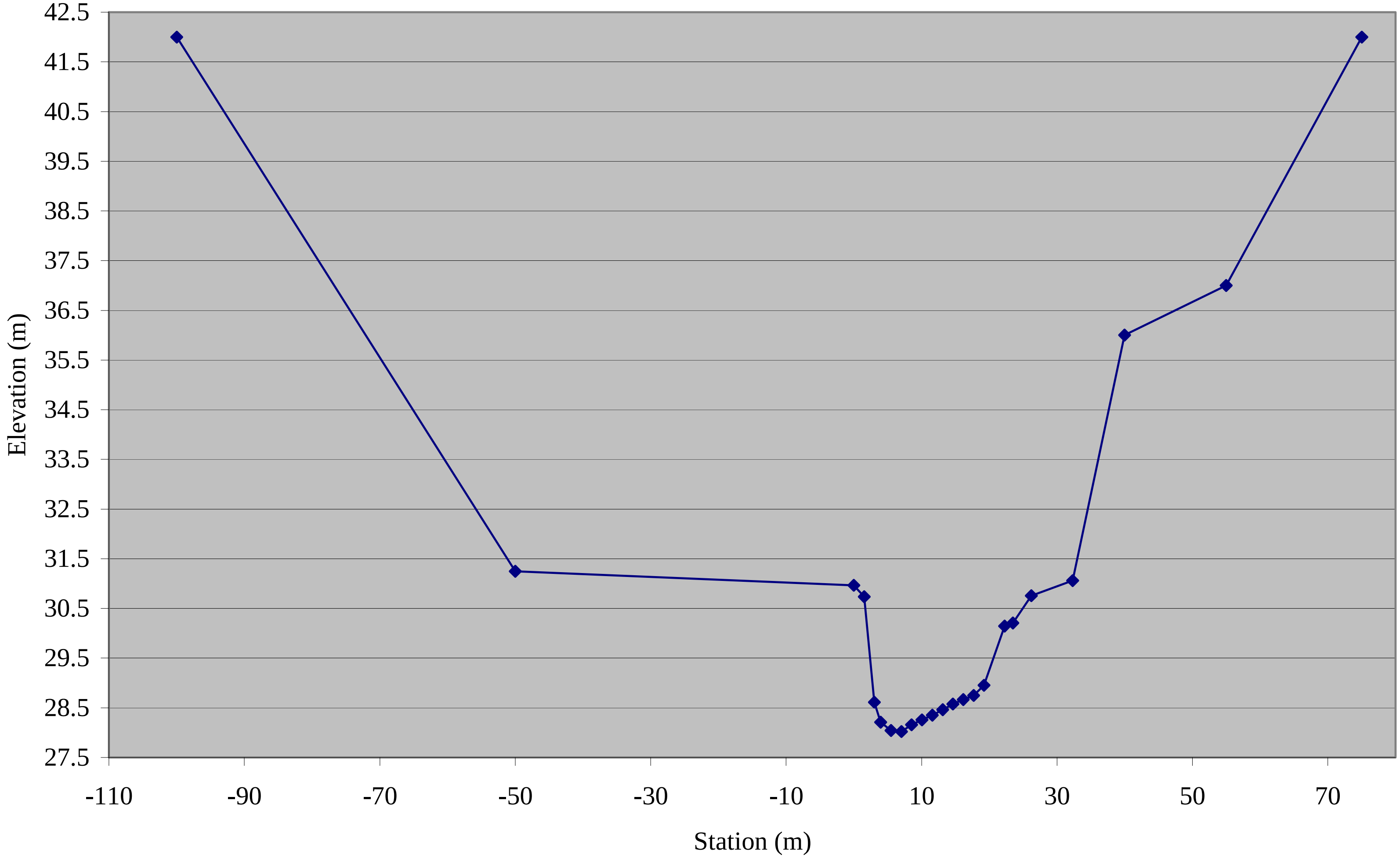


Figure D.26. Smokey Creek cross section X0.5.

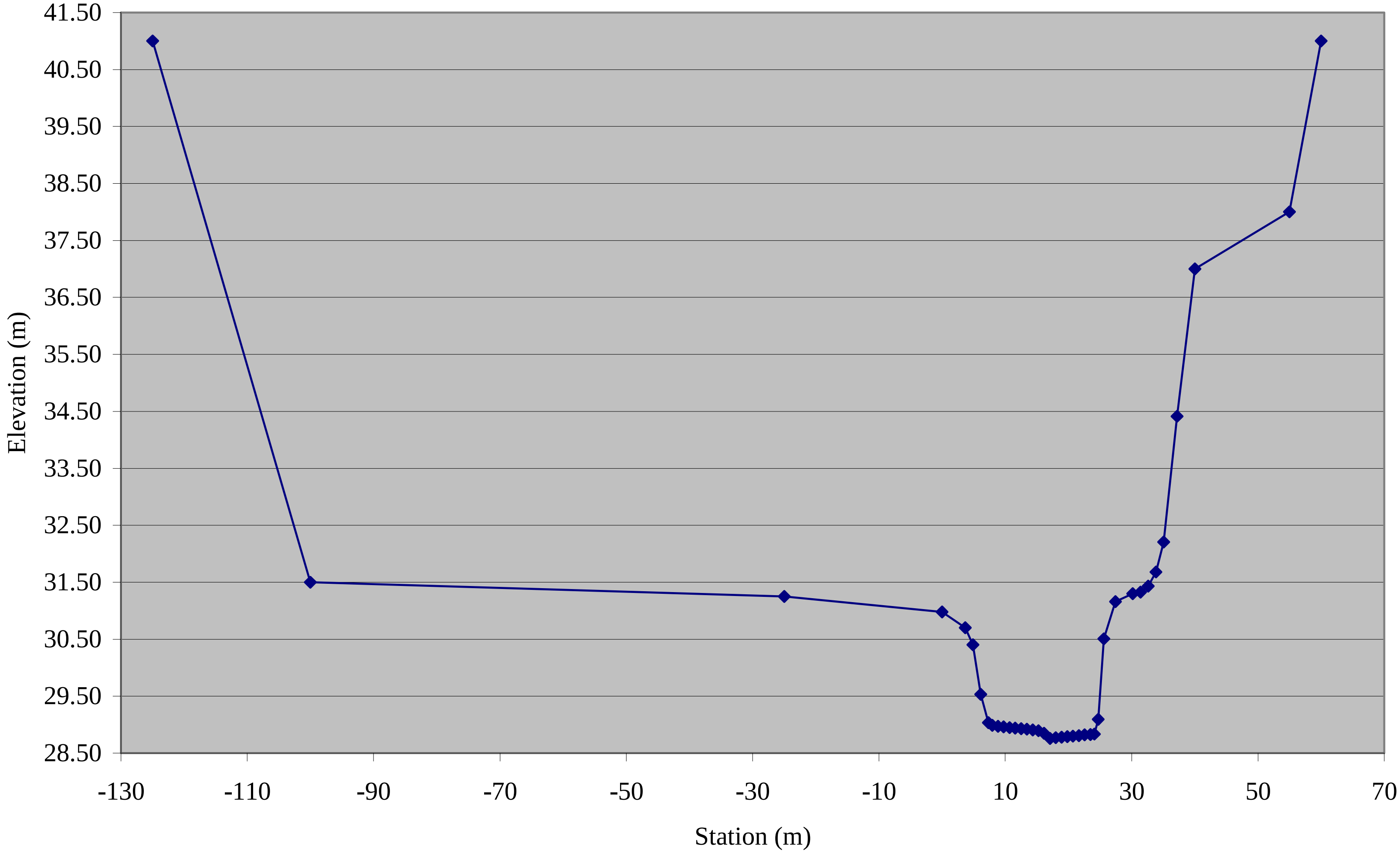


Figure D.27. Smokey Creek cross section X1.

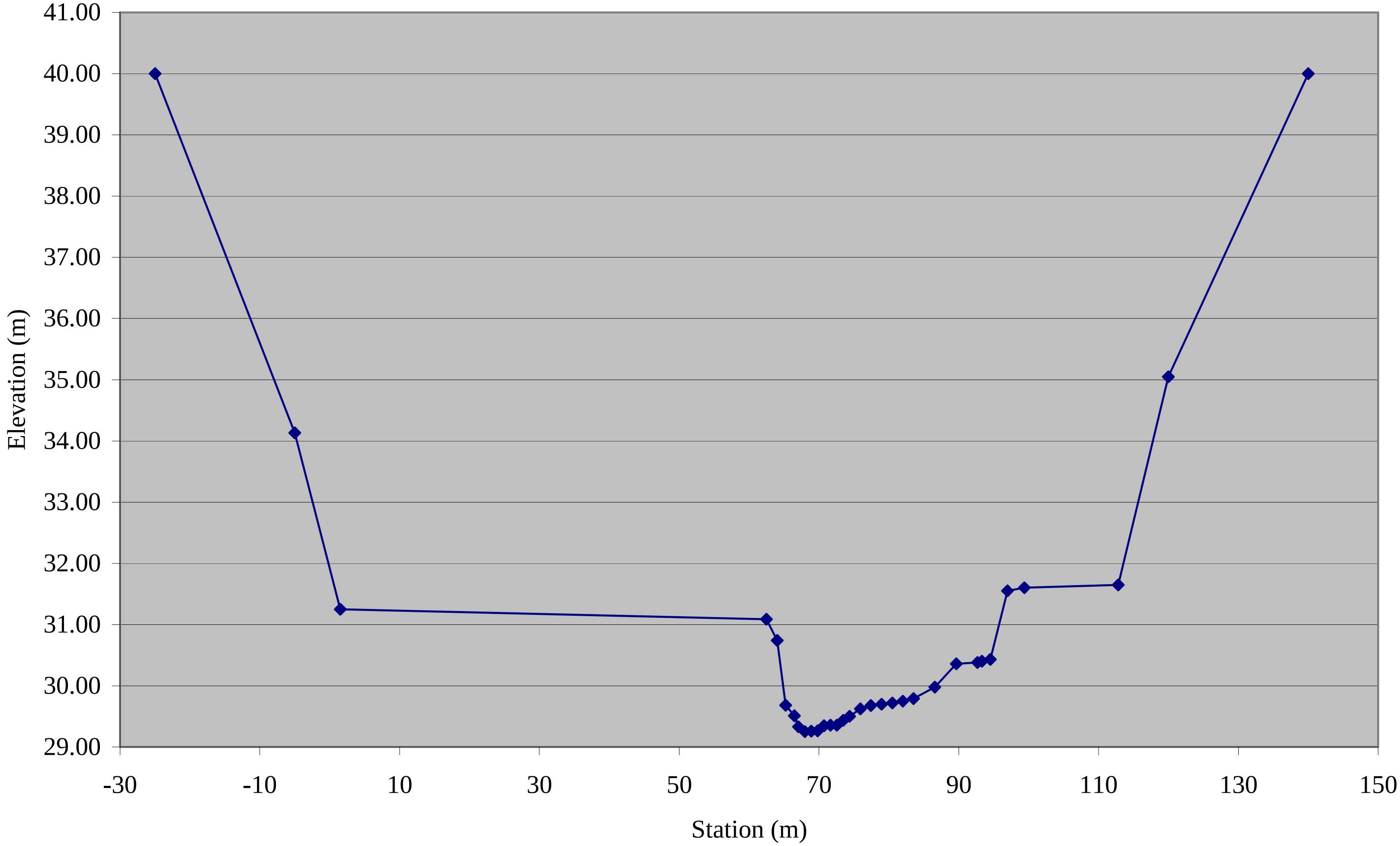


Figure D.28. Smokey Creek cross section X2.

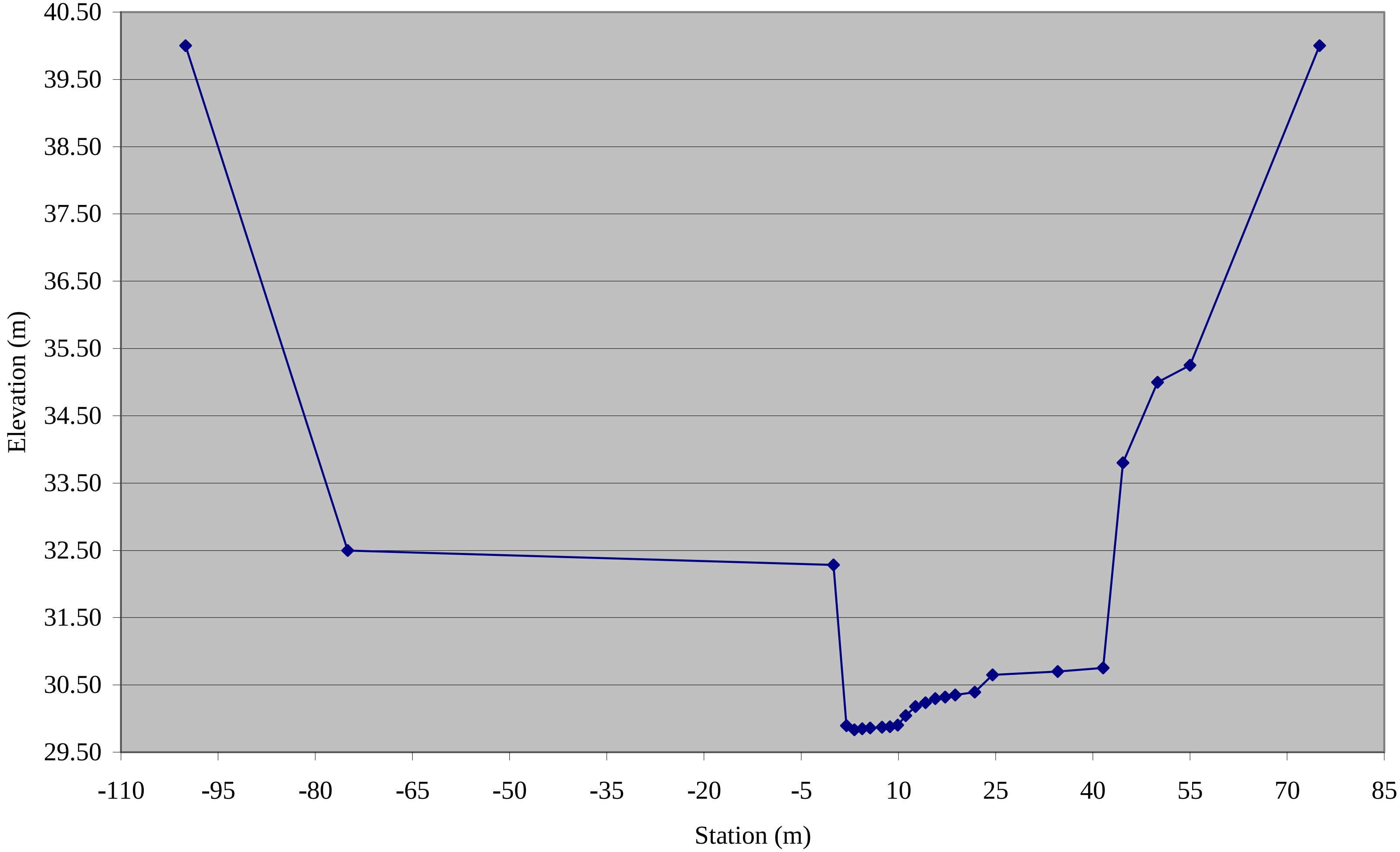


Figure D.29. Smokey Creek cross section X2.5.

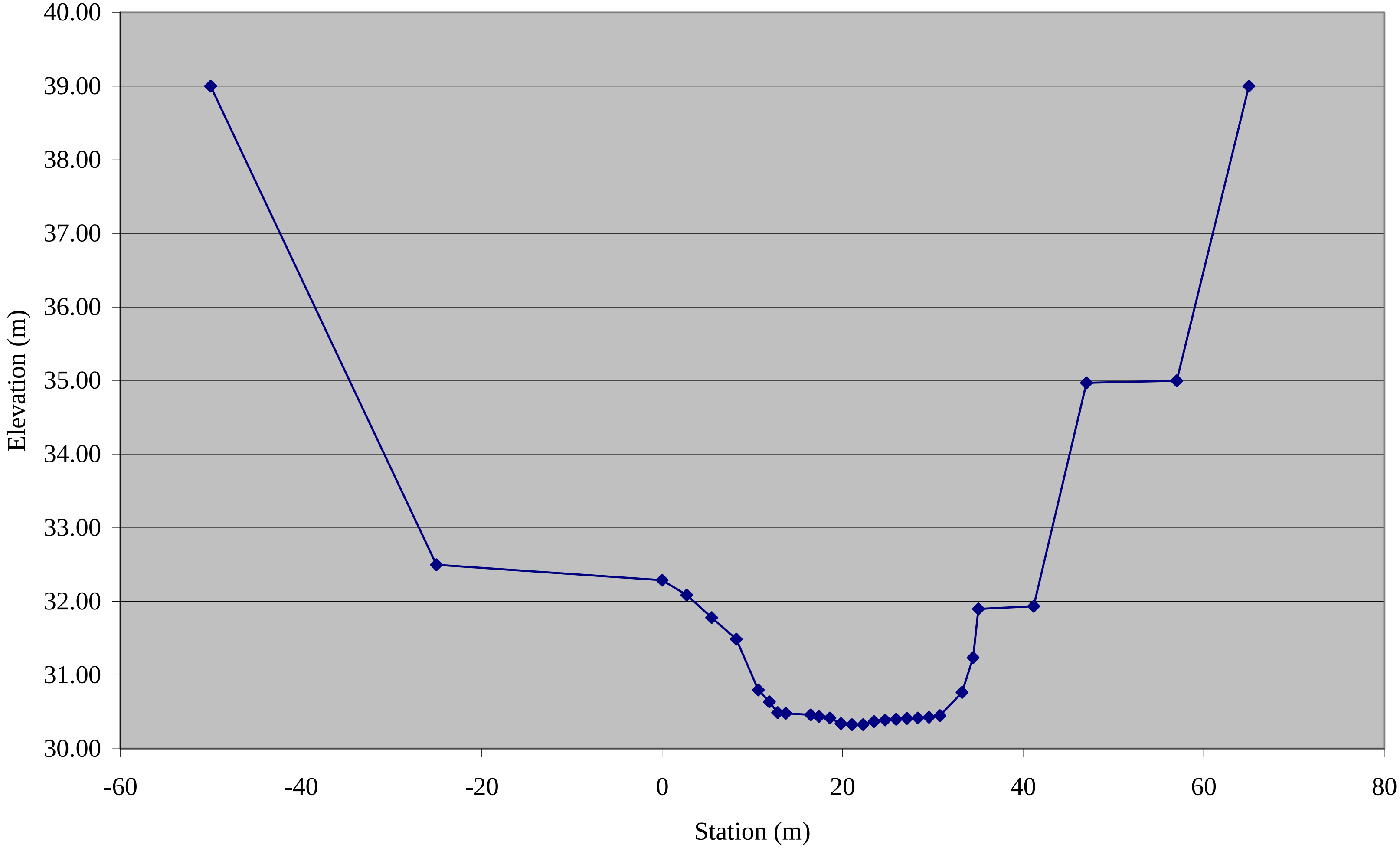


Figure D.30. Smokey Creek cross section X3.

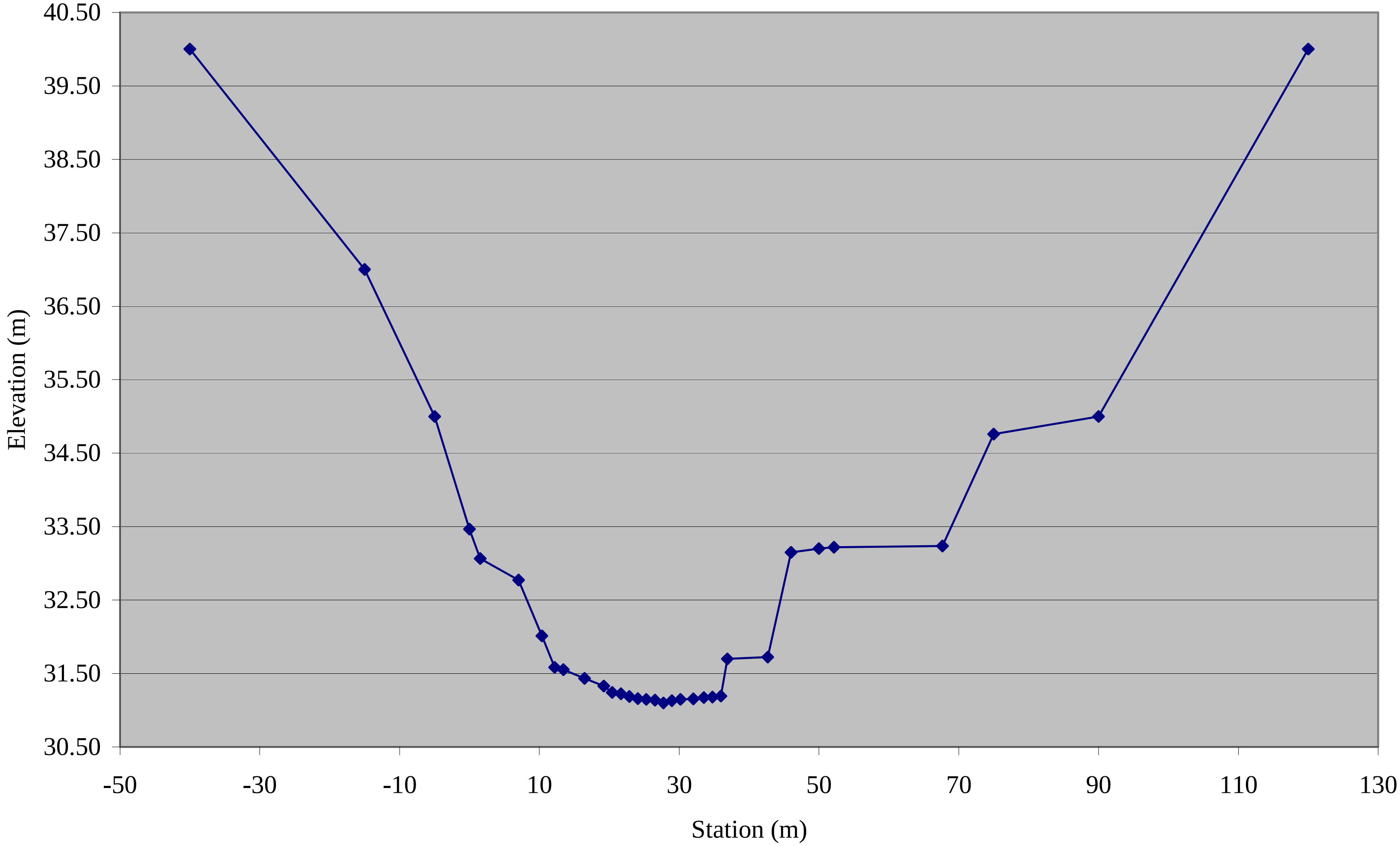


Figure D.31. Smokey Creek cross section X4.

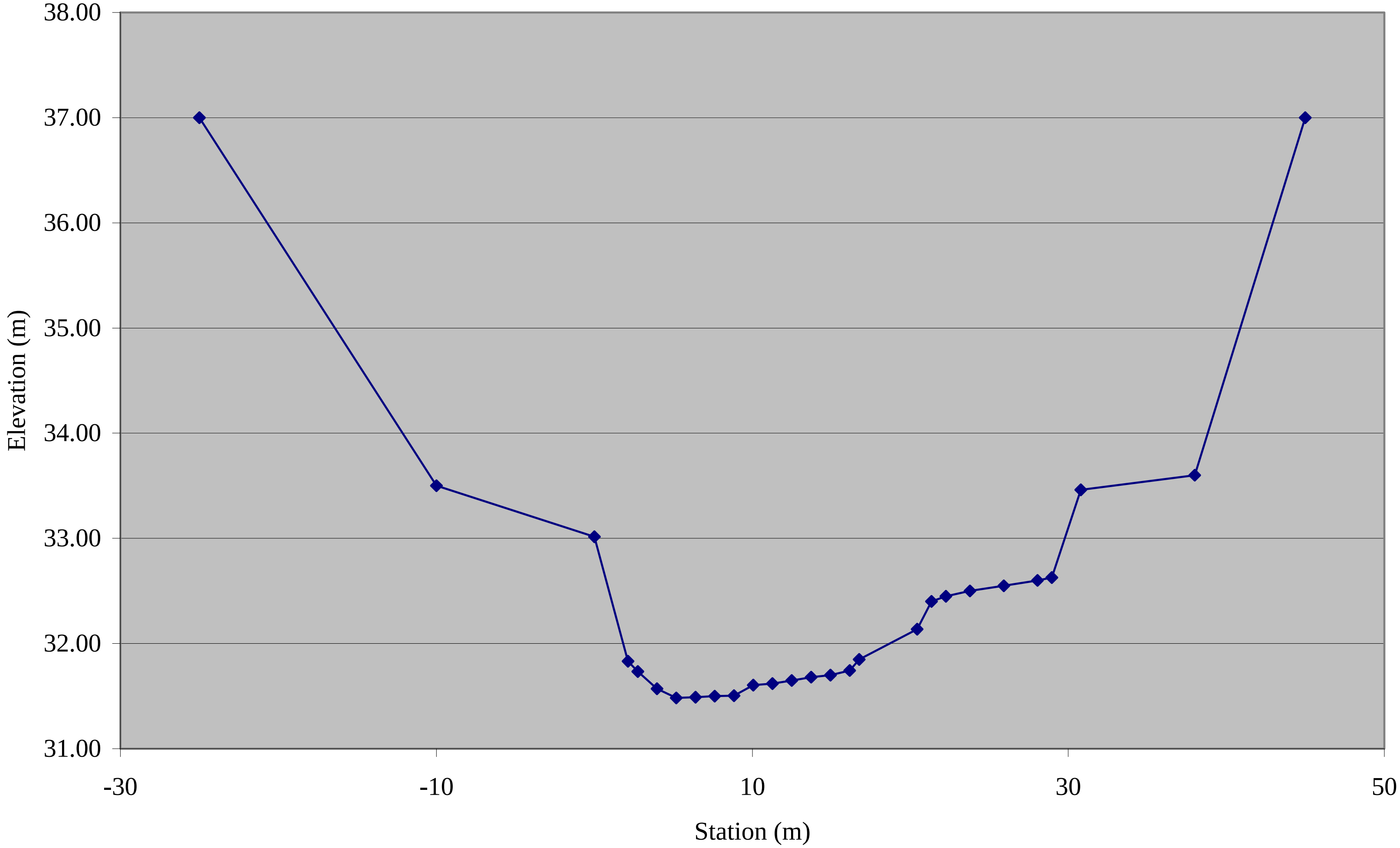


Figure D.32. Smokey Creek cross section X5.

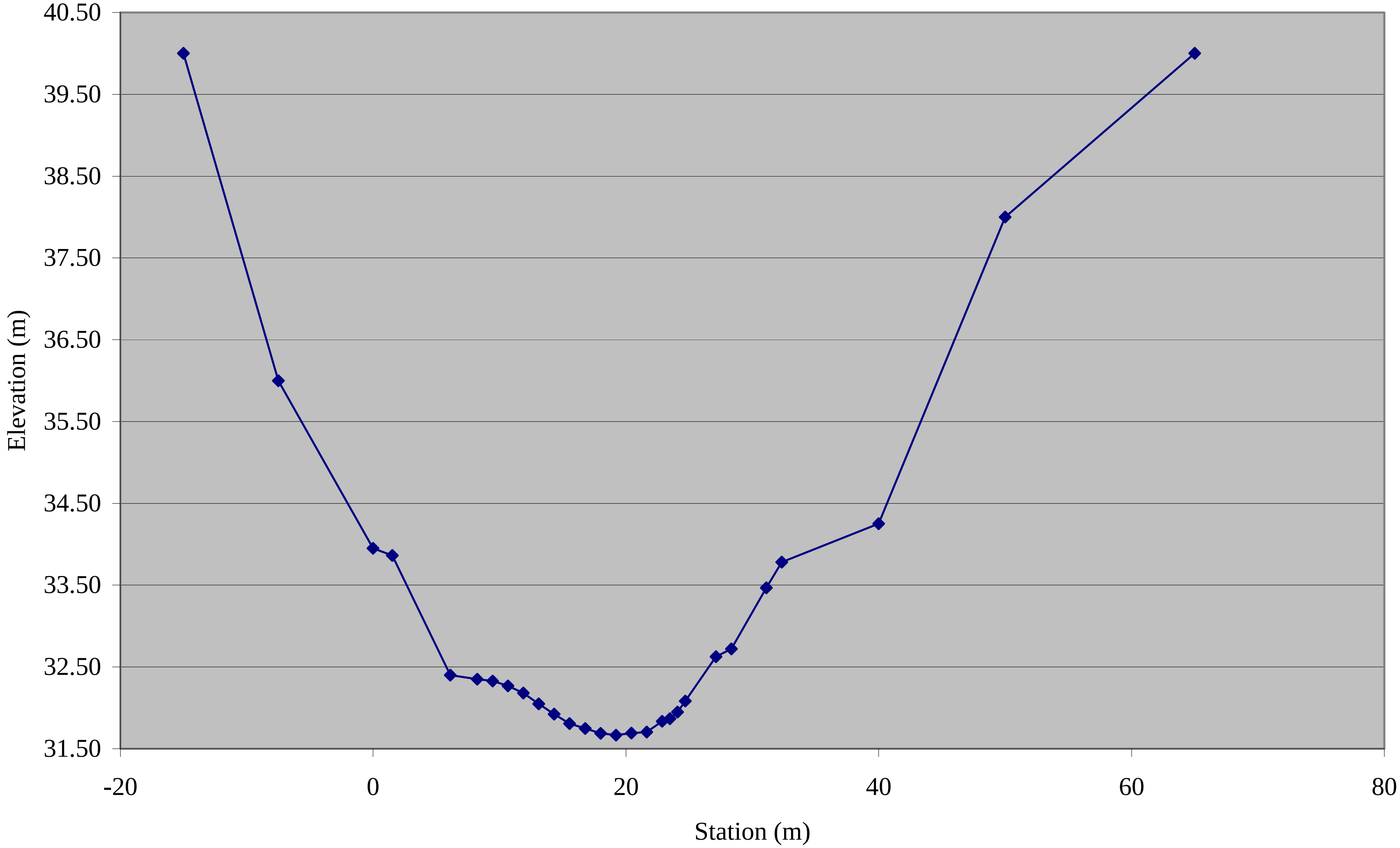


Figure D.33. Smokey Creek cross section X6.

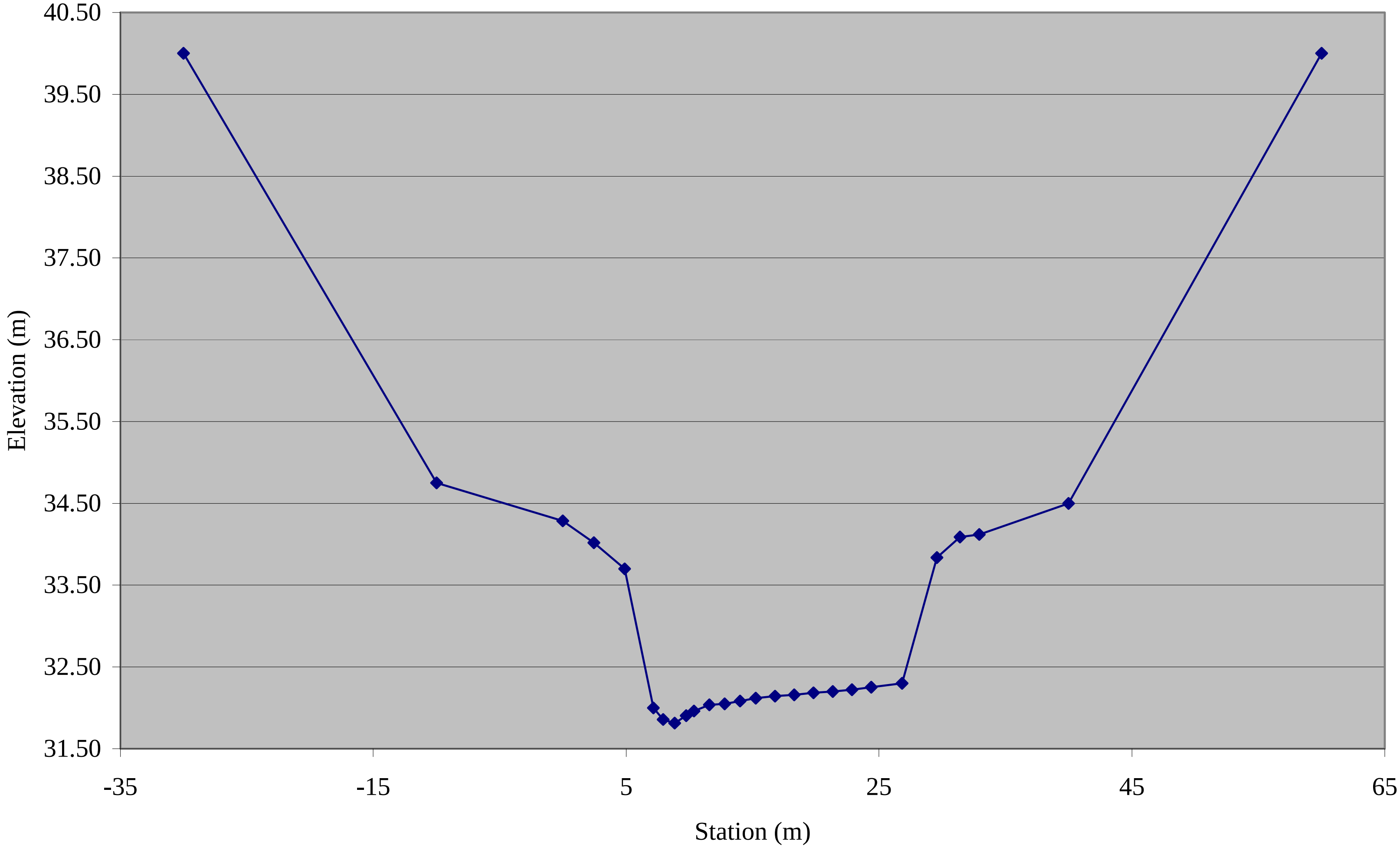


Figure D.34. Smokey Creek cross section X7.

APPENDIX E:

ConCEPTS Model: Output Figures

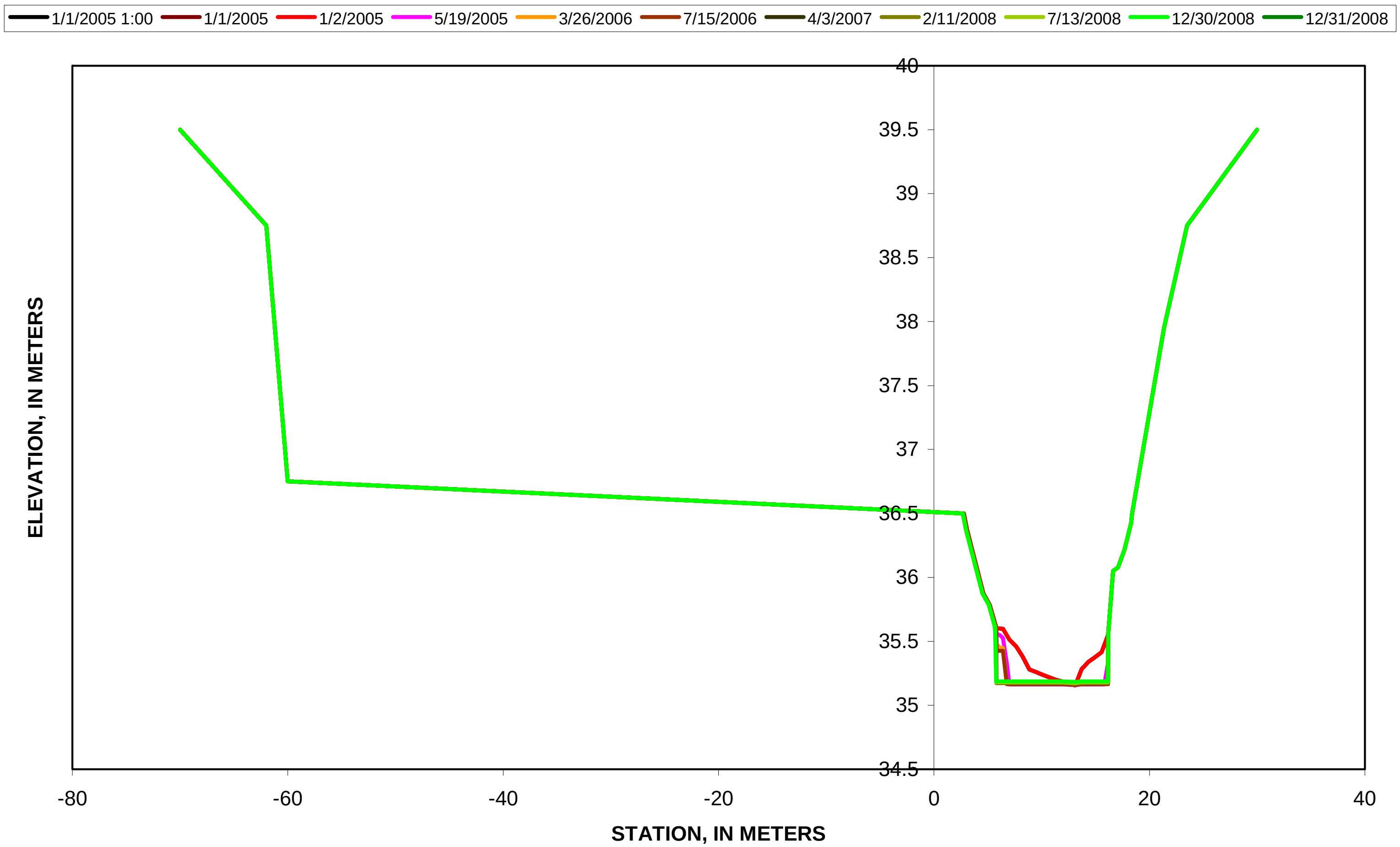


Figure E.1. Brimstone Creek cross section X1 (upstream).

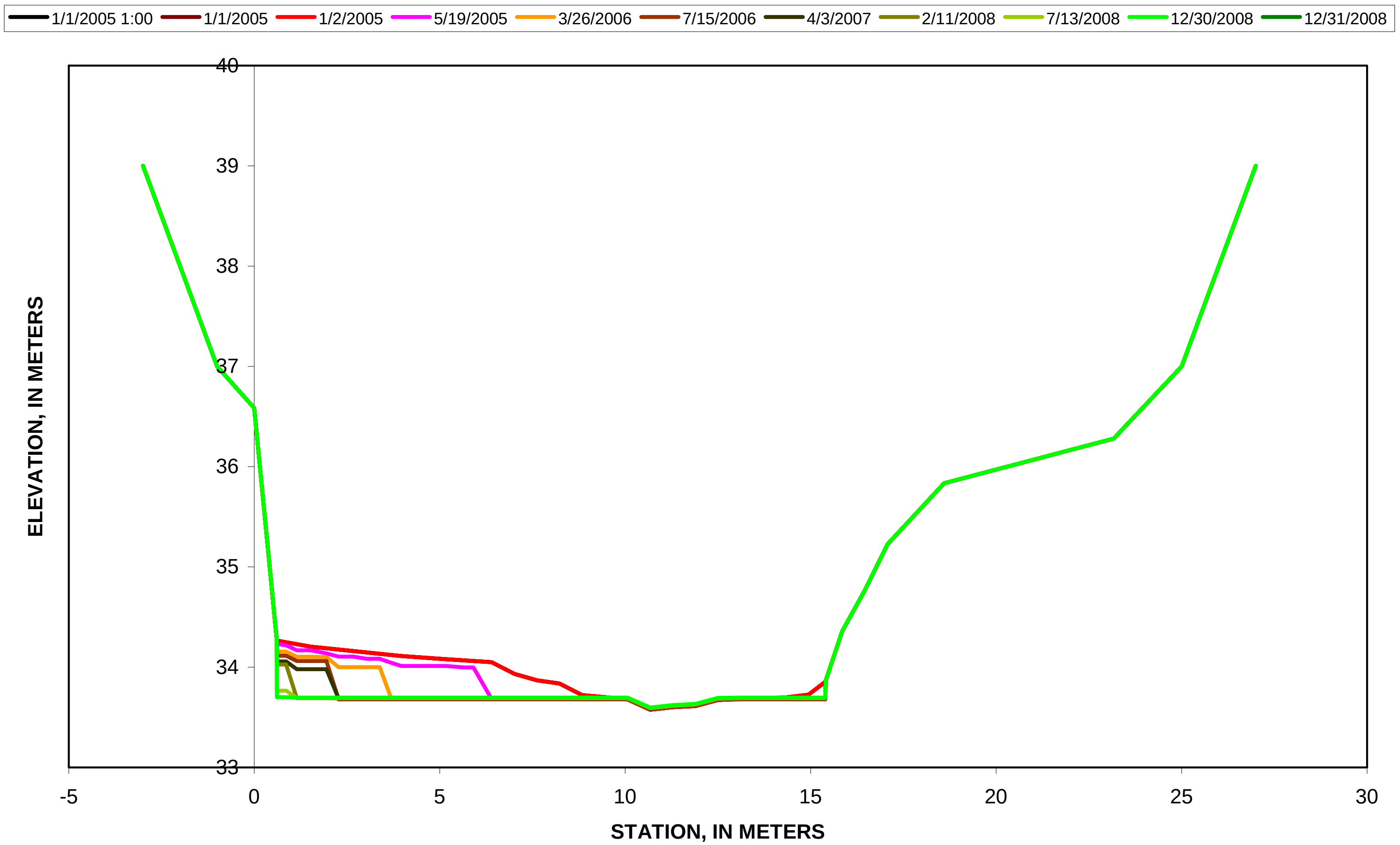


Figure E.2. Brimstone Creek cross section X2.

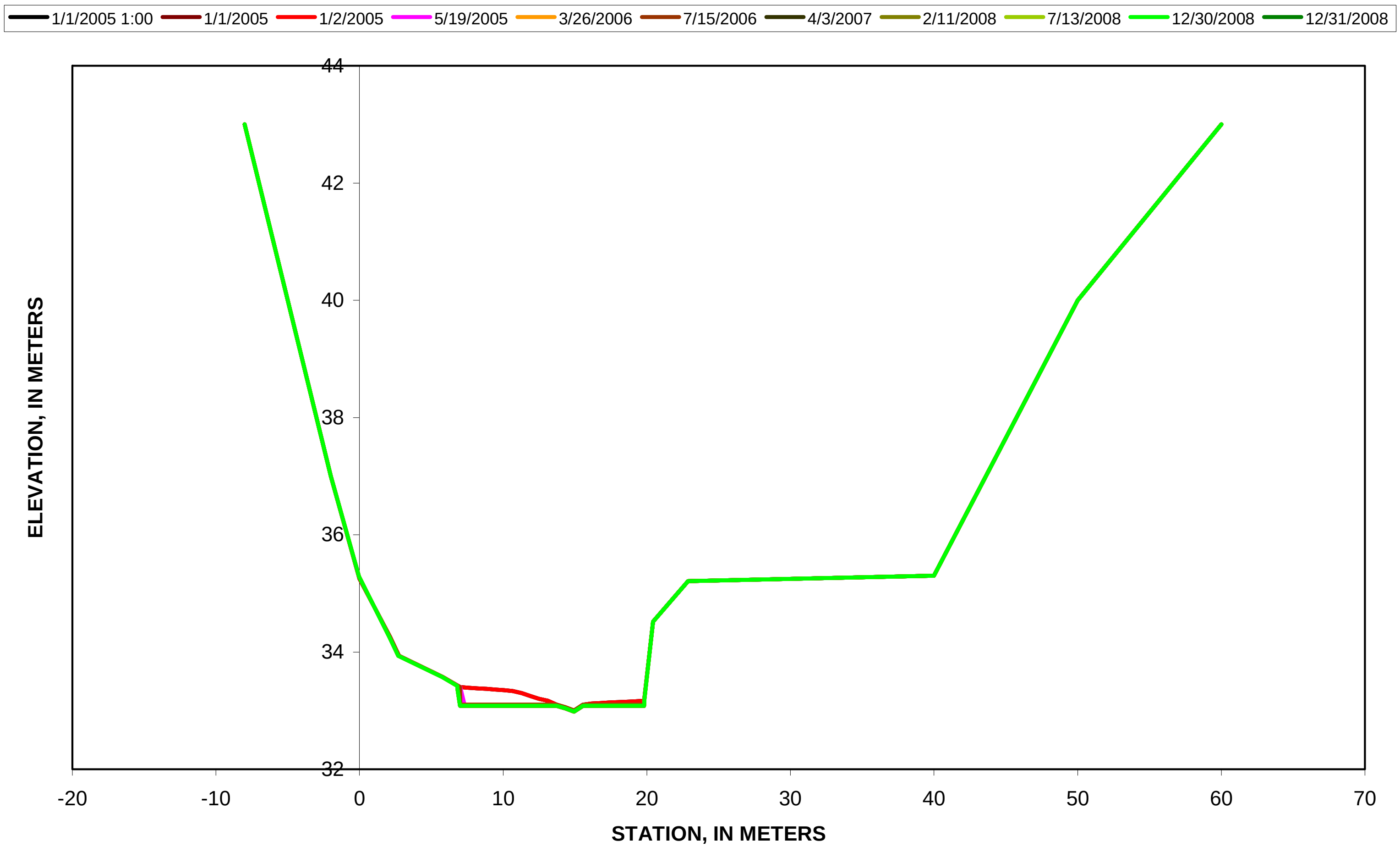


Figure E.3. Brimstone Creek cross section X3.

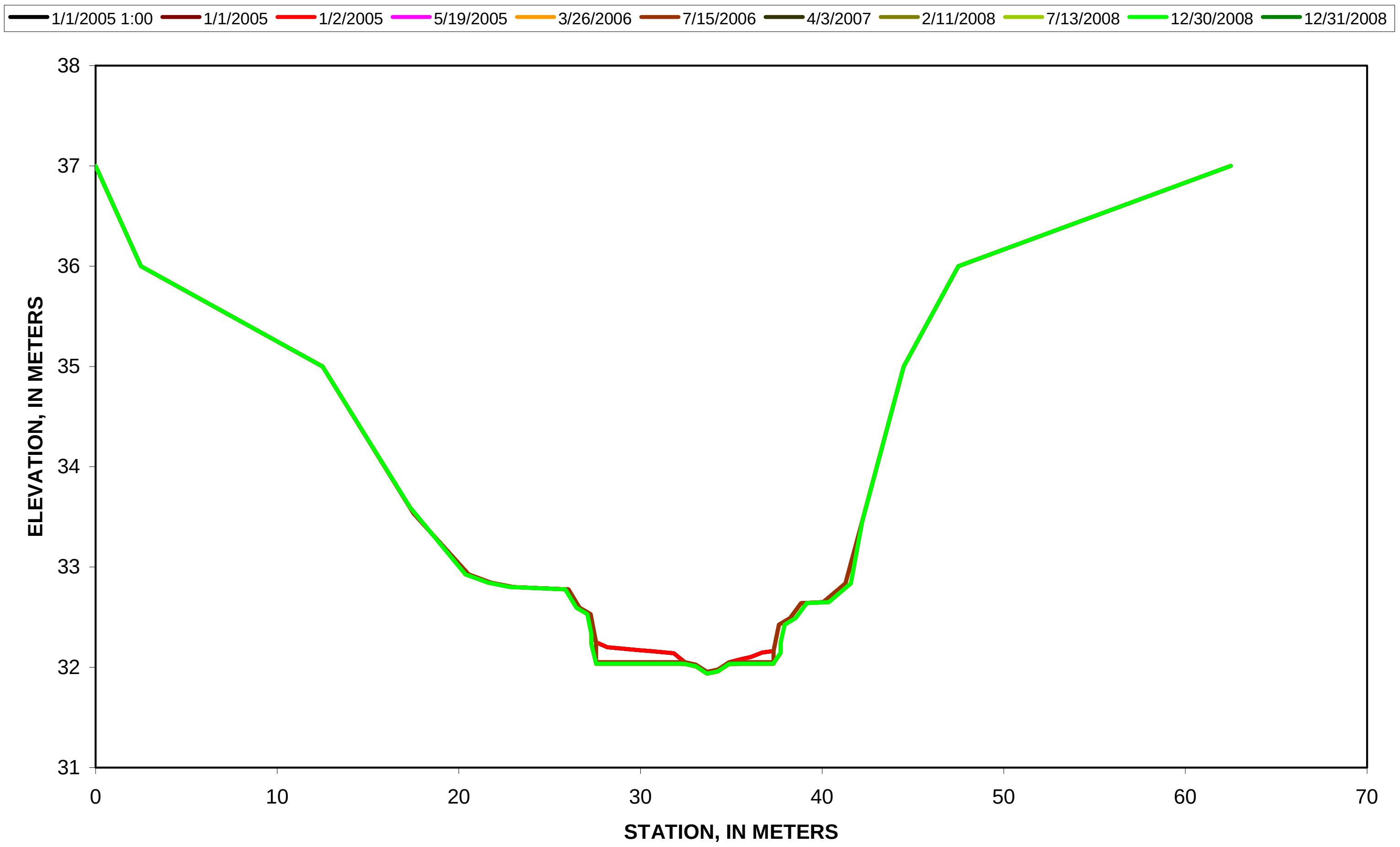


Figure E.4. Brimstone Creek cross section X4.

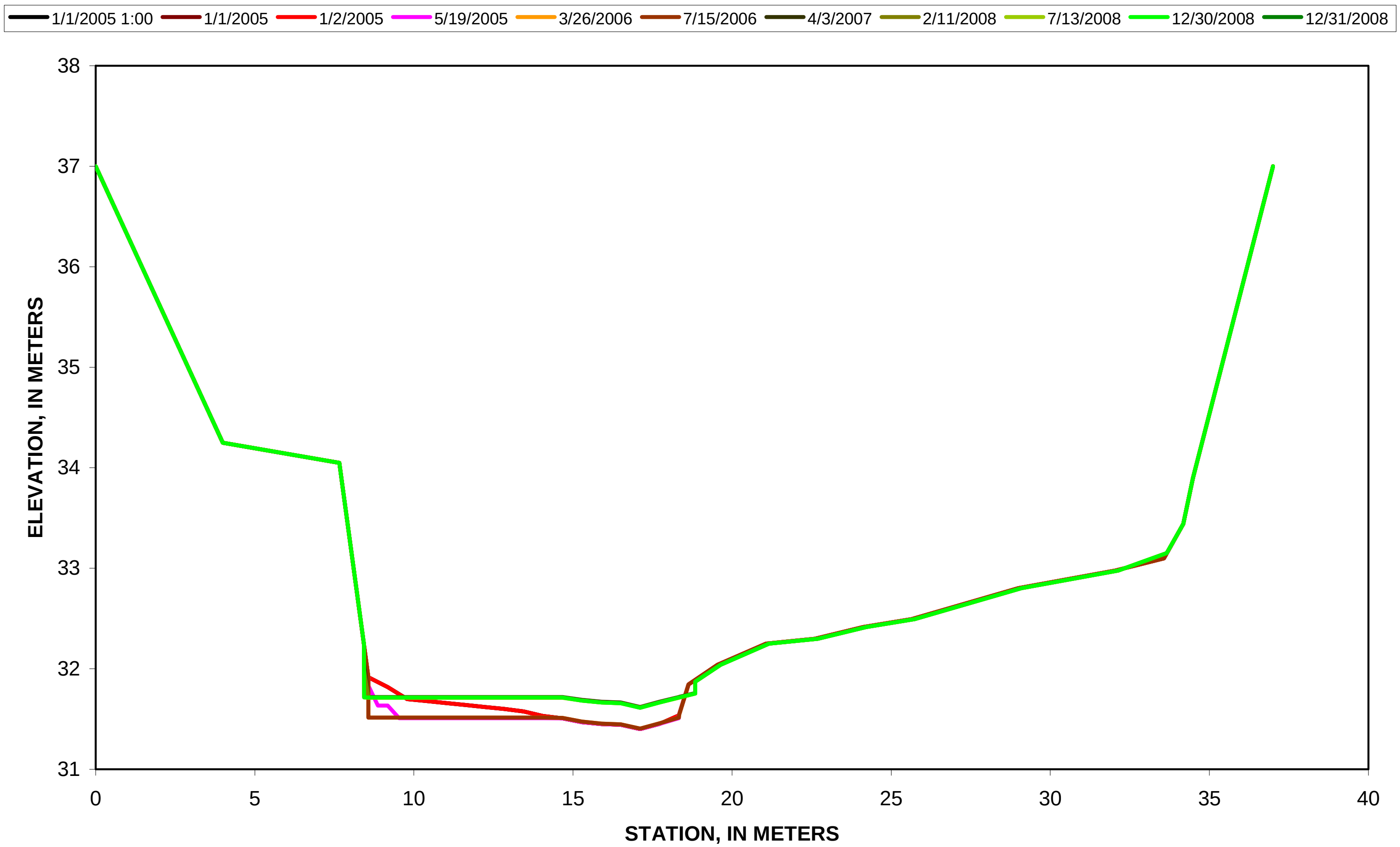


Figure E.5. Brimstone Creek cross section X5.

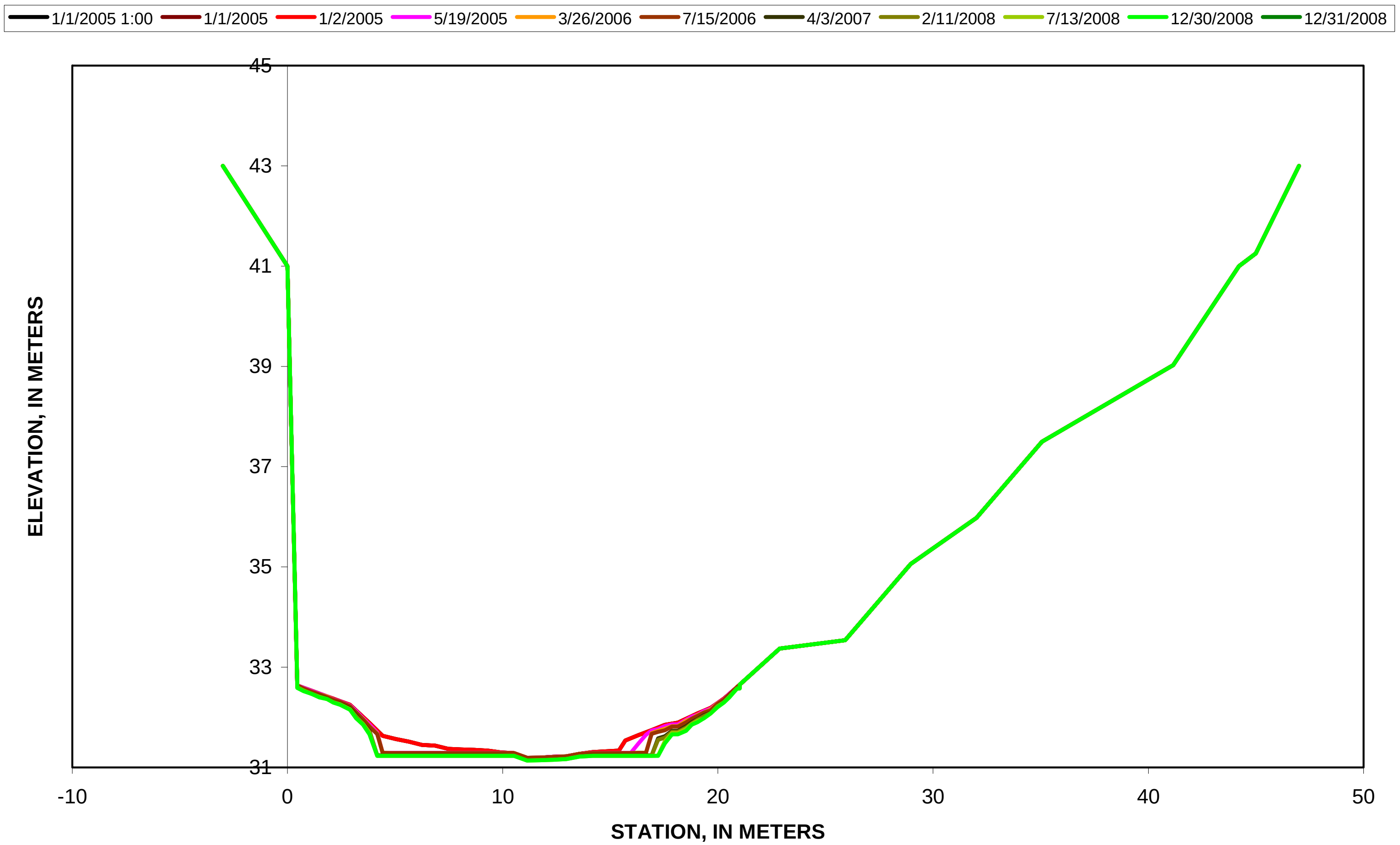


Figure E.6. Brimstone Creek cross section X6.

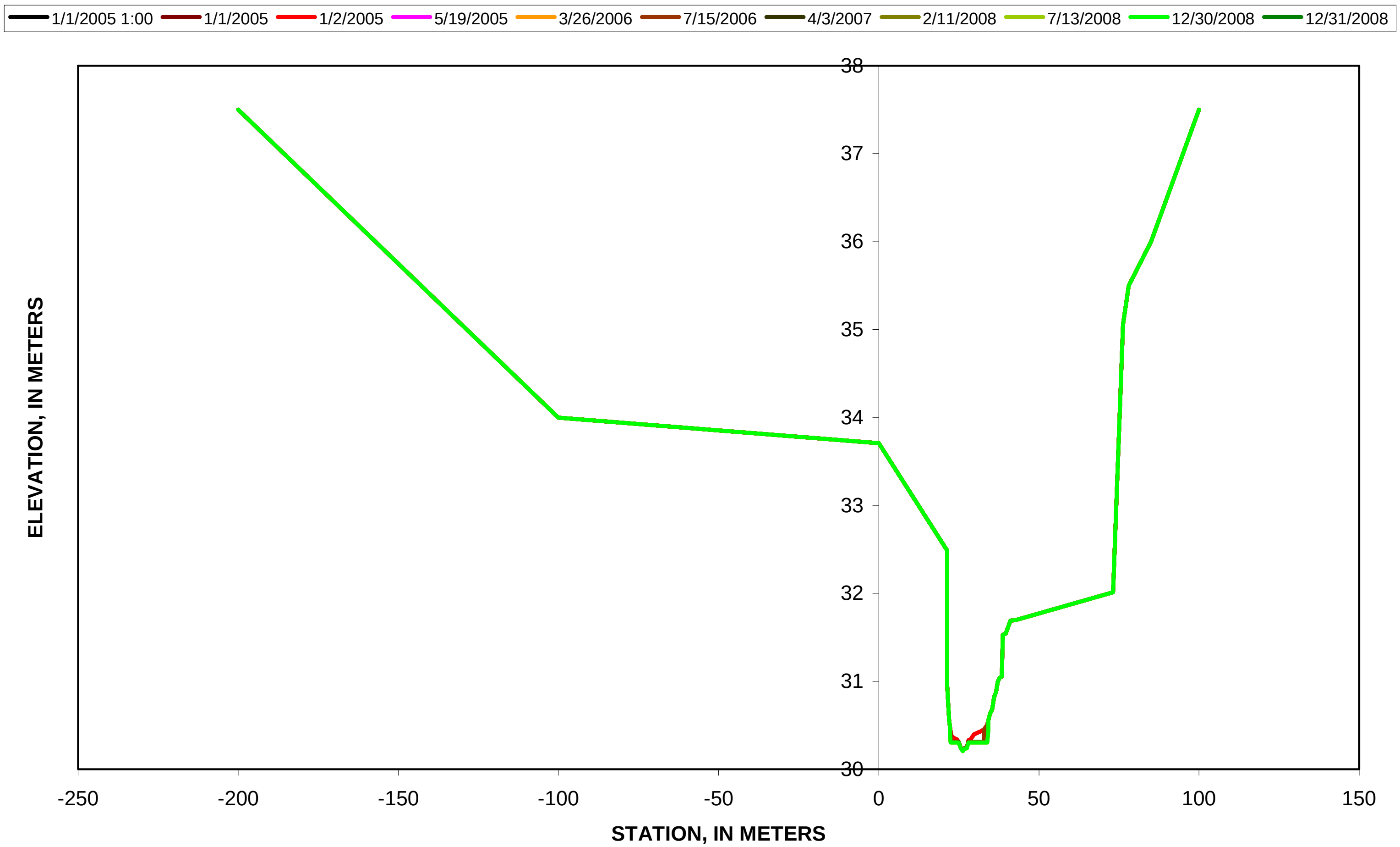


Figure E.7. Brimstone Creek cross section X7.

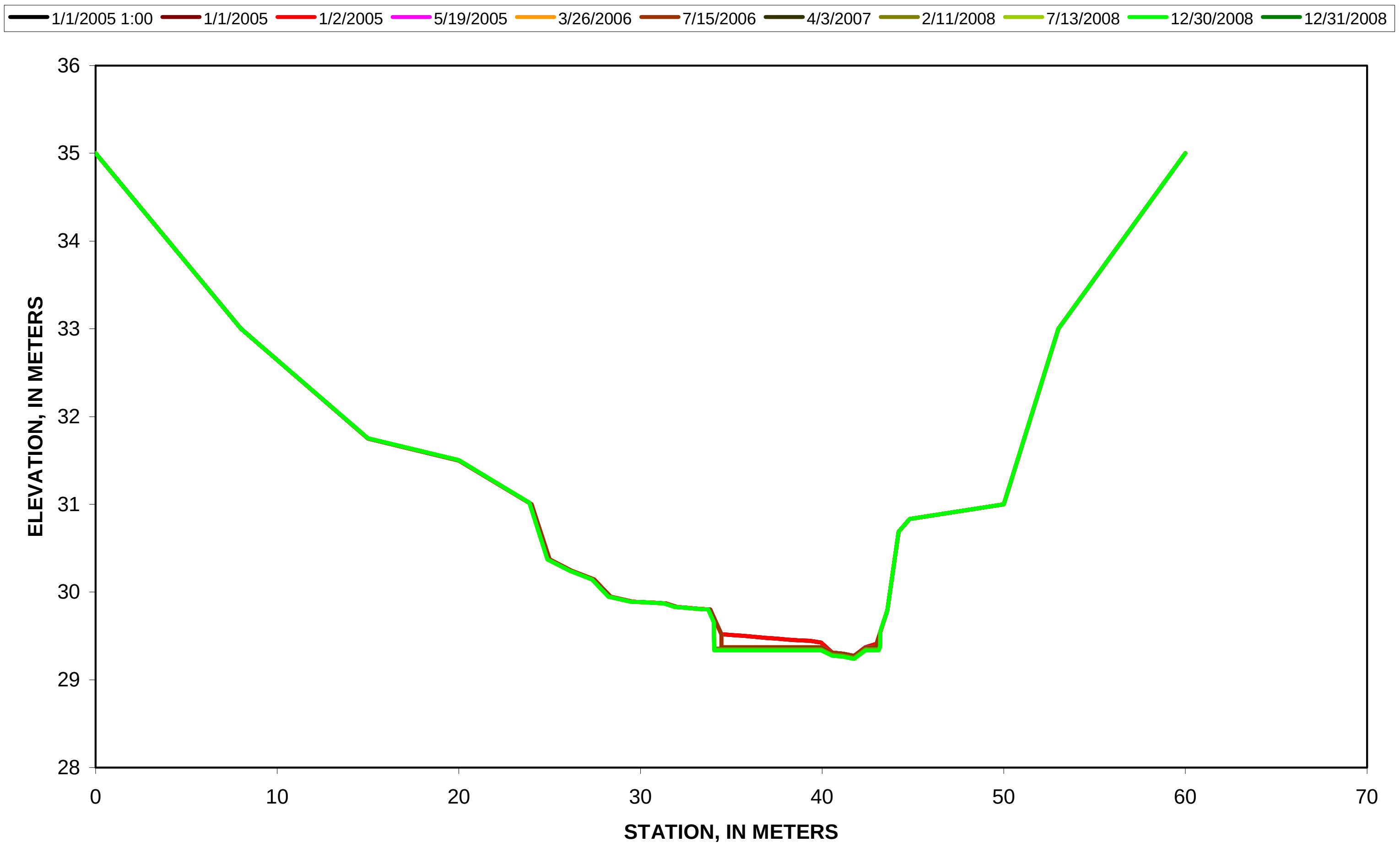


Figure E.8. Brimstone Creek cross section X8 (downstream).

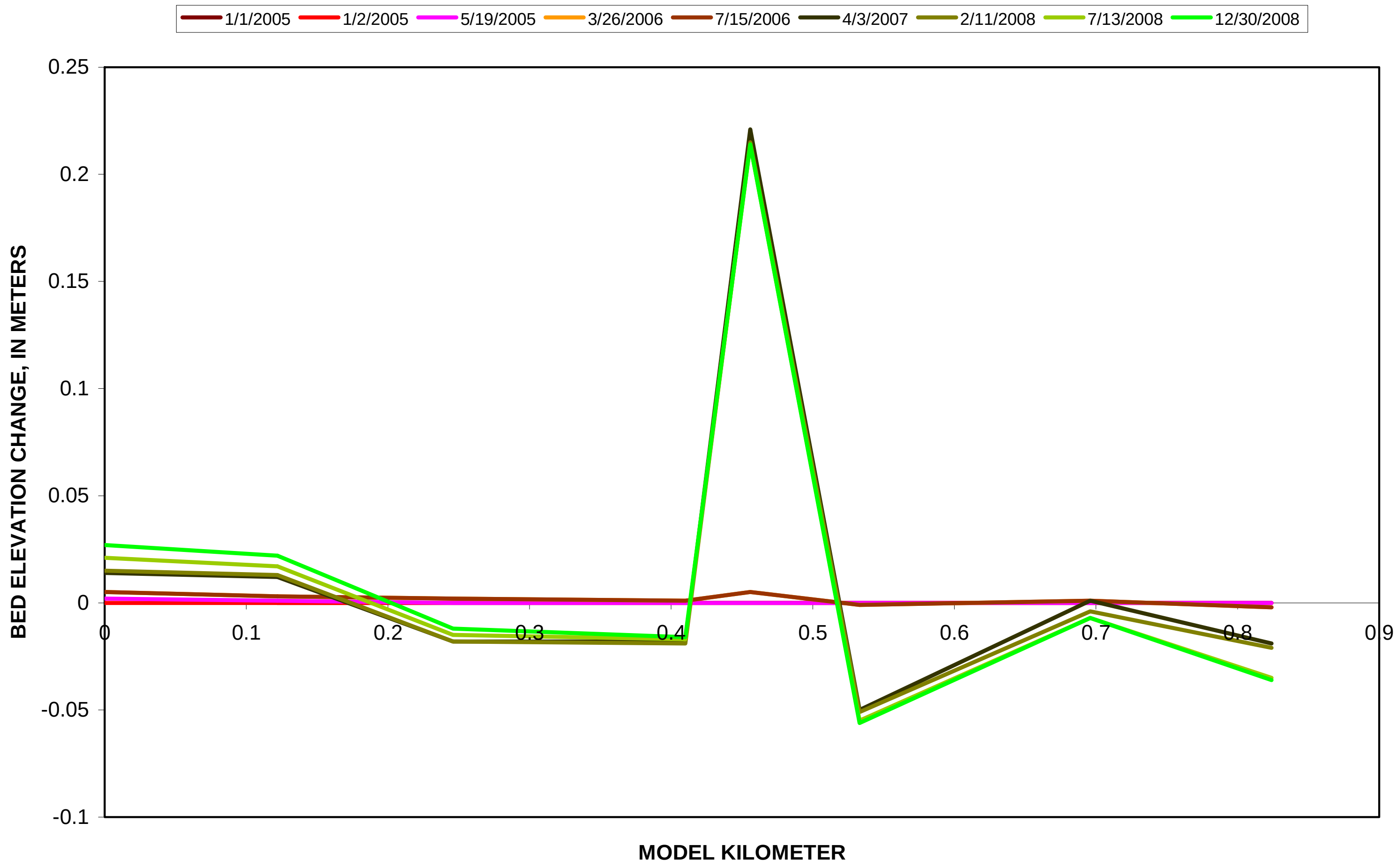


Figure E.9. Brimstone Creek bed elevation change.

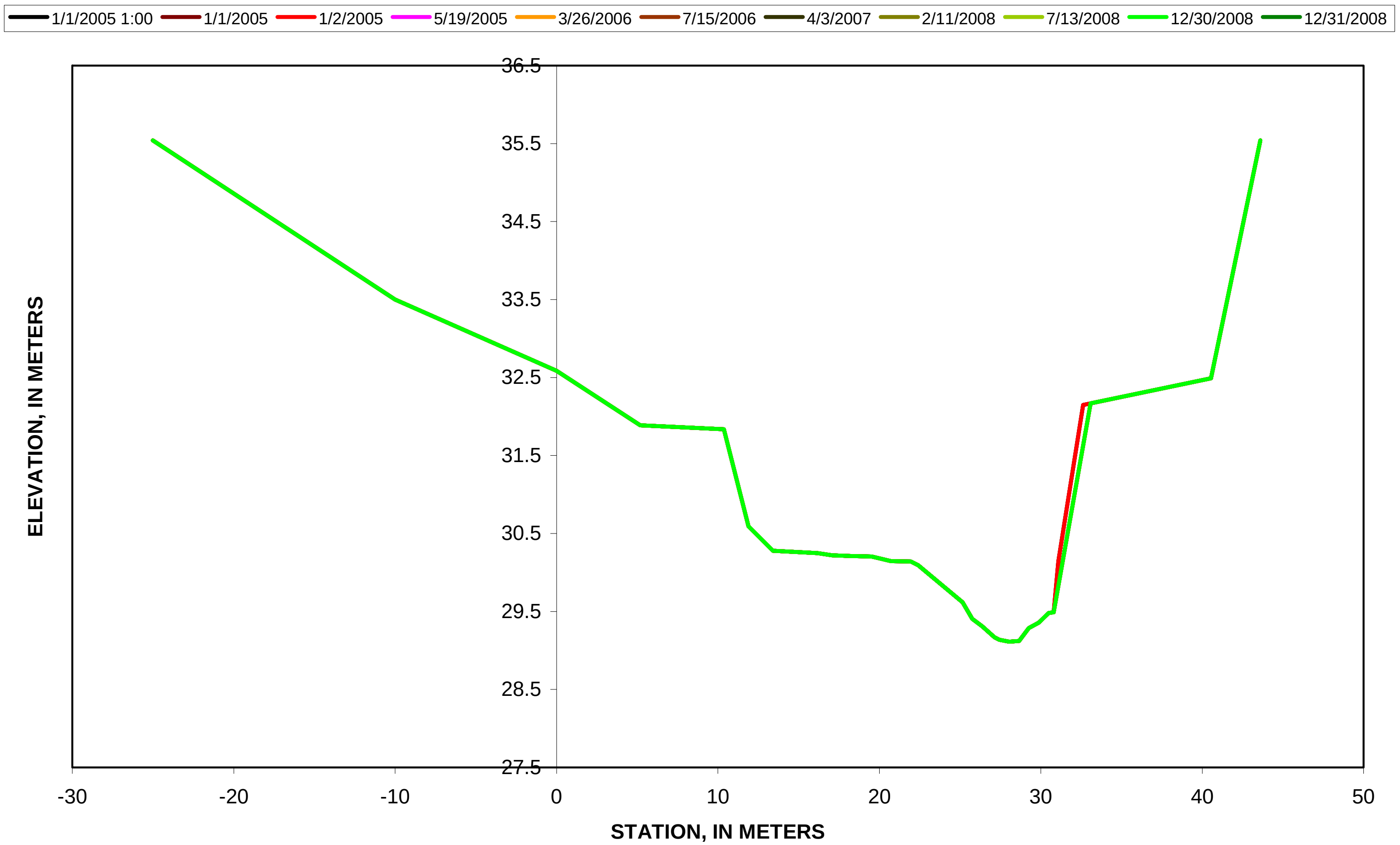


Figure E.10. Ligias Fork cross section X1 (downstream).

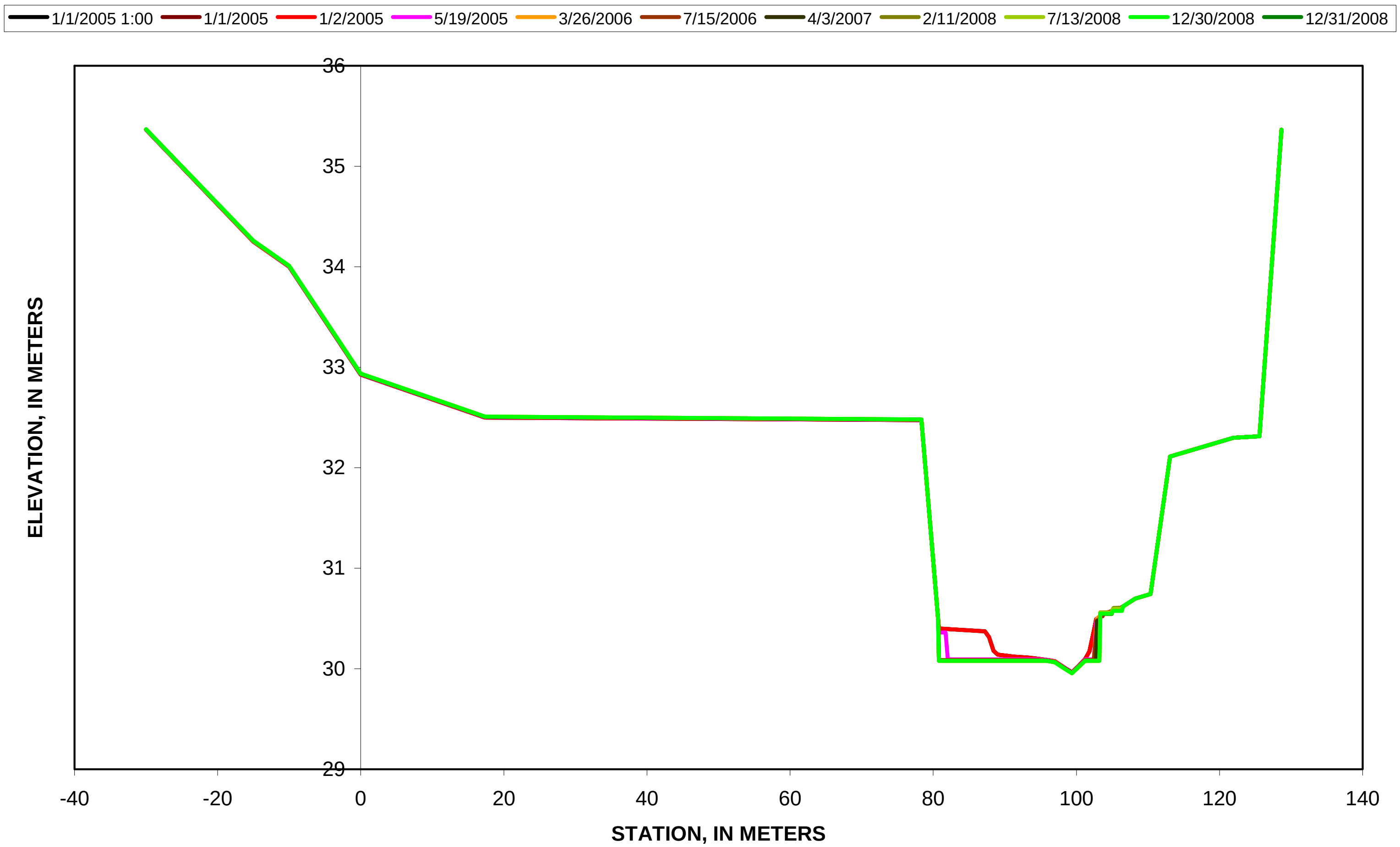


Figure E.11. Ligias Fork cross section X2.

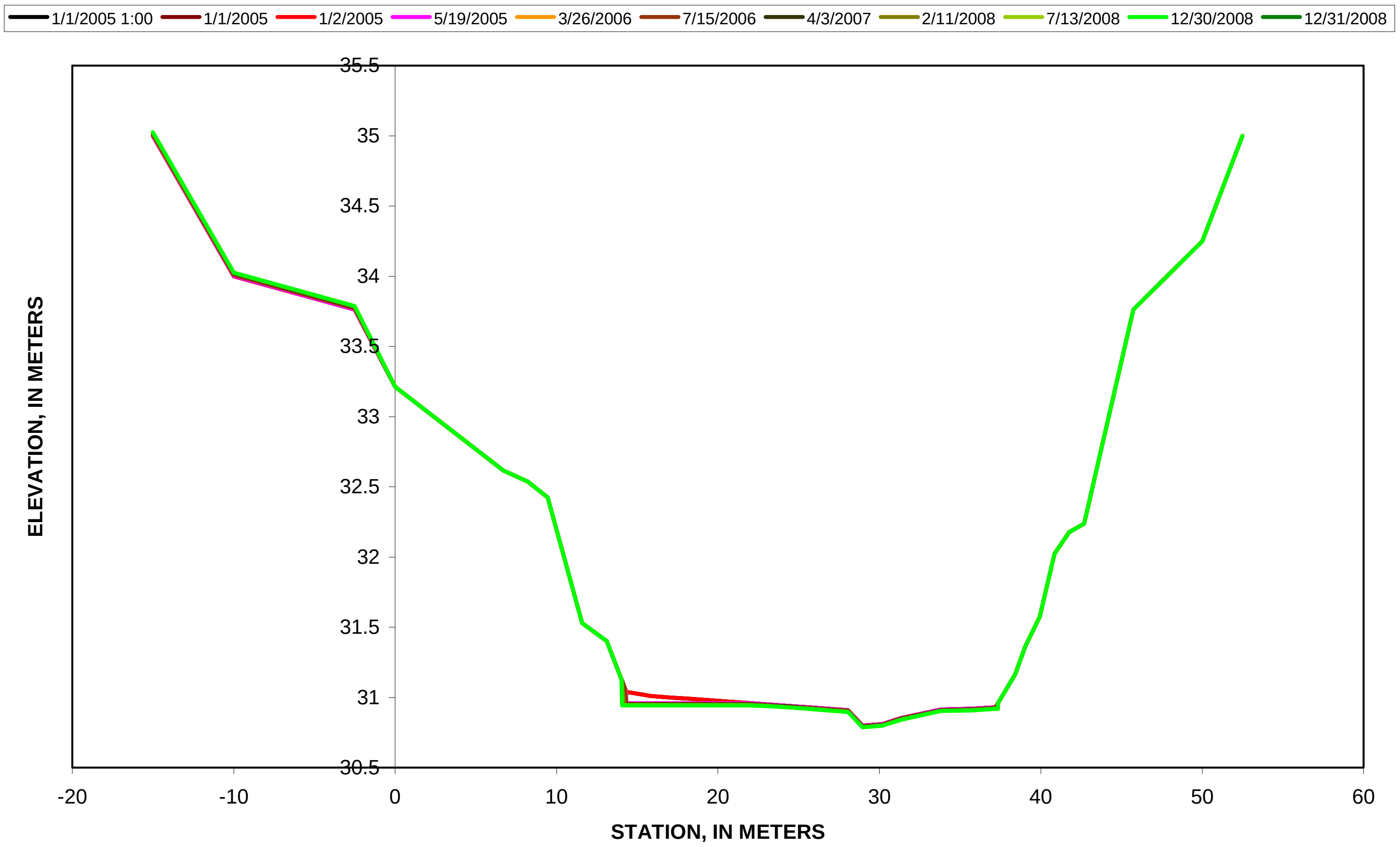


Figure E.12. Ligias Fork cross section X3.

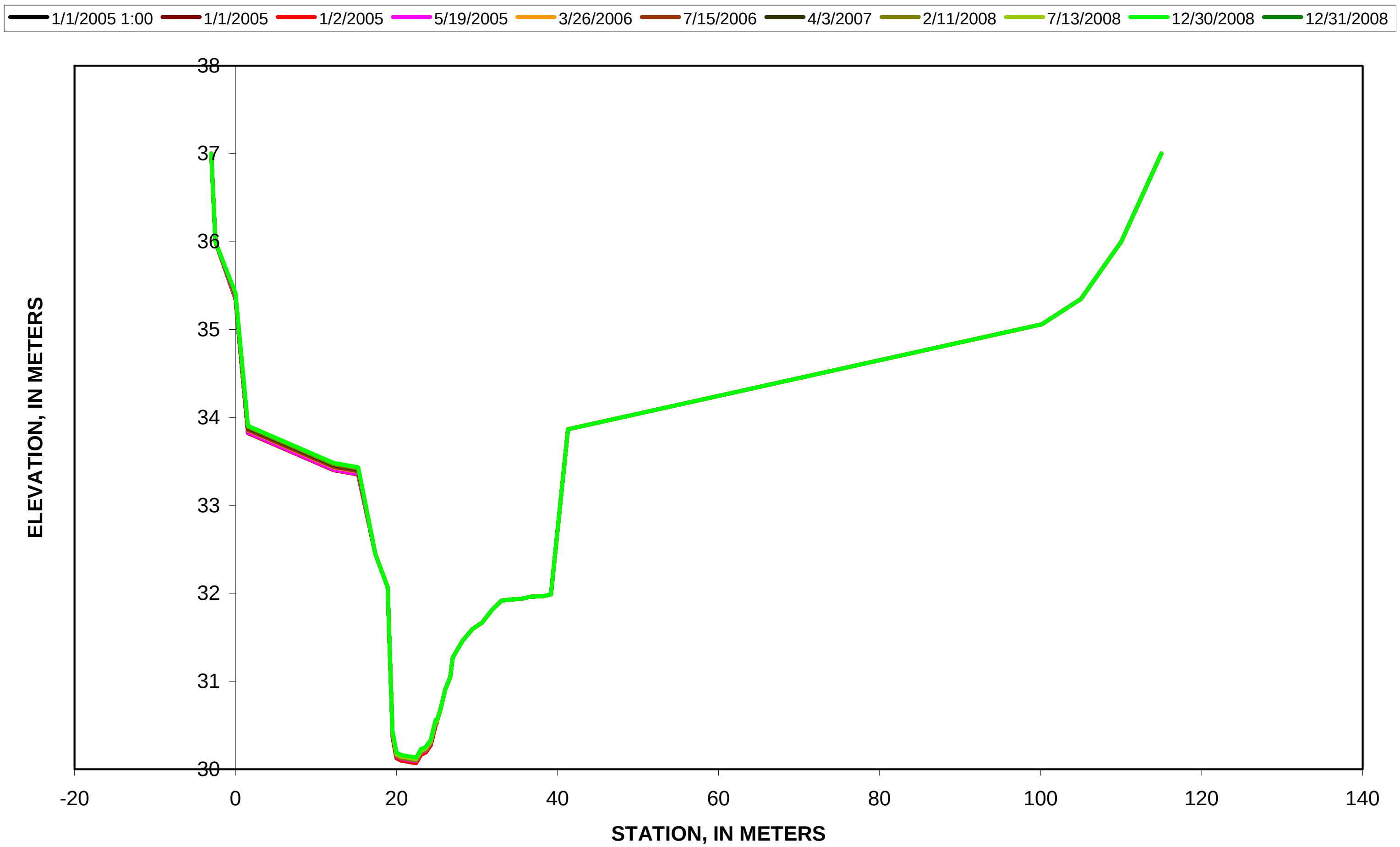


Figure E.13. Ligias Fork cross section X4.

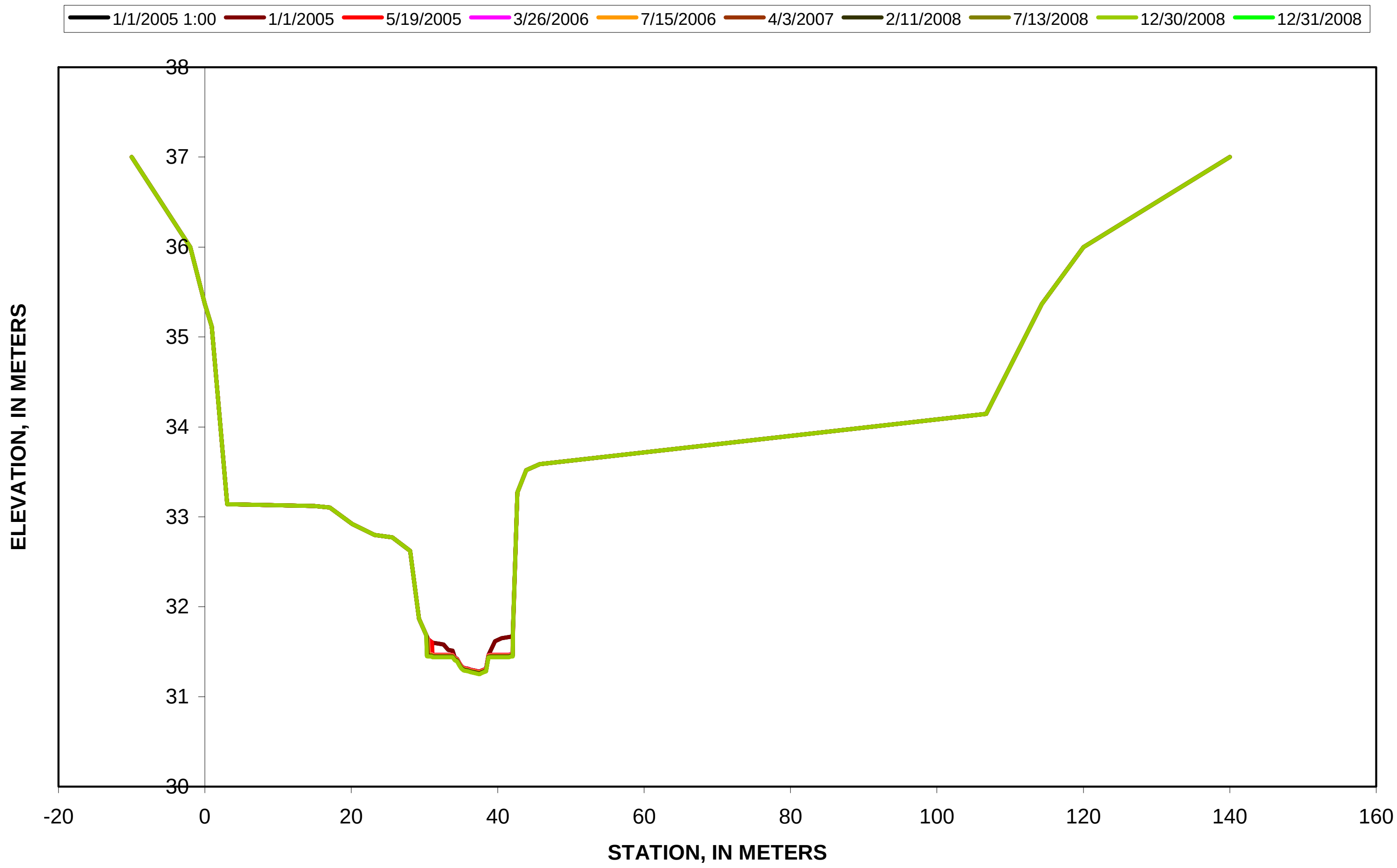


Figure E.14. Ligias Fork cross section X5.

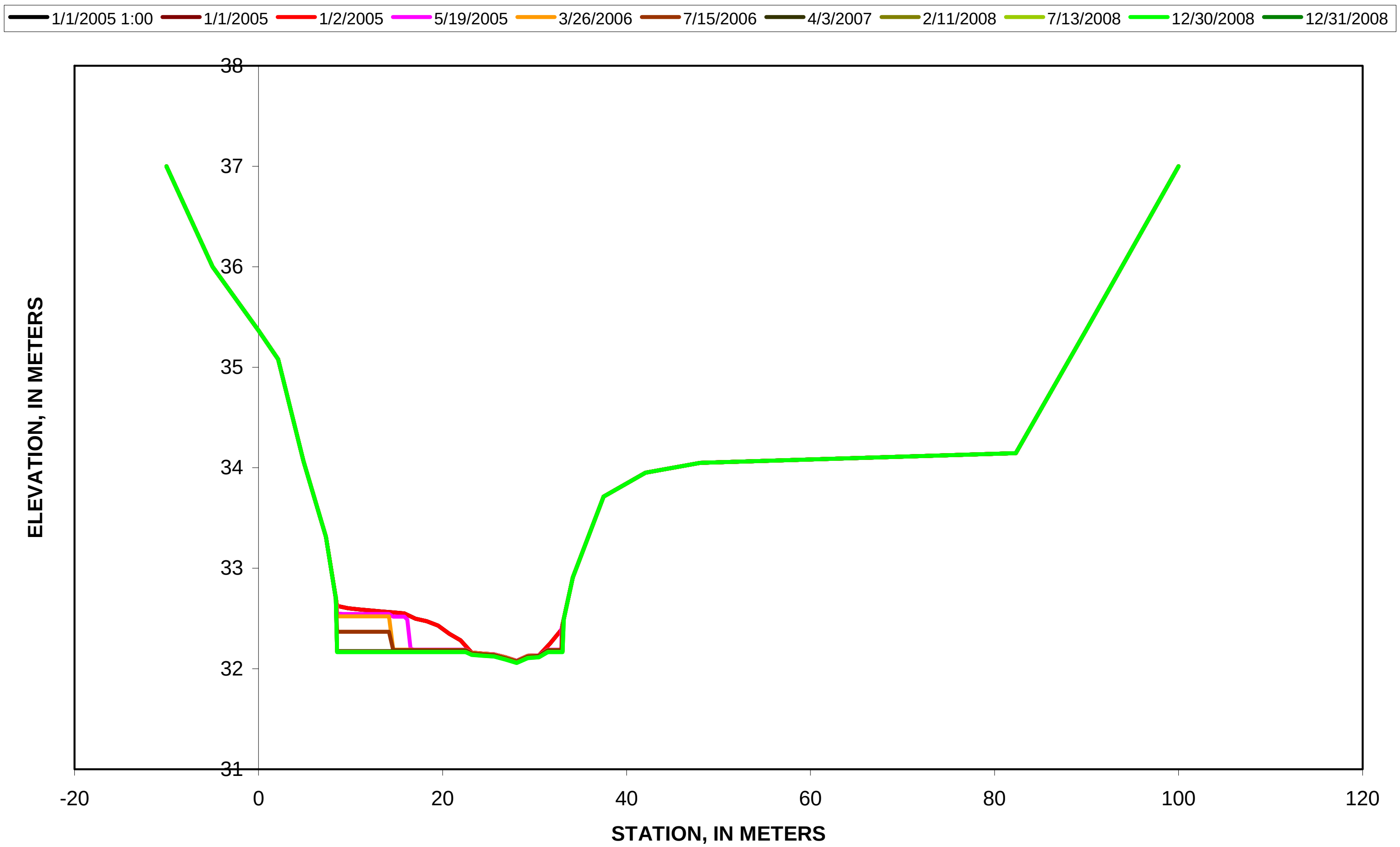


Figure E.15. Ligias Fork cross section X6 (upstream).

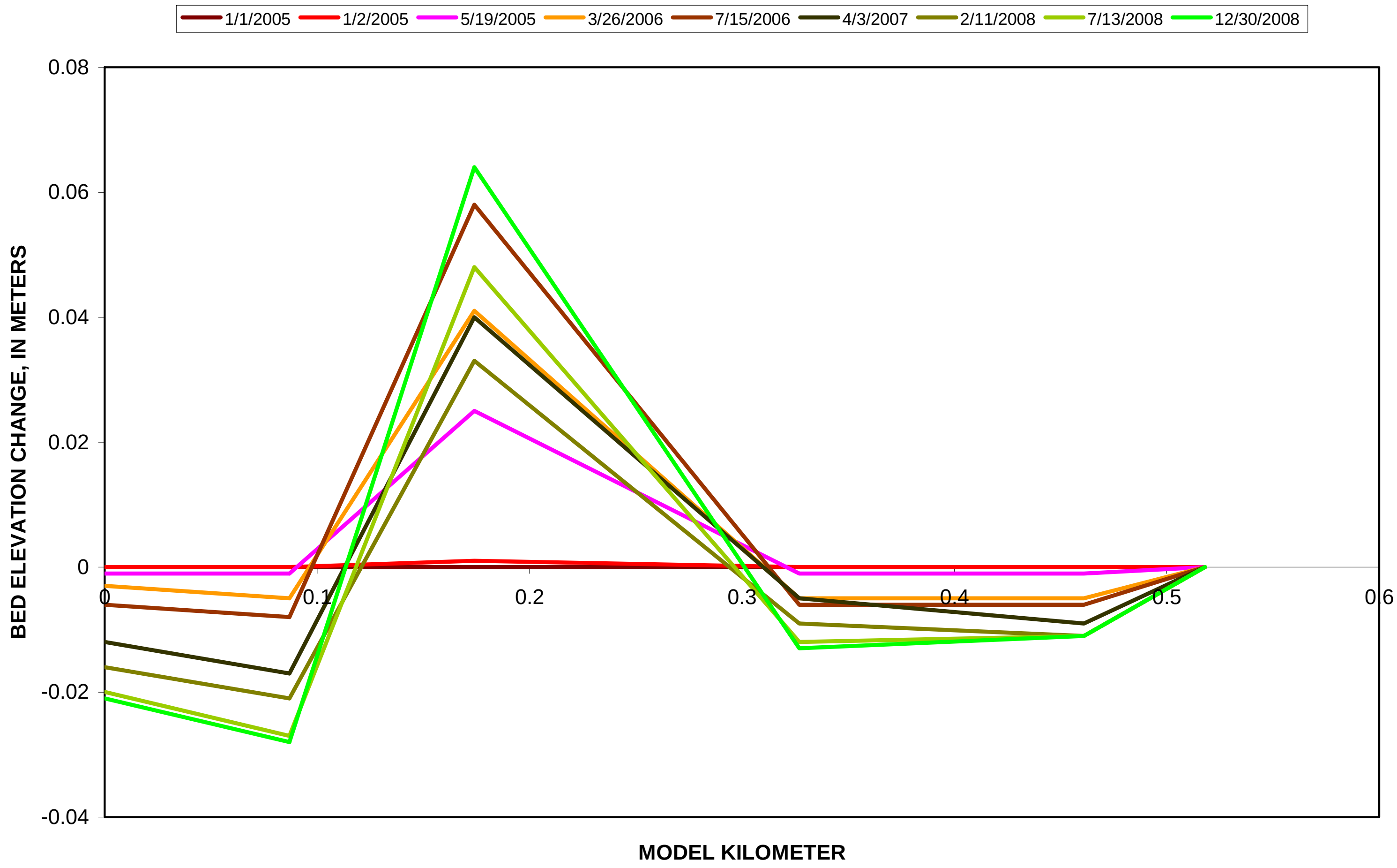


Figure E.16. Ligias Fork bed elevation change.

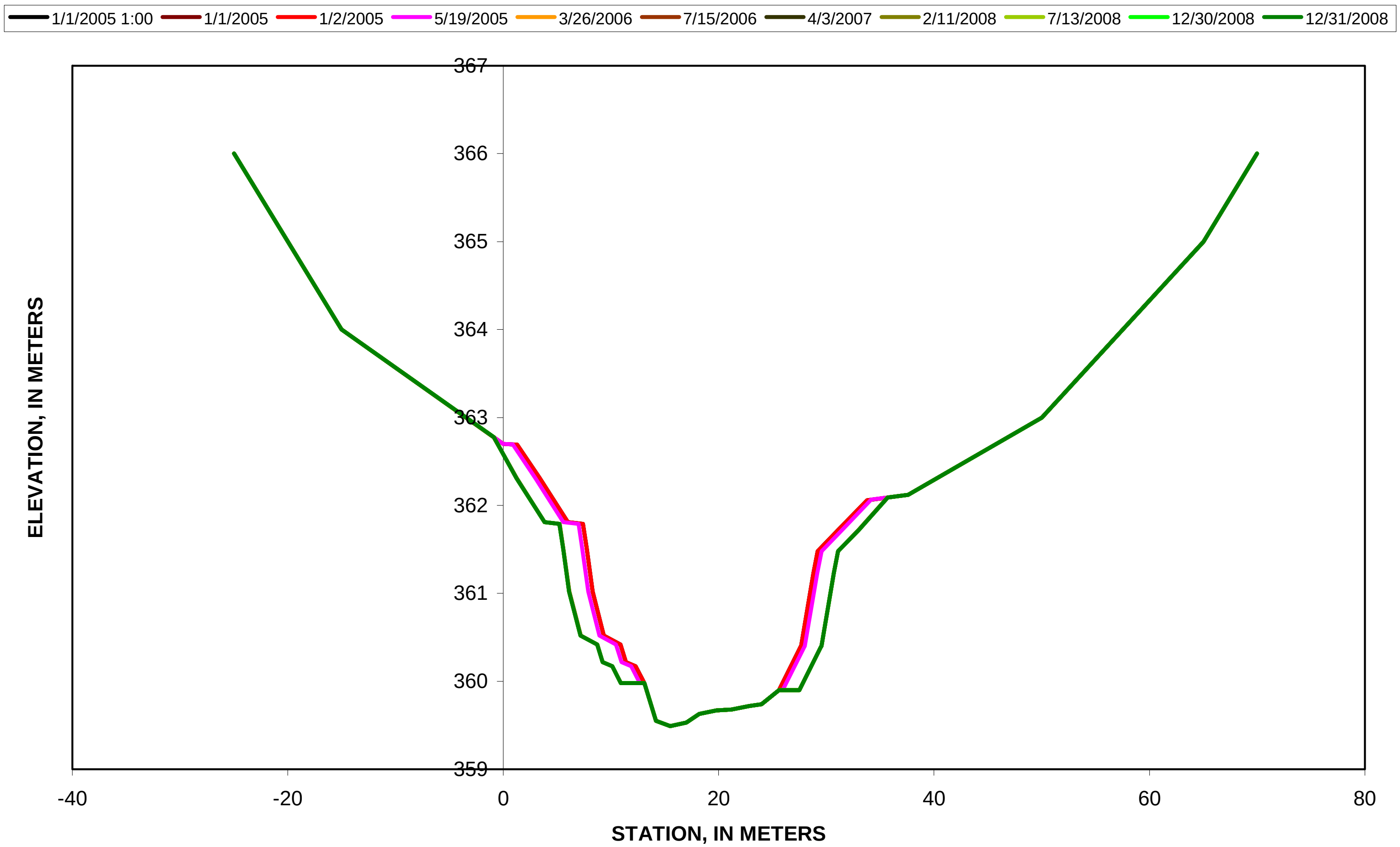


Figure E.17. Montgomery Fork cross section X1 (downstream).

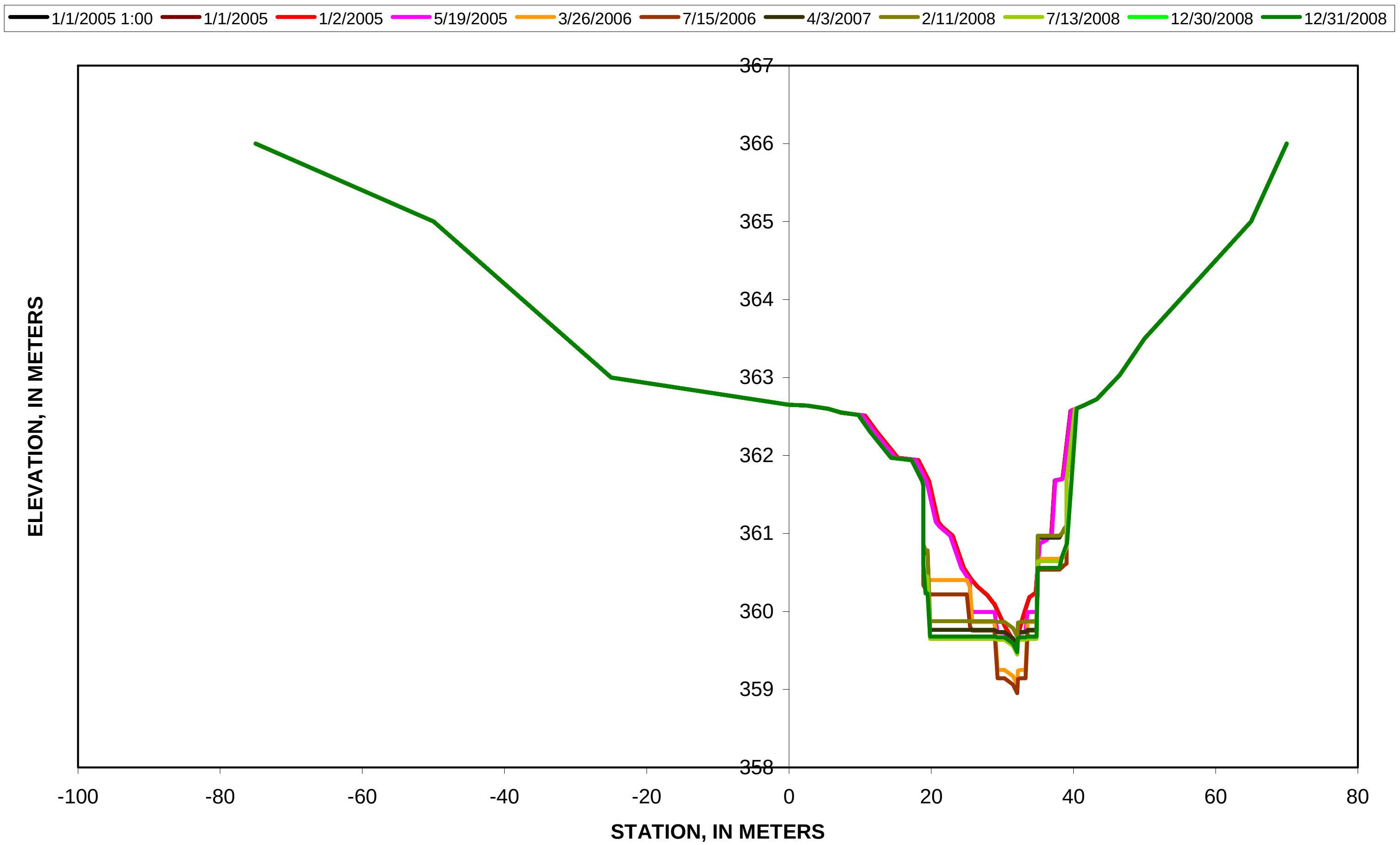


Figure E.18. Montgomery Fork cross section X2.

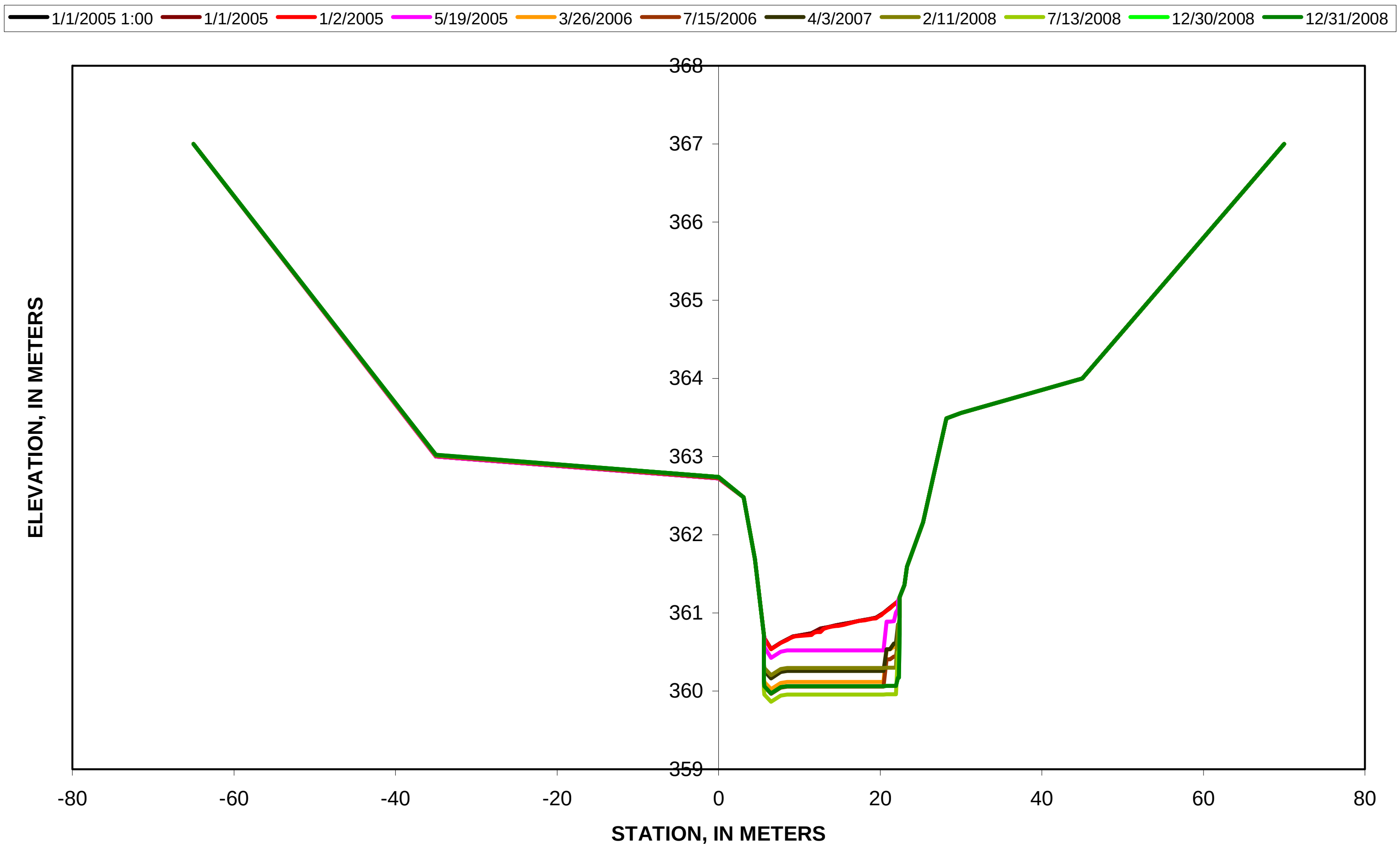


Figure E.19. Montgomery Fork cross section X3.

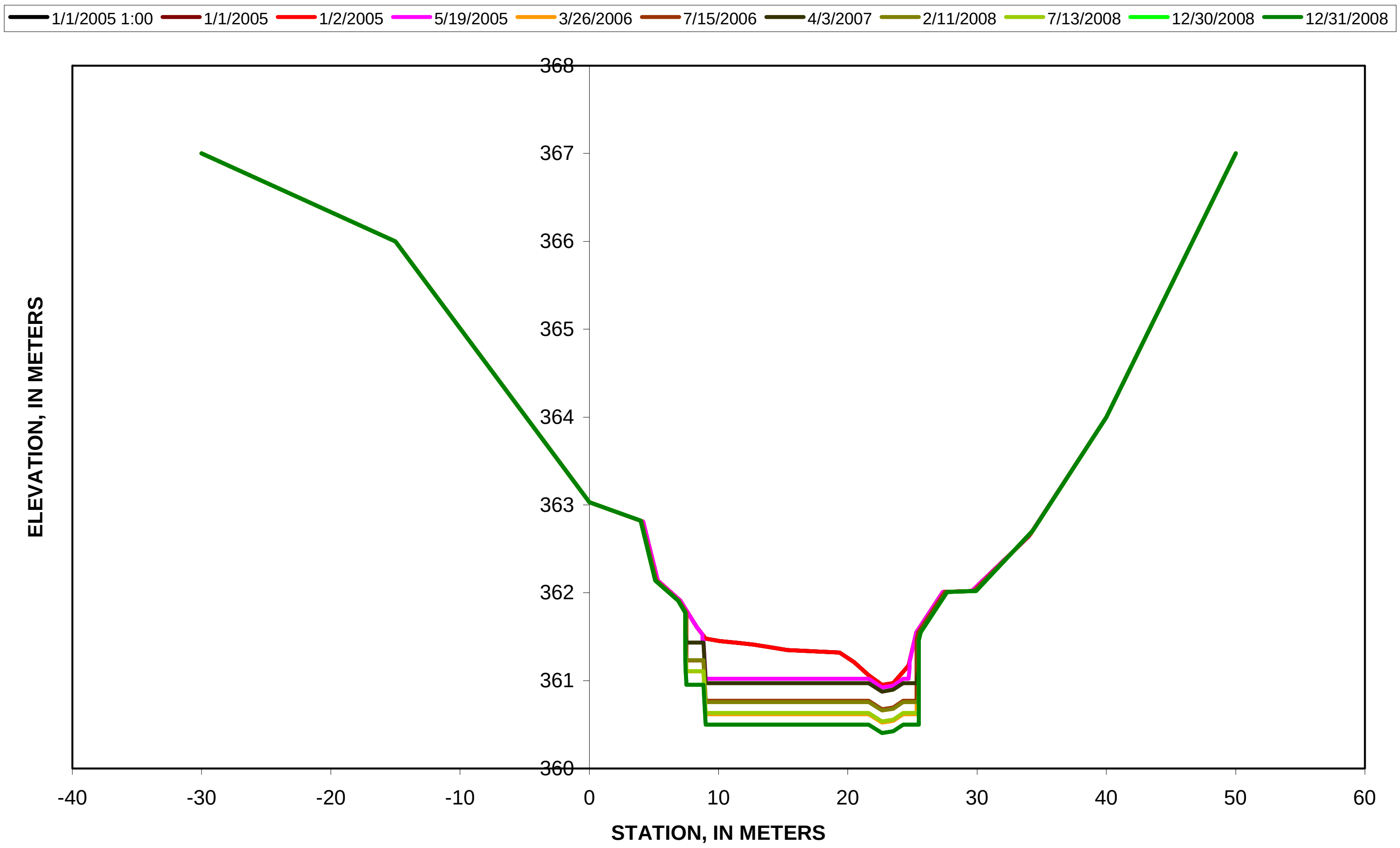


Figure E.20. Montgomery Fork cross section X4.

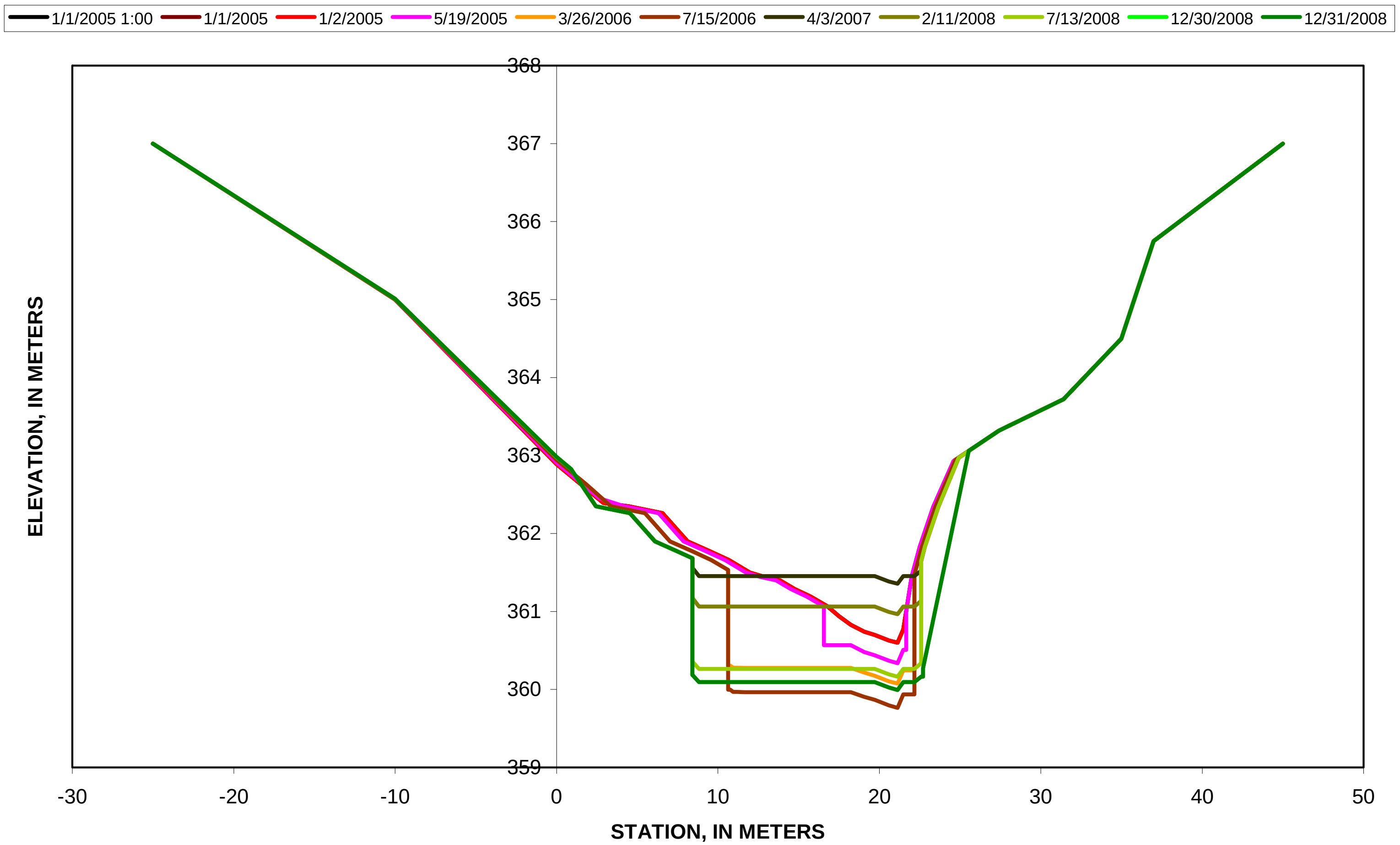


Figure E.20. Montgomery Fork cross section X5.

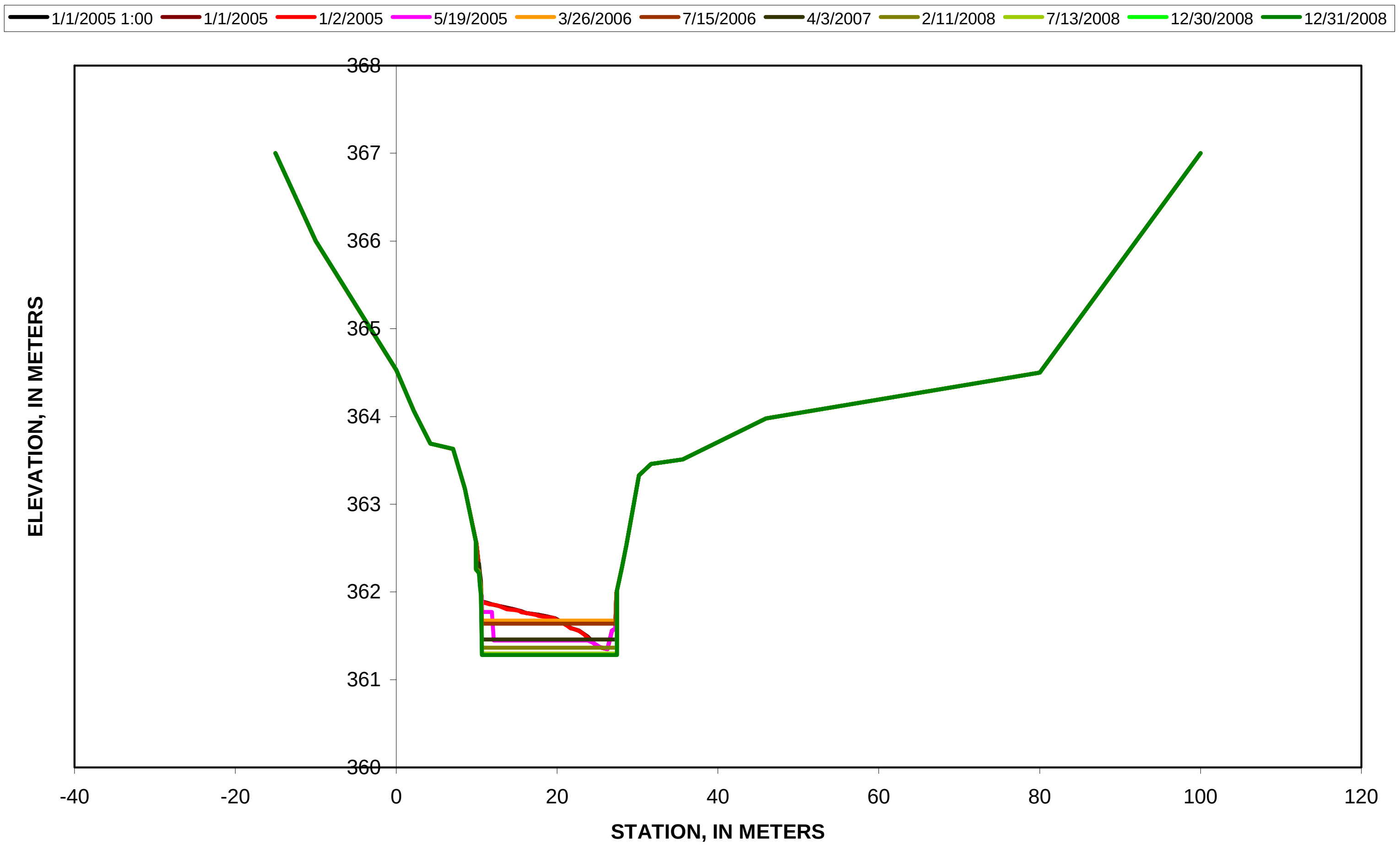


Figure E.21. Montgomery Fork cross section X6.

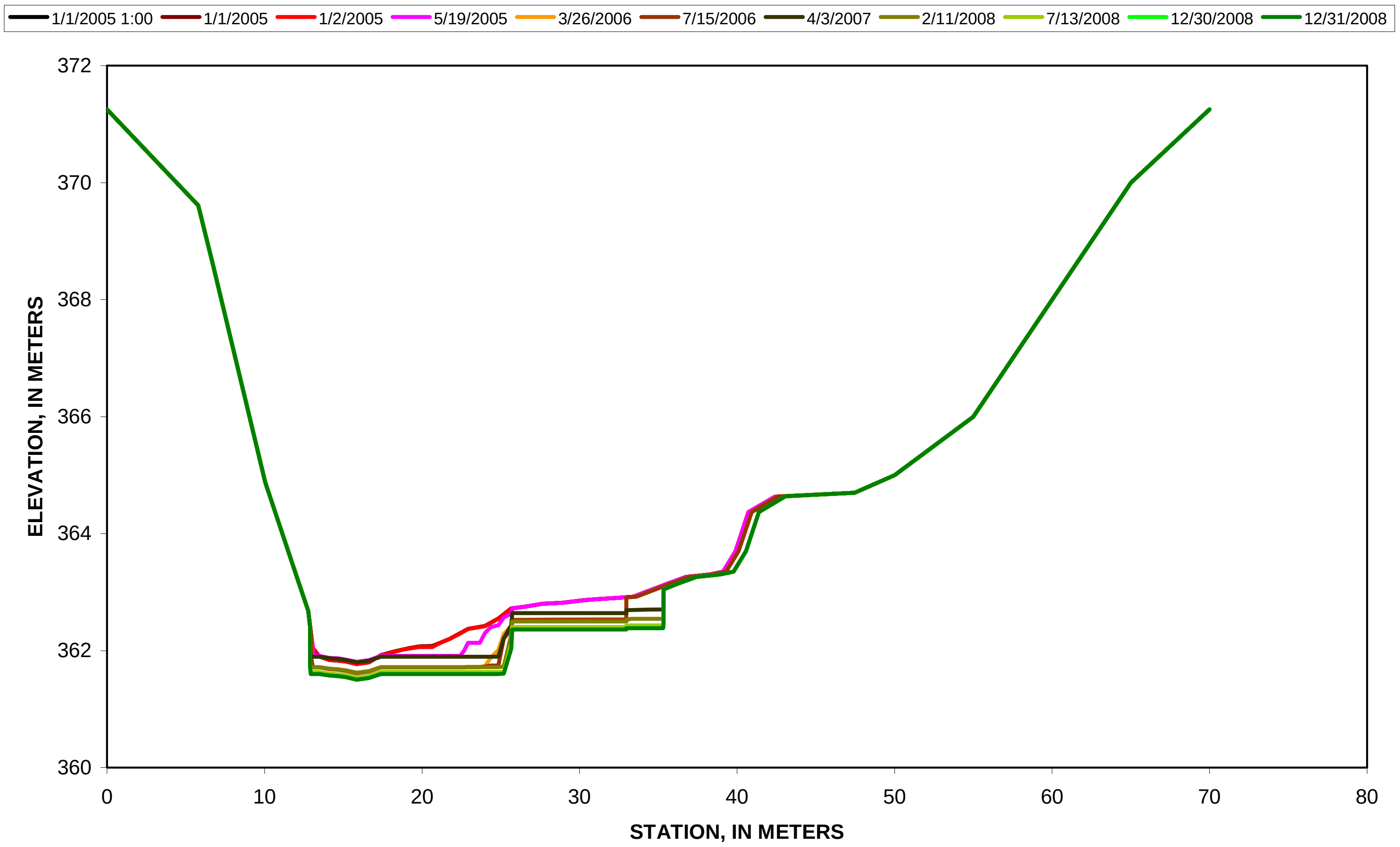


Figure E.21. Montgomery Fork cross section X7.

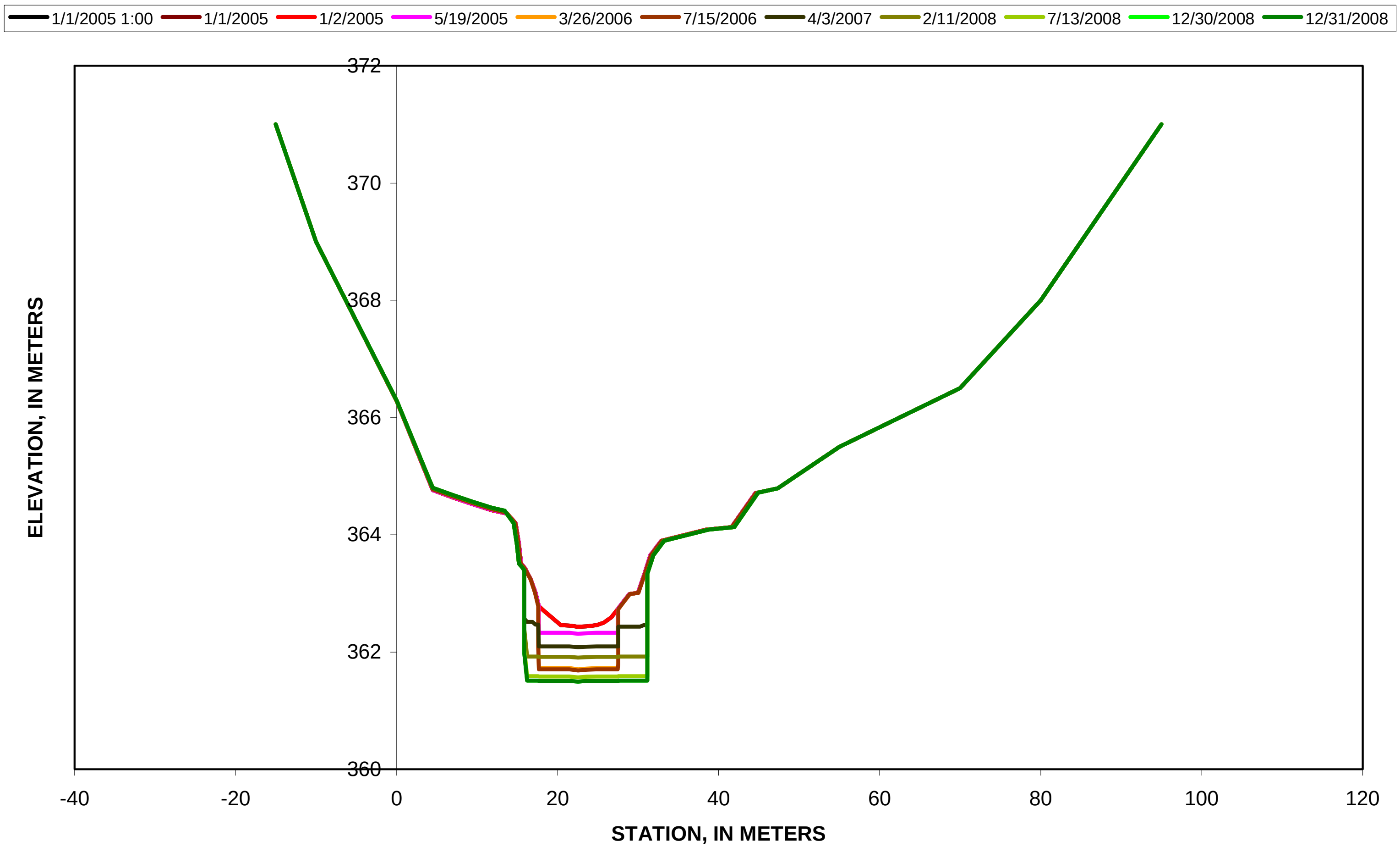


Figure E.22. Montgomery Fork cross section X8.

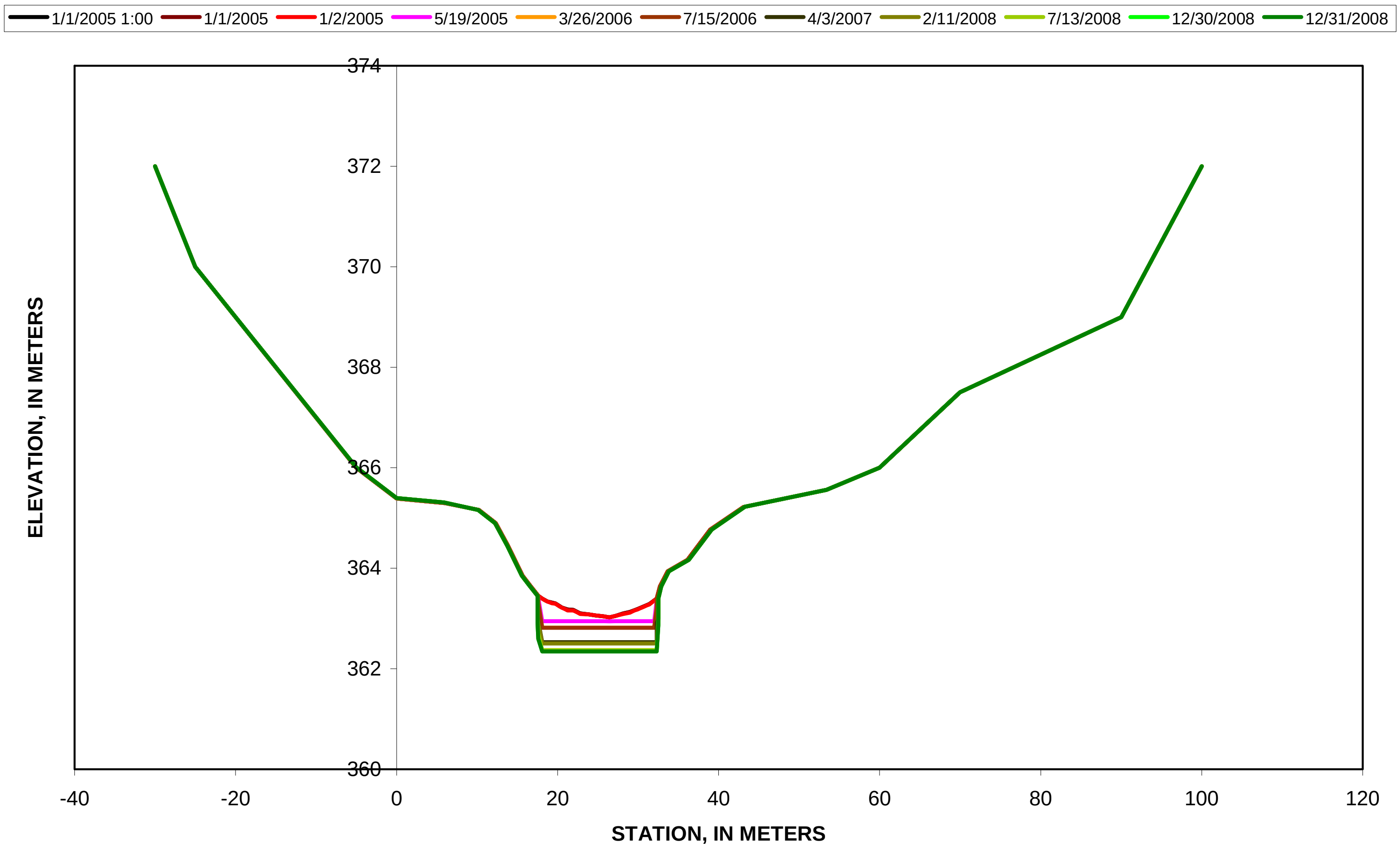


Figure E.23. Montgomery Fork cross section X9.

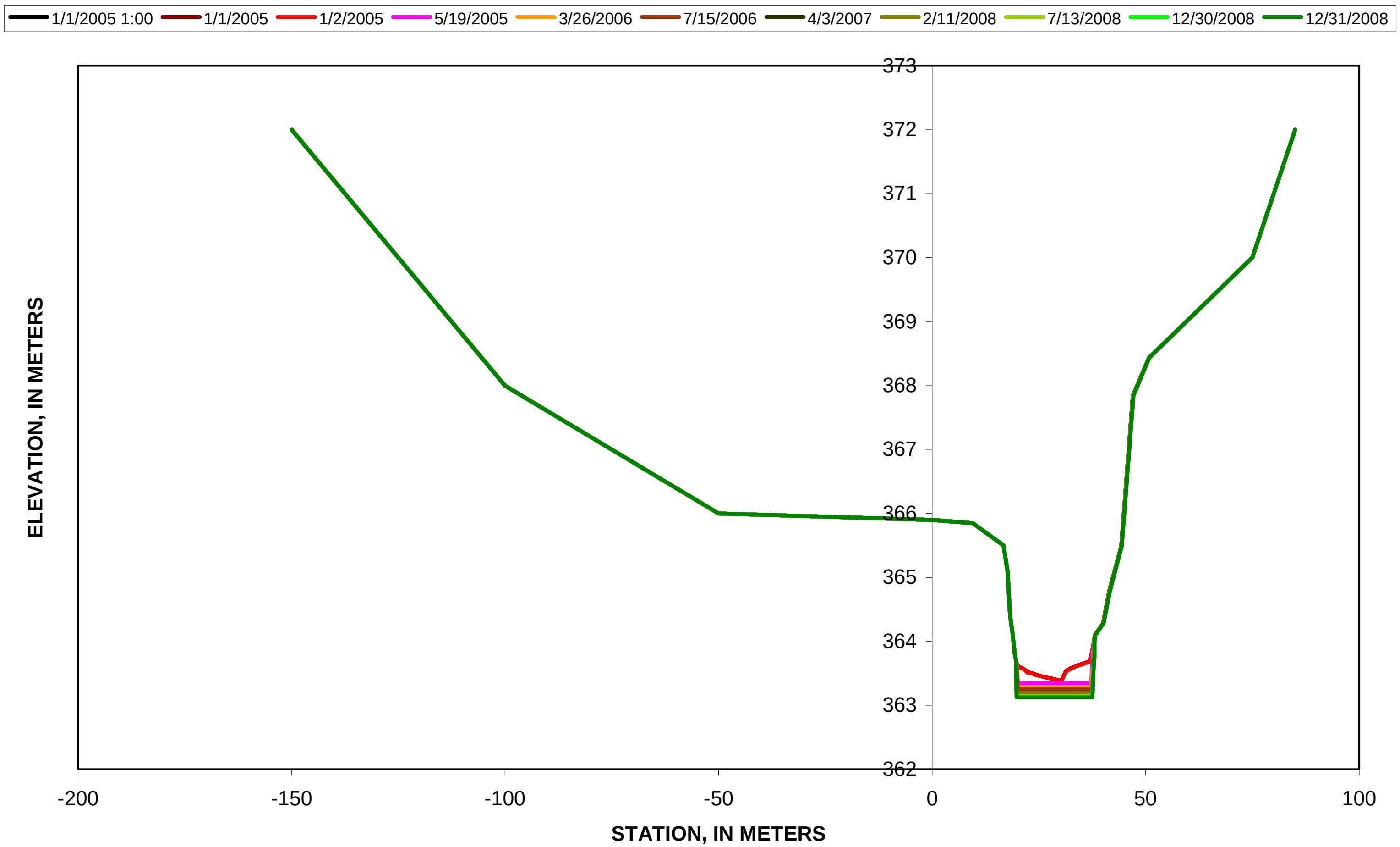


Figure E.24. Montgomery Fork cross section X10 (upstream).

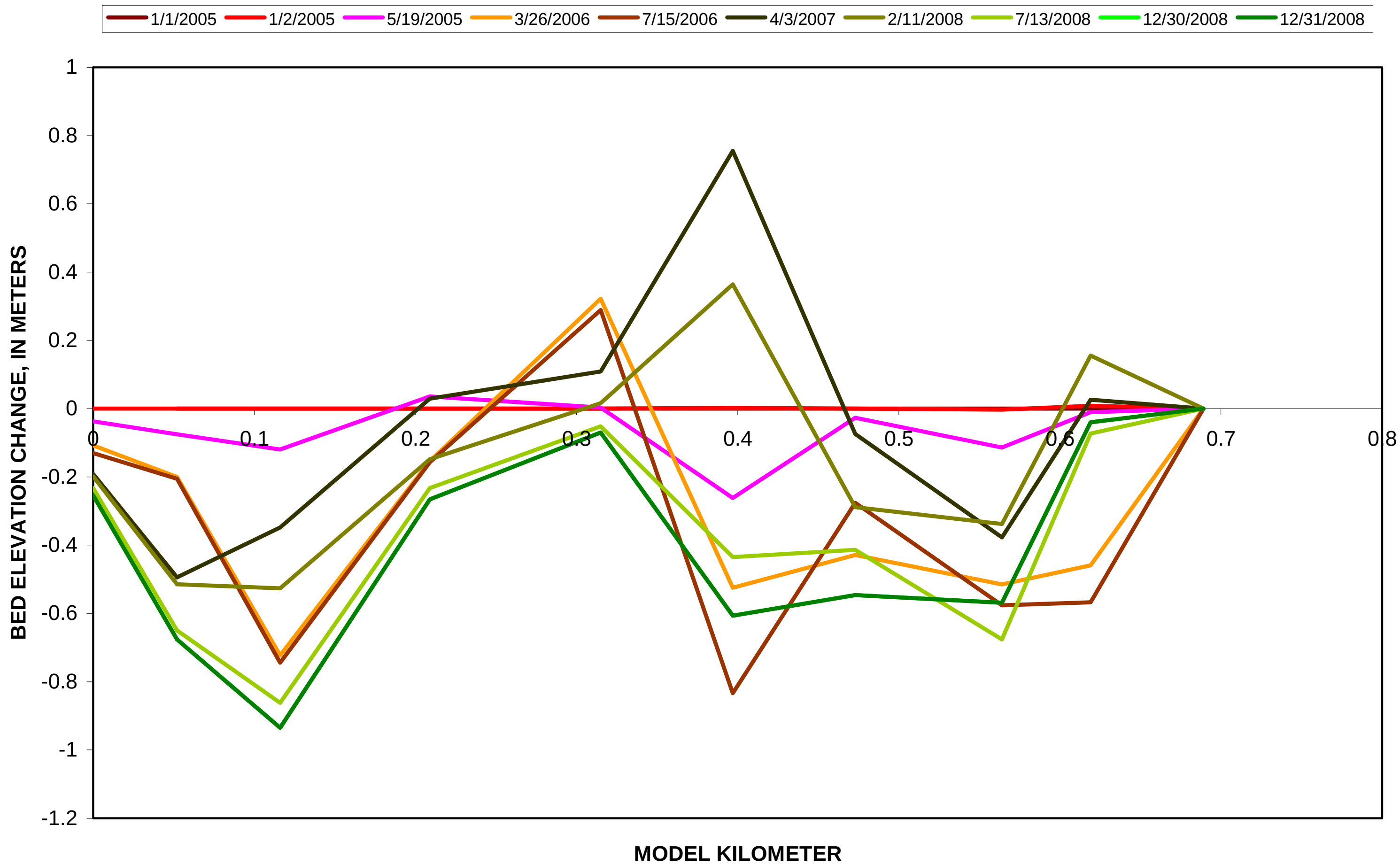


Figure E.25. Montgomery Fork bed elevation change.

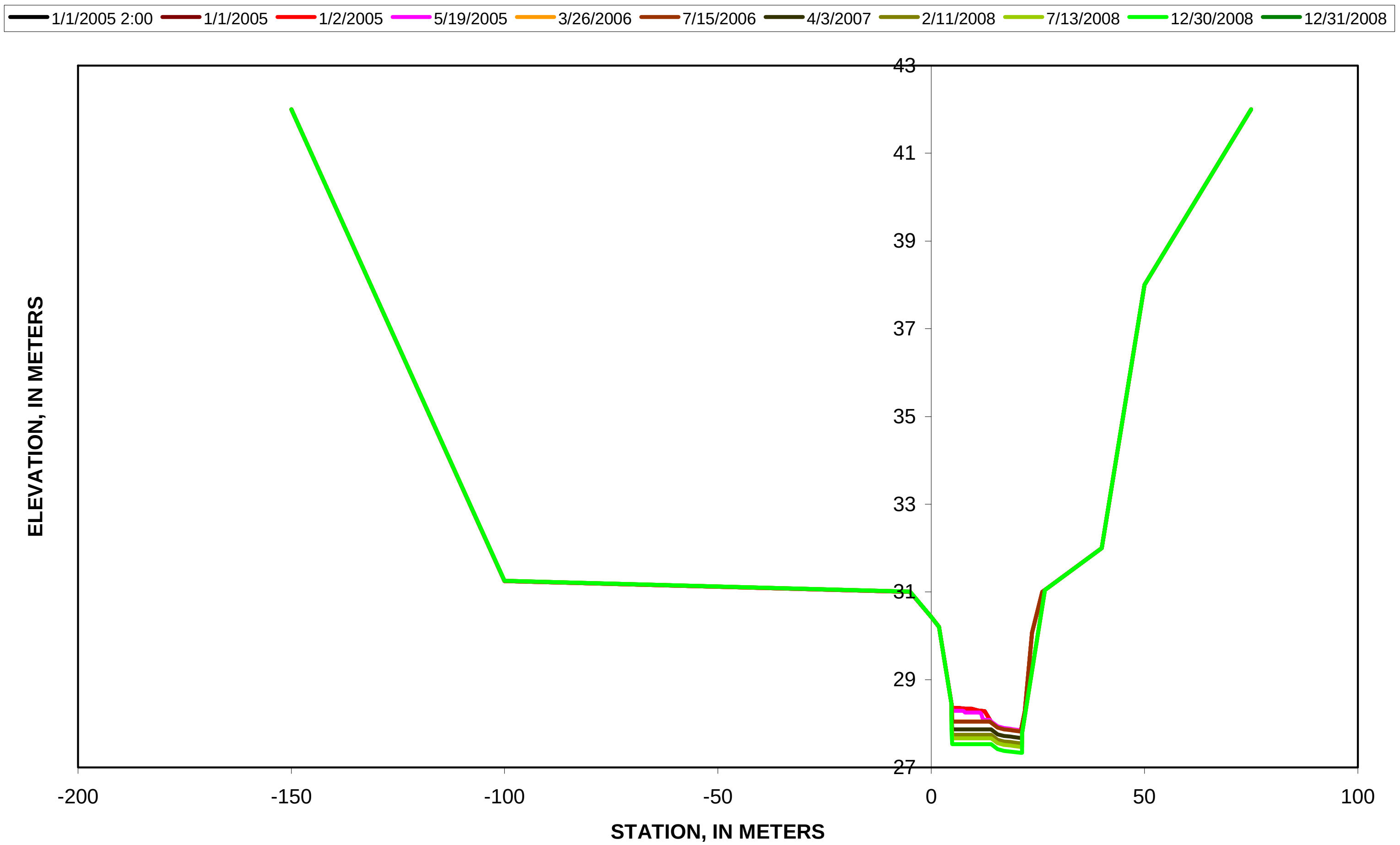


Figure E.26. Smokey Creek cross section X0 (downstream).

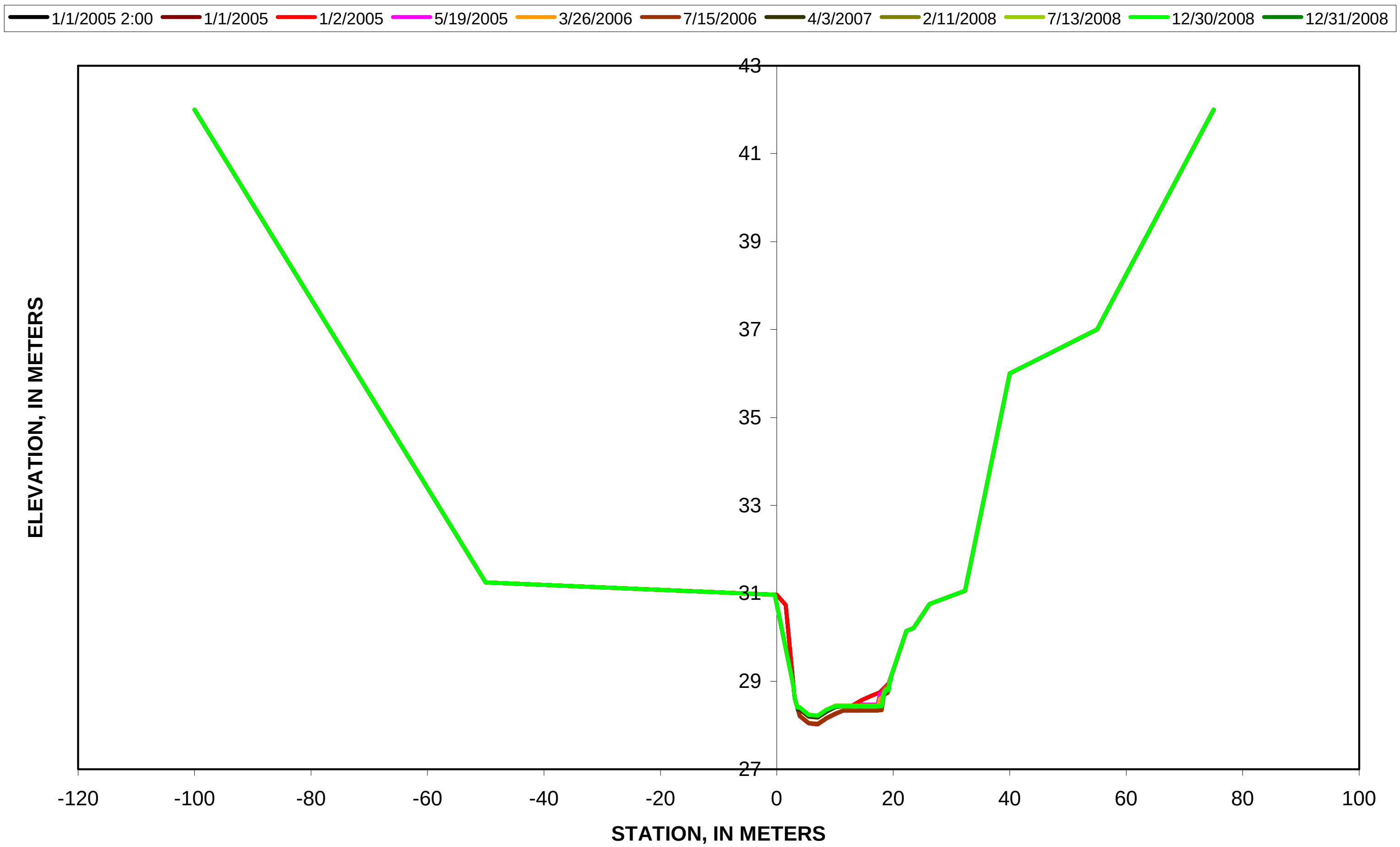


Figure E.27. Smokey Creek cross section X0.5.

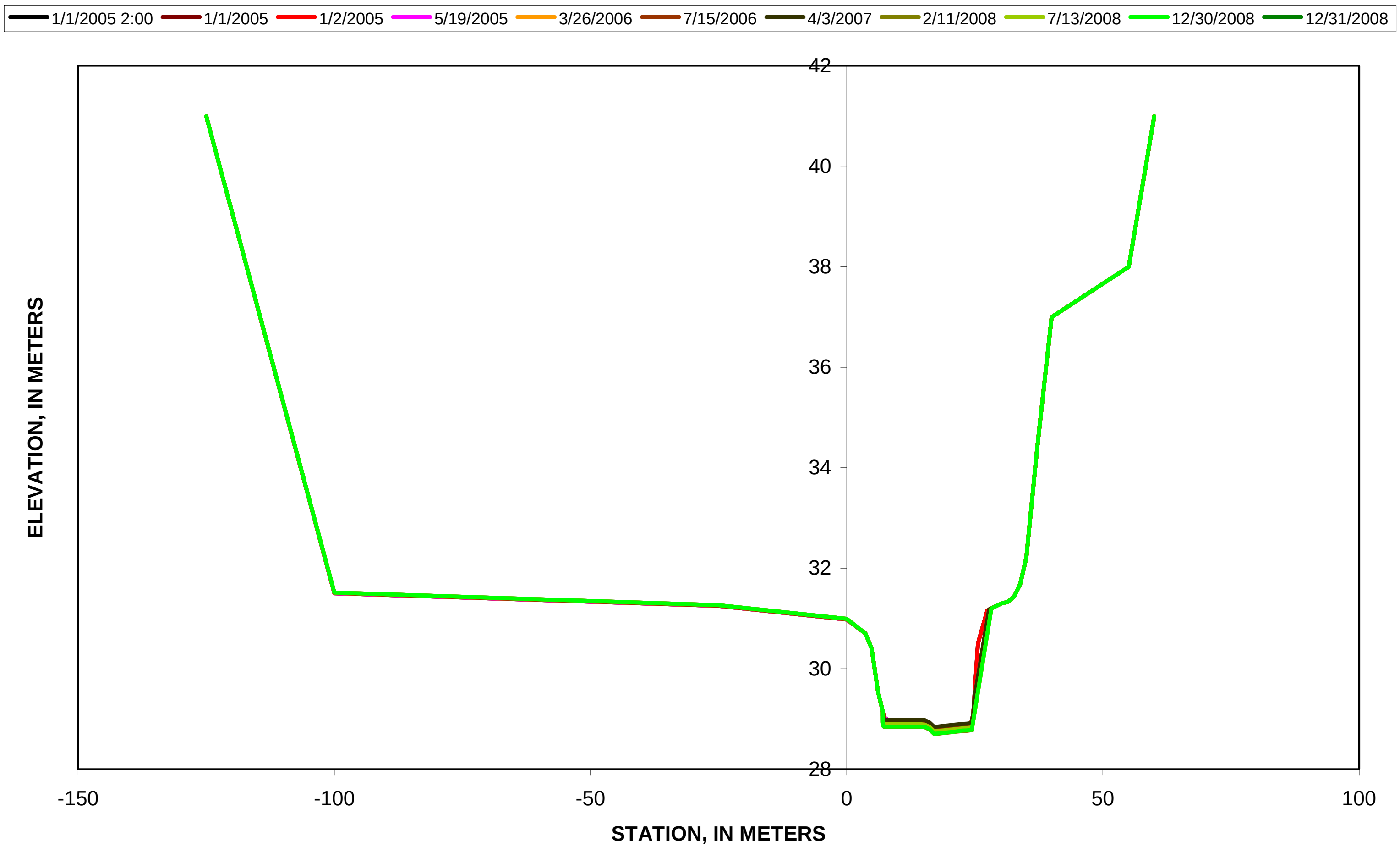


Figure E.28. Smokey Creek cross section X1.

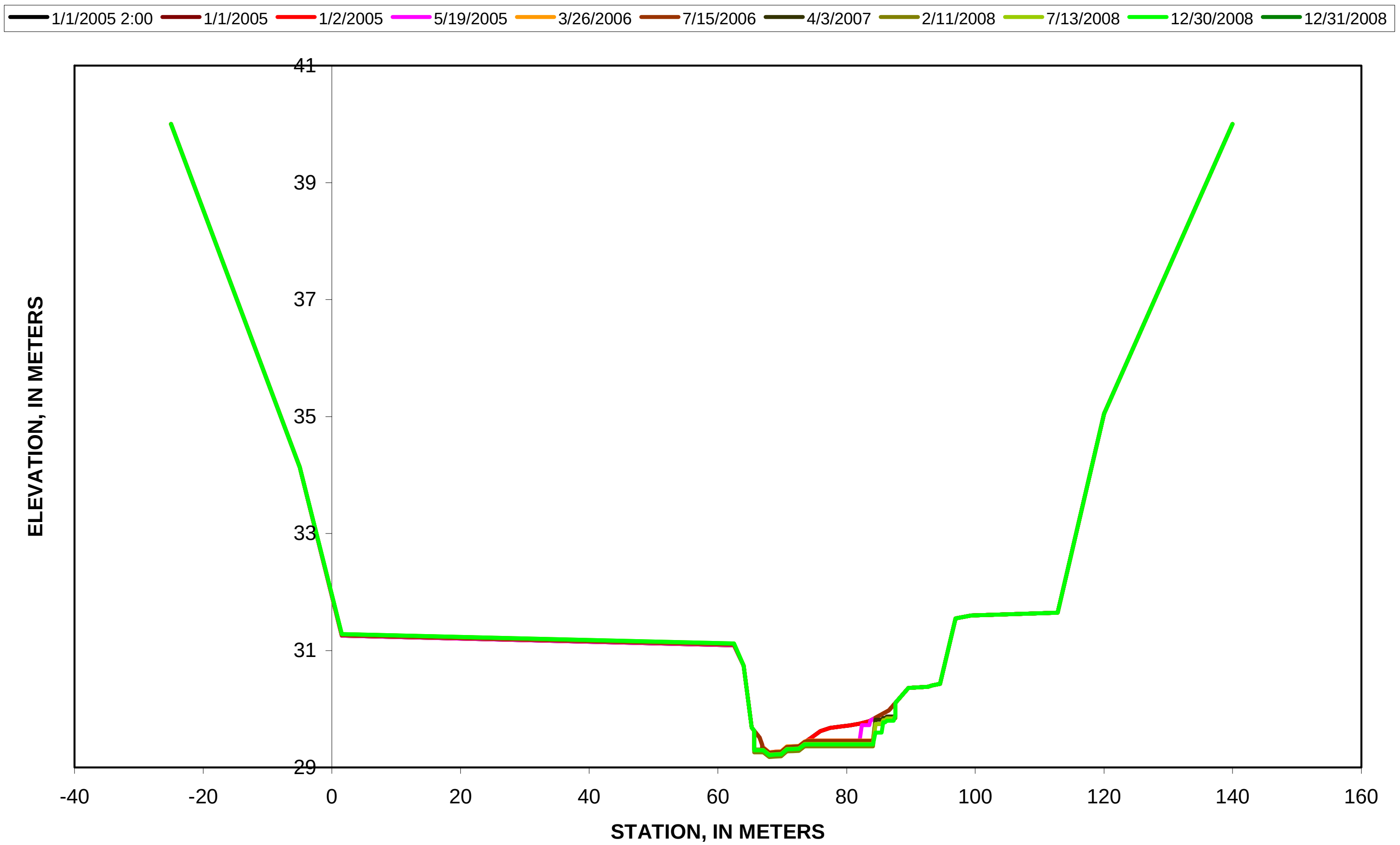


Figure E.29. Smokey Creek cross section X2.

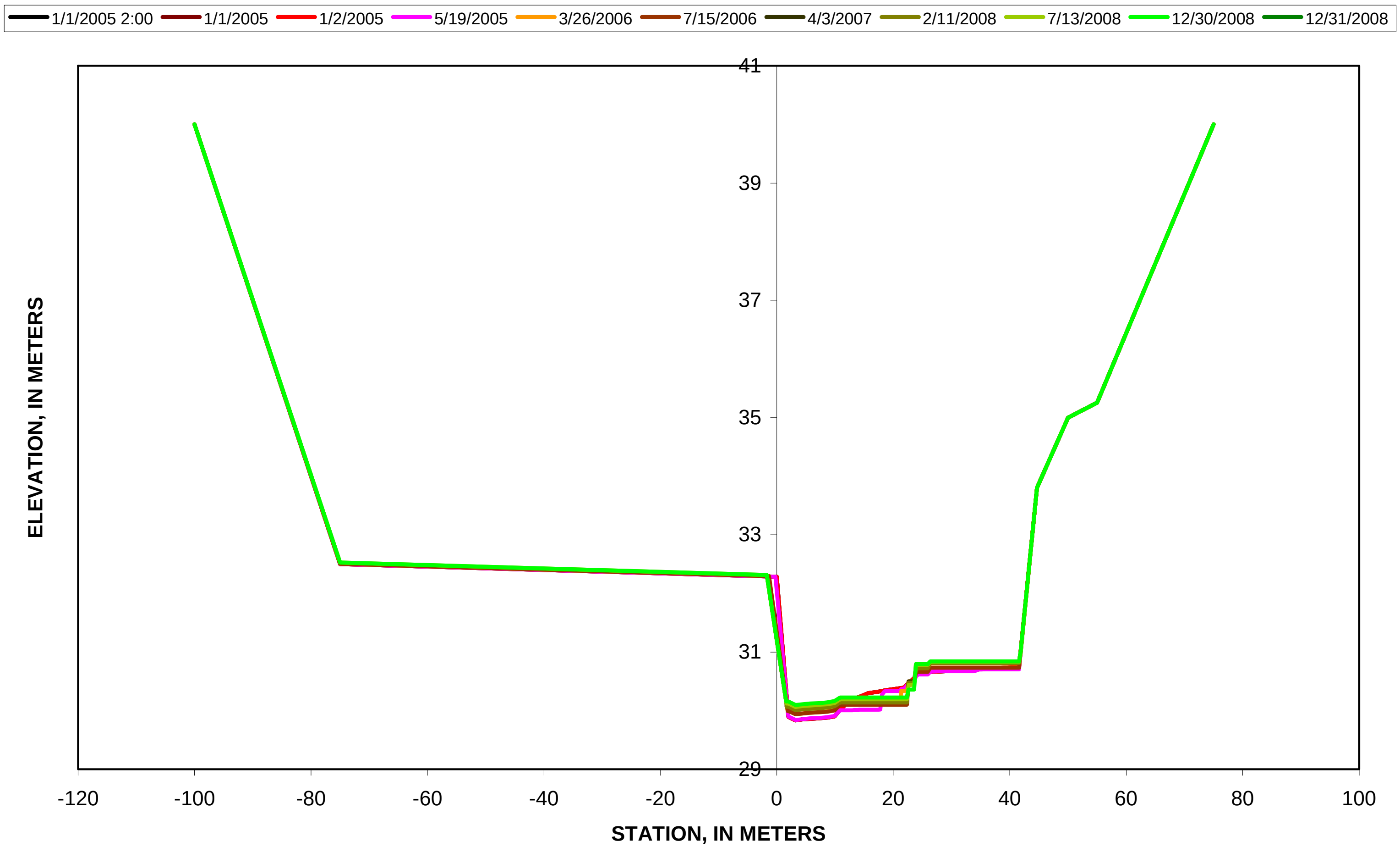


Figure E.30. Smokey Creek cross section X2.5.

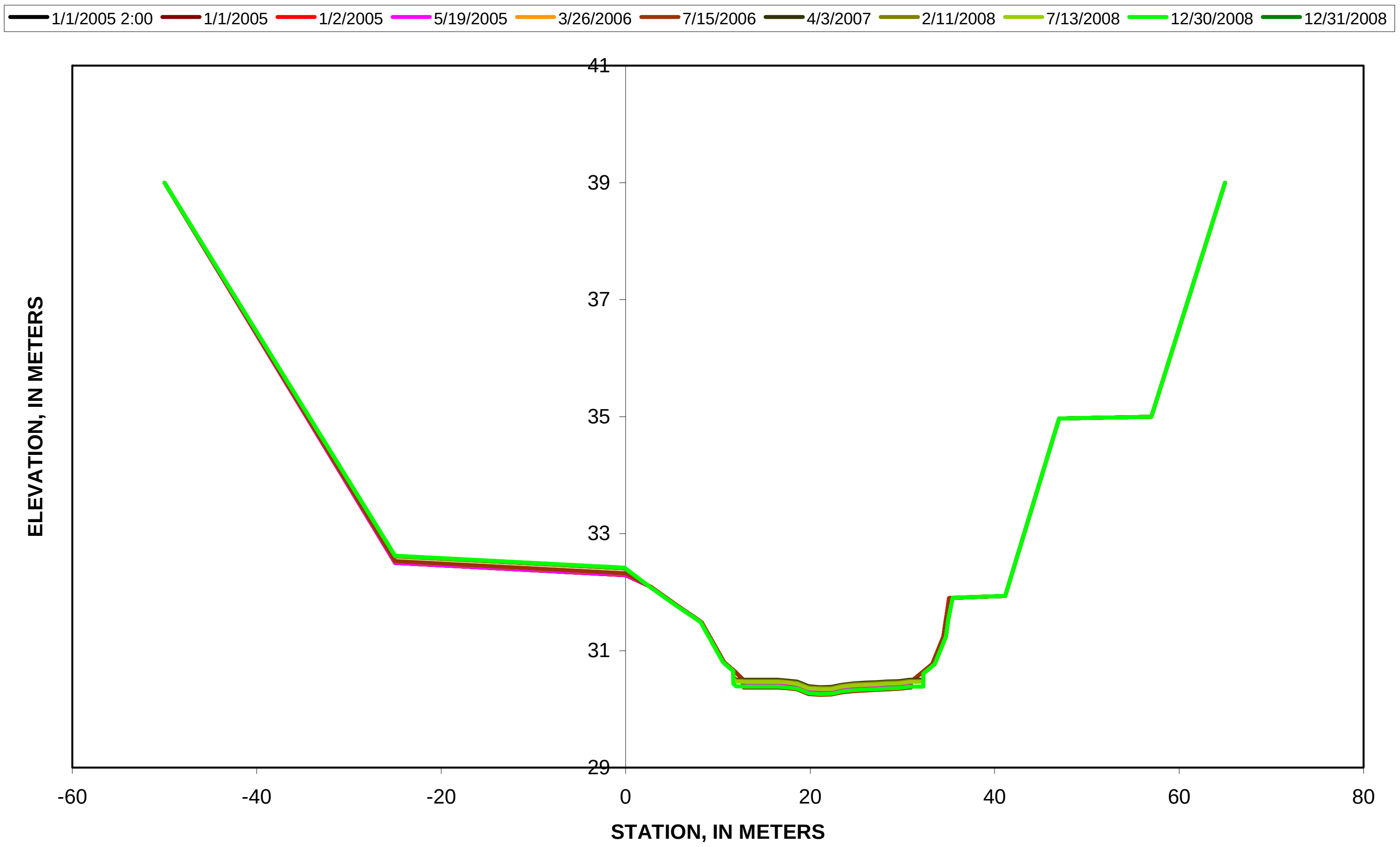


Figure E.31. Smokey Creek cross section X3.

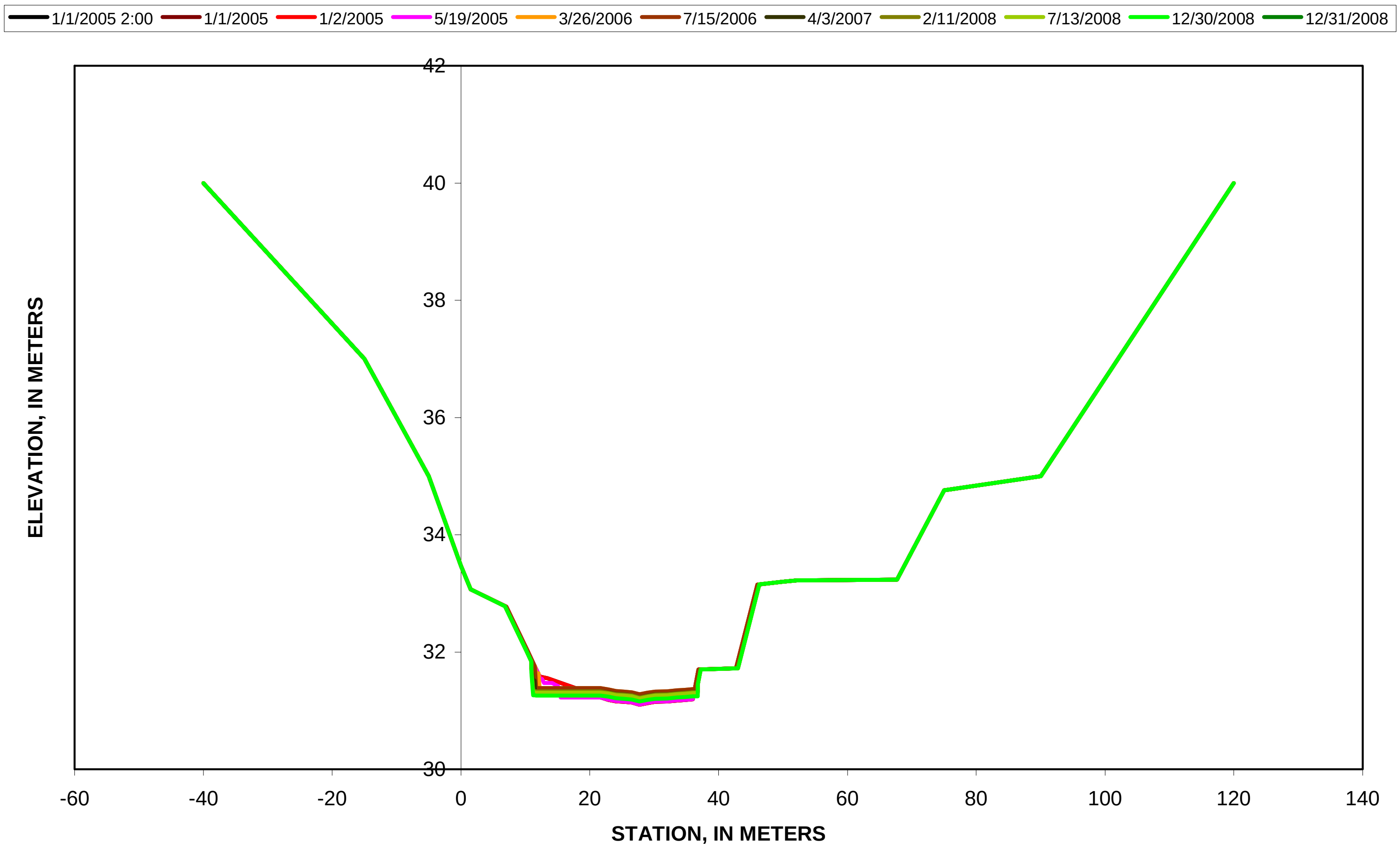


Figure E.32. Smokey Creek cross section X4.

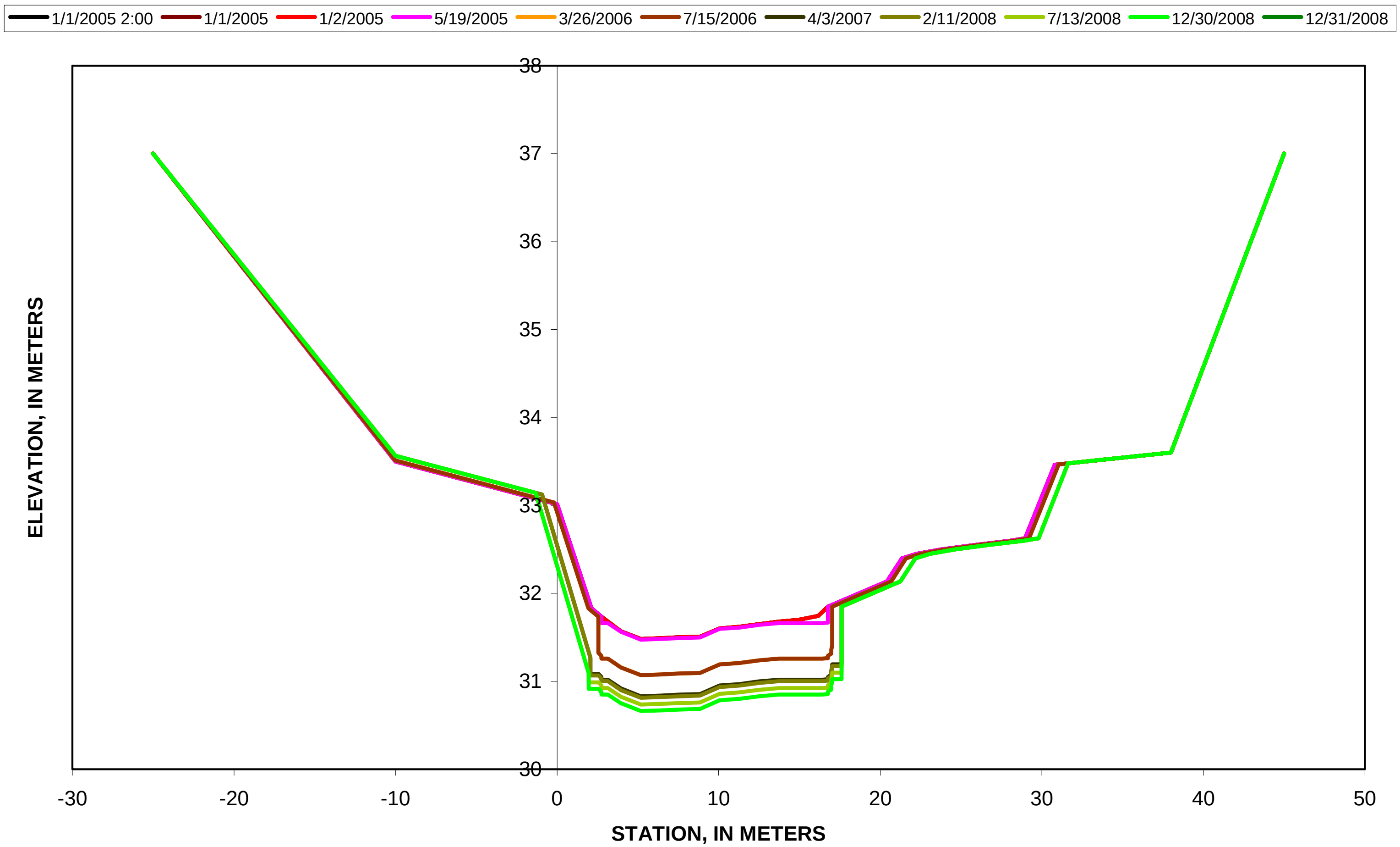


Figure E.33. Smokey Creek cross section X5.

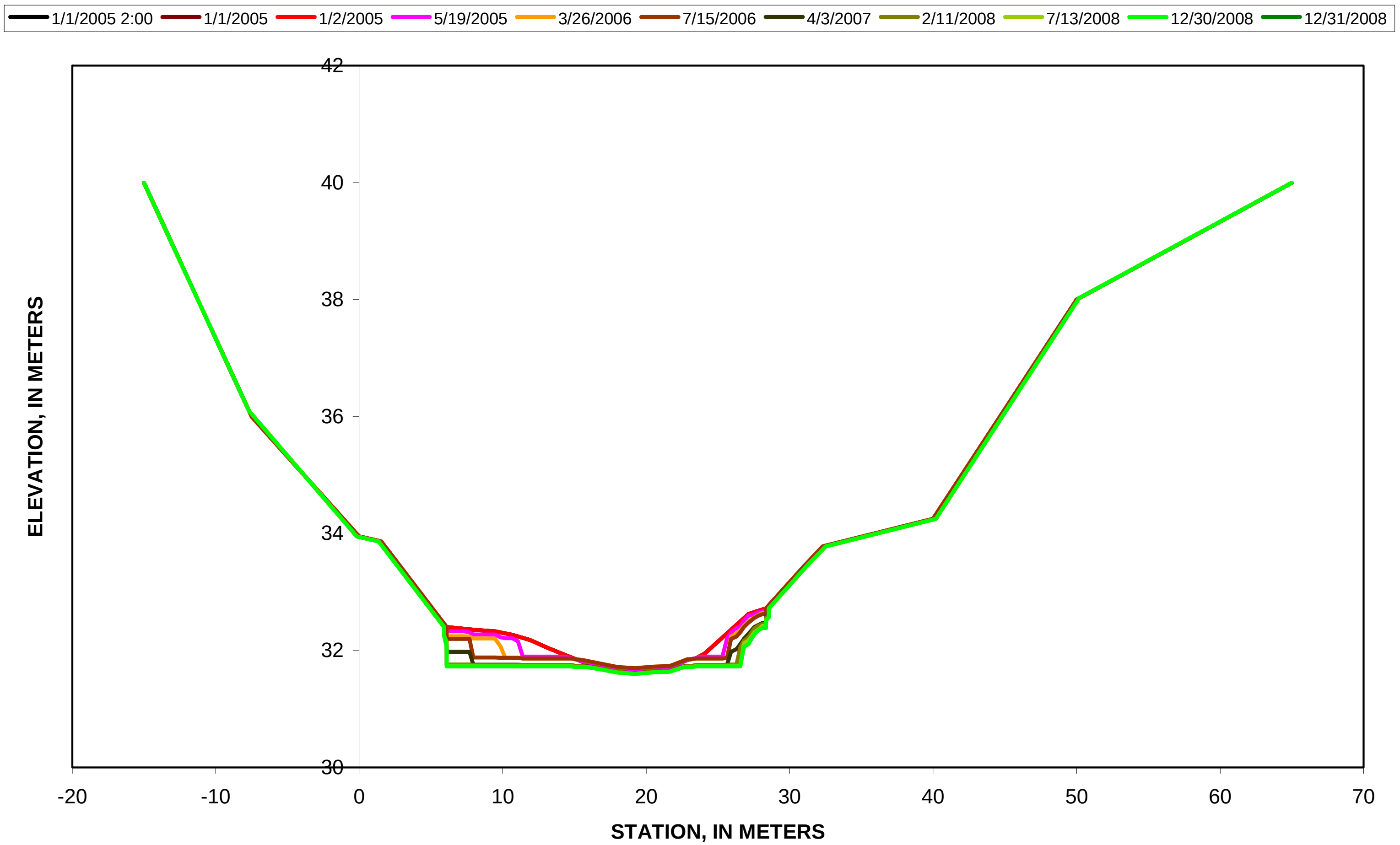


Figure E.34. Smokey Creek cross section X6.

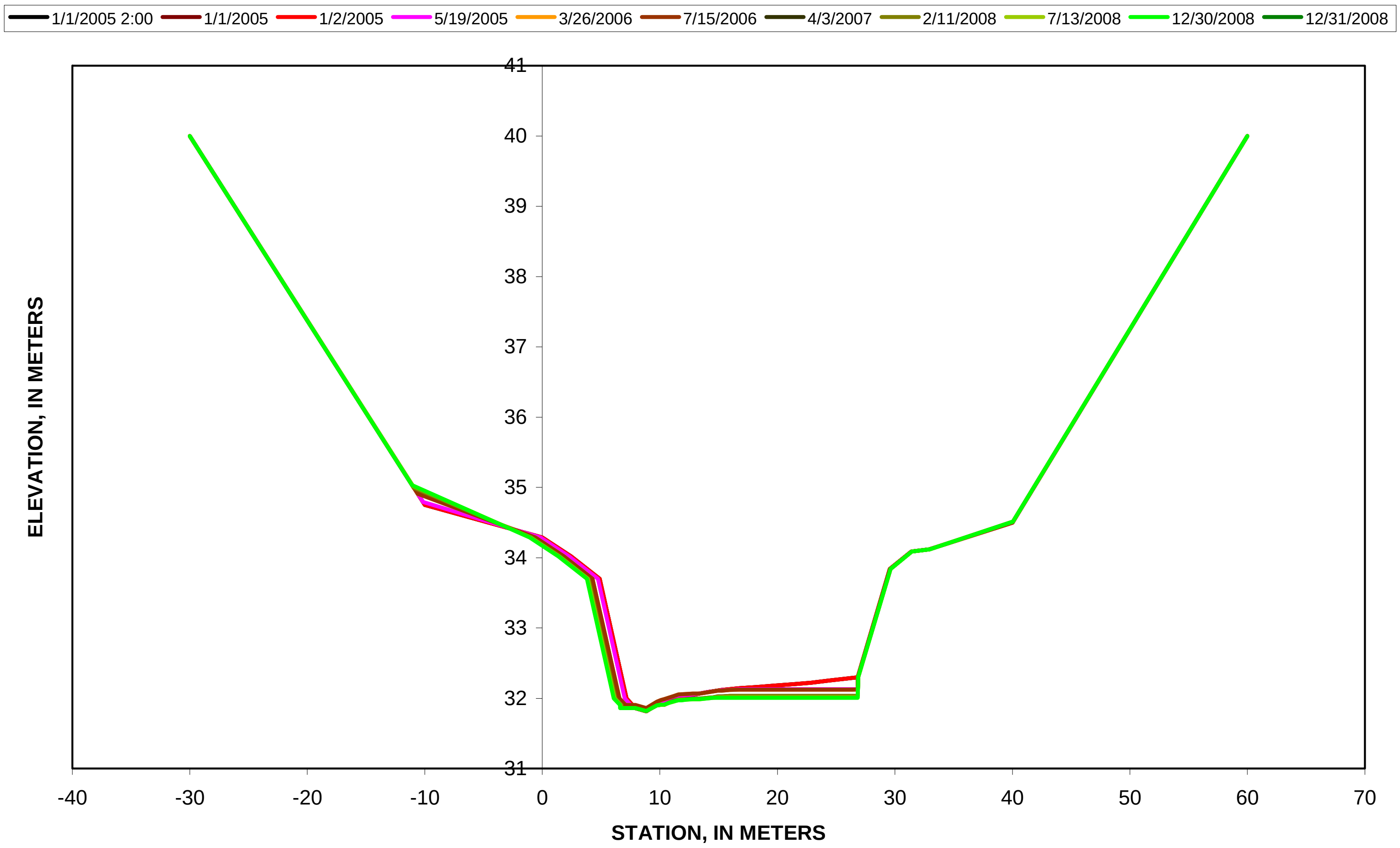


Figure E.35. Smokey Creek cross section X7 (upstream).

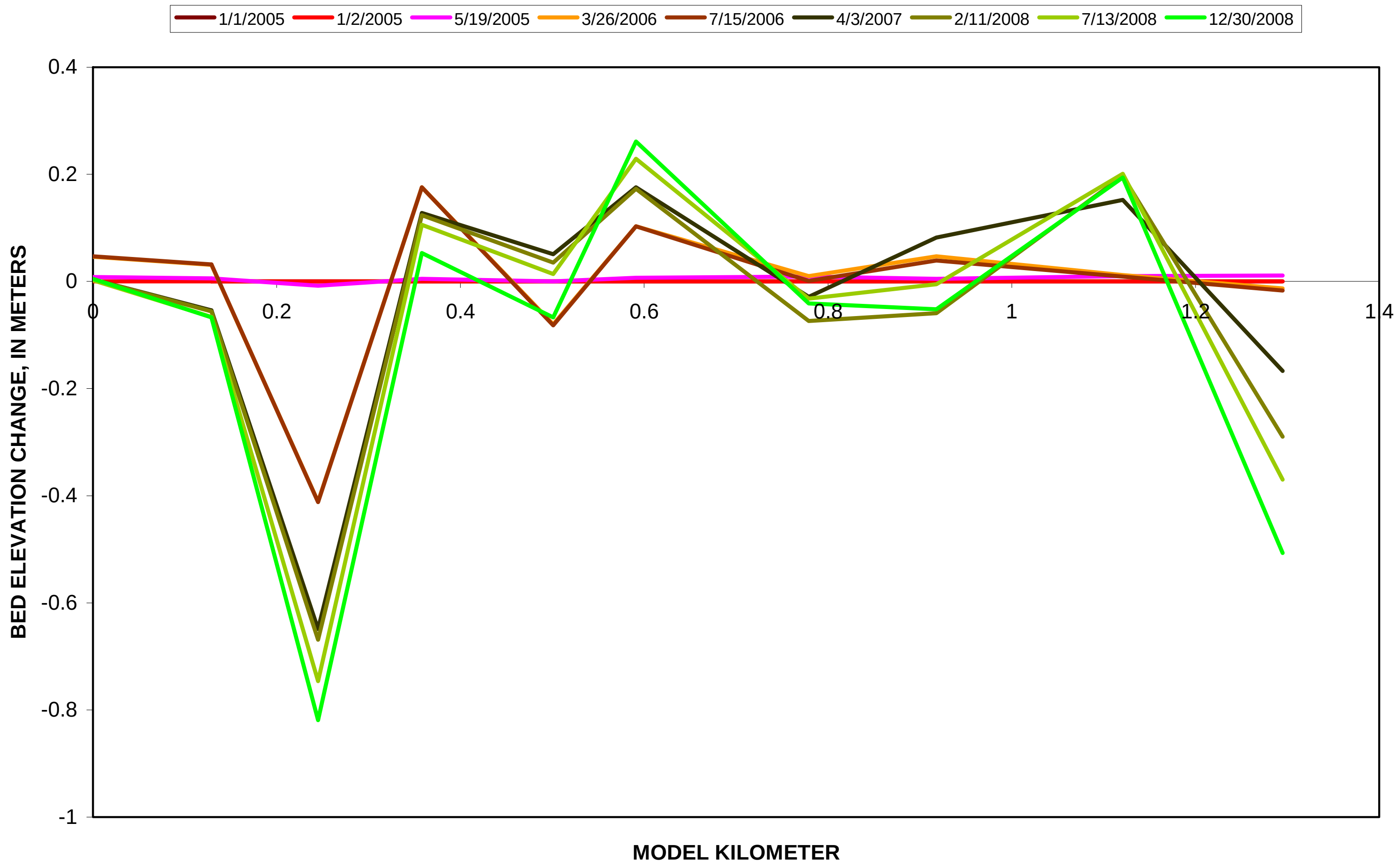


Figure E.36. Smokey Creek bed elevation change.

Table E.1. Brimstone event file summary. cms = m^3/s.

Brimstone Event File Summary														
		Time to Peak Discharge			Time to Peak Depth			Time to Peak Stage			Time to Peak F. Slope		
Date	Time	Date	Time	Peak Discharge	Date	Time	Peak Depth	Date	Time	Peak Stage	Date	Time	F. Slope
mm/dd/yyyy	hh:mm:ss	mm/dd/yyyy	hh:mm:ss	cms	mm/dd/yyyy	hh:mm:ss	m	mm/dd/yyyy	hh:mm:ss	m	mm/dd/yyyy	hh:mm:ss	
Initial	Initial												
01/01/2005	00:00:00			0.10			0.13			29.40	01/01/2005	01:17:02	7.19E-03
01/02/2005	00:00:00	01/02/2005	06:25:55	0.21	01/02/2005	06:25:55	0.20	01/02/2005	06:25:55	29.47	01/02/2005	02:49:15	7.19E-03
05/19/2005	00:00:00	05/19/2005	18:51:40	0.10	05/19/2005	18:51:40	0.11	05/19/2005	18:43:35	29.39	05/19/2005	08:53:30	7.30E-03
03/26/2006	00:00:00	03/26/2006	03:14:24	0.21	03/26/2006	03:14:24	0.13	03/26/2006	03:14:24	29.40	03/26/2006	01:29:06	7.34E-03
07/15/2006	00:00:00	07/15/2006	02:41:58	5.72	07/15/2006	02:41:58	0.55	07/15/2006	02:41:58	29.82	07/15/2006	00:29:38	7.38E-03
04/03/2007	00:00:00	04/03/2007	07:44:00	0.21	04/03/2007	07:44:00	0.13	04/03/2007	07:44:00	29.39	04/03/2007	15:32:04	7.45E-03
02/11/2008	00:00:00	02/11/2008	00:01:47	0.10	02/11/2008	00:01:47	0.11	02/11/2008	00:01:47	29.37	02/11/2008	18:36:13	7.42E-03
07/13/2008	00:00:00	07/13/2008	01:38:24	10.02	07/13/2008	01:38:24	0.71	07/13/2008	01:38:24	29.95	07/13/2008	00:20:24	7.74E-03
12/30/2008	00:00:00	12/29/2008	05:05:42	0.10	12/30/2008	01:58:04	0.11	12/30/2008	01:24:20	29.35	12/30/2008	00:59:02	7.56E-03

Table E.1: Brimstone event file summary (*continued*). Tons are metric tons.

Brimstone Event File Summary									
		Storm event generated sediment yield				Cumulative sediment yield			
Date	Time	Silt YLD	Sand YLD	Gravel YLD	Total YLD	Silt YLD	Sand YLD	Gravel YLD	Total YLD
mm/dd/yyyy	hh:mm:ss	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)
Initial	Initial								
01/01/2005	00:00:00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
01/02/2005	00:00:00	3.70E-01	0.00E+00	0.00E+00	3.70E-01	3.69E-01	0.00E+00	0.00E+00	3.69E-01
05/19/2005	00:00:00	2.71E-02	0.00E+00	0.00E+00	2.71E-02	1.69E+02	3.12E-02	0.00E+00	1.69E+02
03/26/2006	00:00:00	5.90E-02	0.00E+00	0.00E+00	5.90E-02	5.49E+02	1.73E+00	5.94E+00	5.57E+02
07/15/2006	00:00:00	3.36E+00	2.46E-12	0.00E+00	3.36E+00	6.38E+02	1.75E+00	5.94E+00	6.46E+02
04/03/2007	00:00:00	4.36E+00	0.00E+00	0.00E+00	4.36E+00	1.16E+03	1.63E+03	3.91E+02	3.18E+03
02/11/2008	00:00:00	7.79E-02	0.00E+00	0.00E+00	7.79E-02	1.34E+03	1.64E+03	4.10E+02	3.39E+03
07/13/2008	00:00:00	5.86E-01	2.65E-03	8.01E-03	5.96E-01	1.53E+03	1.66E+03	4.65E+02	3.66E+03
12/30/2008	00:00:00	8.18E-02	0.00E+00	0.00E+00	8.18E-02	1.62E+03	1.67E+03	4.87E+02	3.77E+03

Table E.1. Brimstone event file summary (*continued*).

Brimstone Event File Summary														
		Cross sectional changes				Channel widths		Bank Heights		BED MATERIAL				
Date	Time	Bed Change	Cumulative bed change	Lat Change	Cumulative Lat change	Bottom	Floodplain	Left	Right	D16	D50	D84	D90	Dmean
mm/dd/yyyy	hh:mm:ss	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(mm)	(mm)	(mm)	(mm)	(mm)
Initial	Initial					8.54	20.82	1.48	1.42	52	83	111	117	75
01/01/2005	00:00:00	0.00	0.00	0.00	0.00	8.54	20.82	1.48	1.42	52	83	111	117	75
01/02/2005	00:00:00	0.00	0.00	0.00	0.00	8.54	20.82	1.48	1.42	52	83	111	117	75
05/19/2005	00:00:00	0.00	0.00	0.00	0.00	8.54	20.82	1.48	1.42	52	83	111	117	75
03/26/2006	00:00:00	0.00	0.00	0.00	0.00	8.54	20.82	1.48	1.42	54	83	111	117	75
07/15/2006	00:00:00	0.00	0.00	0.00	0.00	8.54	20.82	1.48	1.42	54	83	111	117	75
04/03/2007	00:00:00	0.00	-0.02	0.00	0.61	9.15	20.93	1.52	1.44	10	76	108	115	38
02/11/2008	00:00:00	0.00	-0.02	0.00	0.61	9.15	20.93	1.52	1.44	19	77	109	115	40
07/13/2008	00:00:00	0.00	-0.04	0.00	0.61	9.15	20.93	1.53	1.45	34	80	110	116	49
12/30/2008	00:00:00	0.00	-0.04	0.00	0.61	9.15	20.93	1.53	1.45	34	80	110	116	49

Table E.2. Ligias Creek event file summary. cms = m^3/s.

Ligias Event File Summary														
		Time to Peak Discharge			Time to Peak Depth			Time to Peak Stage			Time to Peak F. Slope		
Date	Time	Date	Time	Peak Discharge	Date	Time	Peak Depth	Date	Time	Peak Stage	Date	Time	F. Slope
mm/dd/yyyy	hh:mm:ss	mm/dd/yyyy	hh:mm:ss	(cms)	mm/dd/yyyy	hh:mm:ss	(m)	mm/dd/yyyy	hh:mm:ss	(m)	mm/dd/yyyy	hh:mm:ss	
Initial	Initial												
01/01/2005	00:00:00			0.51			0.23			29.35	01/01/2005	04:27:35	1.40E-02
01/02/2005	00:00:00	01/02/2005	04:12:35	2.51	01/02/2005	04:12:35	0.49	01/02/2005	04:12:35	29.60	01/02/2005	00:19:15	1.40E-02
05/19/2005	00:00:00	05/19/2005	09:14:12	0.51	05/19/2005	09:14:12	0.24	05/19/2005	09:14:12	29.35	05/19/2005	06:14:54	1.35E-02
03/26/2006	00:00:00	03/26/2006	01:04:48	0.50	03/26/2006	01:04:48	0.23	03/25/2006	12:09:00	29.35	03/26/2006	02:25:48	1.32E-02
07/15/2006	00:00:00	07/15/2006	03:11:06	29.93	07/15/2006	03:11:06	5.60	07/15/2006	03:11:06	34.72	07/15/2006	06:22:28	1.35E-02
04/03/2007	00:00:00	04/03/2007	03:09:26	9.86	04/03/2007	03:09:26	1.03	04/03/2007	03:09:26	30.14	04/02/2007	23:58:48	1.31E-02
02/11/2008	00:00:00	02/11/2008	09:16:45	0.59	02/11/2008	09:16:45	0.26	02/11/2008	09:16:45	29.37	02/11/2008	00:27:00	1.31E-02
07/13/2008	00:00:00	07/13/2008	02:11:08	20.91	07/13/2008	02:11:08	1.63	07/13/2008	02:11:08	30.74	07/13/2008	06:19:48	1.31E-02
12/30/2008	00:00:00	12/30/2008	02:00:13	3.43	12/30/2008	02:00:13	0.58	12/30/2008	02:00:13	29.69	12/30/2008	00:08:24	1.31E-02

Table E.2. Ligias Creek event file summary (*continued*). Tons are metric tons.

Ligias Event File Summary									
		Storm event generated sediment yield				Cumulative sediment yield			
Date	Time	Silt YLD	Sand YLD	Gravel YLD	Total YLD	Silt YLD	Sand YLD	Gravel YLD	Total YLD
mm/dd/yyyy	hh:mm:ss	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)
Initial	Initial								
01/01/2005	00:00:00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
01/02/2005	00:00:00	1.59E+00	8.50E-13	0.00E+00	1.59E+00	1.59E+00	8.50E-13	0.00E+00	1.59E+00
05/19/2005	00:00:00	1.30E-01	0.00E+00	0.00E+00	1.30E-01	6.01E+02	3.47E+01	3.99E+00	6.40E+02
03/26/2006	00:00:00	7.73E-02	0.00E+00	0.00E+00	7.73E-02	1.80E+03	3.48E+01	4.15E+00	1.84E+03
07/15/2006	00:00:00	2.36E+01	4.90E-03	0.00E+00	2.36E+01	2.17E+03	3.49E+01	4.18E+00	2.21E+03
04/03/2007	00:00:00	8.84E+01	8.87E-05	0.00E+00	8.84E+01	3.50E+03	3.53E+01	4.55E+00	3.54E+03
02/11/2008	00:00:00	1.37E+00	0.00E+00	0.00E+00	1.37E+00	4.27E+03	3.57E+01	4.70E+00	4.31E+03
07/13/2008	00:00:00	1.61E+01	2.75E-02	8.54E-12	1.62E+01	4.90E+03	3.59E+01	4.75E+00	4.94E+03
12/30/2008	00:00:00	2.33E+00	1.09E-12	0.00E+00	2.33E+00	5.13E+03	3.61E+01	6.41E+00	5.17E+03

Table E.2. Ligias Creek event file summary (*continued*).

Ligias Event File Summary														
		Cross sectional changes				Channel widths		Bank Heights		BED MATERIAL				
Date	Time	Bed Change	Cumulative bed change	Lat Change	Cumulative Lat change	Bottom	Floodplain	Left	Right	D16	D50	D84	D90	Dmean
mm/dd/yyyy	hh:mm:ss	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(mm)	(mm)	(mm)	(mm)	(mm)
Initial	Initial					5.64	22.26	2.22	2.66	28	69	105	113	55
01/01/2005	00:00:00	0.00	0.00	0.00	0.00	5.64	22.26	2.22	2.66	28	69	105	113	55
01/02/2005	00:00:00	0.00	0.00	0.00	0.00	5.64	22.26	2.22	2.66	28	69	105	113	55
05/19/2005	00:00:00	0.00	0.00	0.00	0.00	5.64	22.72	2.22	2.68	28	69	105	113	55
03/26/2006	00:00:00	0.00	0.00	0.00	0.00	5.64	22.72	2.22	2.68	28	69	105	113	55
07/15/2006	00:00:00	0.00	0.00	0.00	0.00	5.64	22.72	2.22	2.68	28	69	105	113	55
04/03/2007	00:00:00	0.00	0.00	0.00	0.00	5.64	22.72	2.22	2.68	28	69	105	113	55
02/11/2008	00:00:00	0.00	0.00	0.00	0.00	5.64	22.72	2.22	2.68	28	69	105	113	55
07/13/2008	00:00:00	0.00	0.00	0.00	0.00	5.64	22.72	2.22	2.68	28	69	105	113	55
12/30/2008	00:00:00	0.00	0.00	0.00	0.00	5.64	22.72	2.22	2.68	28	69	105	113	55

Table E.3. Montgomery Fork event file summary. cms = m^3/s.

Montgomery Event File Summary														
		Time to Peak Discharge			Time to Peak Depth			Time to Peak Stage			Time to Peak F. Slope			
Date	Time	Date	Time	Peak Discharge	Date	Time	Peak Depth	Date	Time	Peak Stage	Date	Time	F. Slope
mm/dd/yyyy	hh:mm:ss	mm/dd/yyyy	hh:mm:ss	(cms)	mm/dd/yyyy	hh:mm:ss	(m)	mm/dd/yyyy	hh:mm:ss	(m)	mm/dd/yyyy	hh:mm:ss	
Initial	Initial												
01/01/2005	00:00:00	01/01/2005	09:19:15	0.35	01/01/2005	09:19:15	0.22	01/01/2005	09:19:15	359.71	01/01/2005	09:19:15	3.33E-03
01/02/2005	00:00:00	01/02/2005	01:51:20	7.62	01/02/2005	01:51:20	0.62	01/02/2005	01:51:20	360.11	01/02/2005	01:59:54	6.58E-03
05/19/2005	00:00:00	05/19/2005	09:22:09	0.36	05/19/2005	09:22:09	0.24	05/19/2005	09:22:09	359.73	05/19/2005	09:14:08	1.99E-03
03/26/2006	00:00:00	03/26/2006	09:26:30	0.36	03/26/2006	09:17:55	0.42	03/26/2006	09:17:55	359.91	03/26/2006	09:26:30	1.08E-04
07/15/2006	00:00:00	07/15/2006	01:21:17	84.16	07/15/2006	01:21:17	1.99	07/15/2006	01:21:17	361.48	07/15/2006	01:21:17	3.58E-03
04/03/2007	00:00:00	04/03/2007	01:48:09	21.38	04/03/2007	01:48:09	0.95	04/03/2007	01:48:09	360.44	04/03/2007	05:59:45	6.57E-03
02/11/2008	00:00:00	02/11/2008	09:26:48	0.31	02/11/2008	09:26:48	0.20	02/11/2008	09:26:48	359.69	02/11/2008	00:26:13	5.77E-03
07/13/2008	00:00:00	07/13/2008	01:18:08	49.11	07/13/2008	01:18:08	1.35	07/13/2008	01:18:08	360.84	07/13/2008	01:18:08	5.46E-03
12/30/2008	00:00:00	12/30/2008	09:26:30	0.35	12/30/2008	09:26:30	0.23	12/30/2008	09:26:30	359.72	12/30/2008	01:00:05	3.34E-03

Table E.3. Montgomery Fork event file summary (*continued*). Tons are metric tons.

Montgomery Event File Summary									
		Storm event generated sediment yield				Cumulative sediment yield			
Date	Time	Silt YLD	Sand YLD	Gravel YLD	Total YLD	Silt YLD	Sand YLD	Gravel YLD	Total YLD
mm/dd/yyyy	hh:mm:ss	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)
Initial	Initial								
01/01/2005	00:00:00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
01/02/2005	00:00:00	8.45E+00	1.37E+00	1.00E+00	1.08E+01	8.52E+00	1.39E+00	1.01E+00	1.09E+01
05/19/2005	00:00:00	1.58E+00	0.00E+00	0.00E+00	1.58E+00	2.17E+03	2.67E+03	2.31E+03	7.15E+03
03/26/2006	00:00:00	6.92E-01	4.18E-24	0.00E+00	6.92E-01	7.81E+03	1.60E+04	1.44E+04	3.83E+04
07/15/2006	00:00:00	8.61E+01	3.11E+00	1.60E+01	1.05E+02	8.72E+03	1.61E+04	1.48E+04	3.97E+04
04/03/2007	00:00:00	1.13E+02	1.12E+01	5.53E+01	1.80E+02	1.38E+04	3.06E+04	2.24E+04	6.69E+04
02/11/2008	00:00:00	7.29E+00	0.00E+00	0.00E+00	7.29E+00	1.60E+04	3.11E+04	2.50E+04	7.21E+04
07/13/2008	00:00:00	2.34E+01	6.09E+00	1.21E+02	1.51E+02	1.86E+04	3.28E+04	2.98E+04	8.12E+04
12/30/2008	00:00:00	2.38E+00	0.00E+00	0.00E+00	2.38E+00	2.00E+04	3.33E+04	3.27E+04	8.59E+04

Table E.3. Montgomery Fork event file summary (*continued*).

Montgomery Event File Summary														
		Cross sectional changes				Channel widths		Bank Heights		BED MATERIAL				
Date	Time	Bed Change	Cumulative bed change	Lat Change	Cumulative Lat change	Bottom	Floodplain	Left	Right	D16	D50	D84	D90	Dmean
mm/dd/yyyy	hh:mm:ss	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(mm)	(mm)	(mm)	(mm)	(mm)
Initial	Initial					12.50	32.50	2.71	2.16	6	30	88	102	24
01/01/2005	00:00:00	0.00	0.00	0.00	0.00	12.50	32.50	2.71	2.16	6	30	88	102	24
01/02/2005	00:00:00	0.00	0.00	0.00	0.00	12.50	32.50	2.71	2.16	6	30	88	102	24
05/19/2005	00:00:00	0.00	0.00	0.00	0.75	13.25	33.25	2.71	2.17	6	30	88	102	24
03/26/2006	00:00:00	0.00	0.00	0.00	4.11	16.61	36.61	2.80	2.19	6	30	88	102	24
07/15/2006	00:00:00	0.00	0.00	0.00	4.11	16.61	36.61	2.80	2.19	6	30	88	102	24
04/03/2007	00:00:00	0.00	0.00	0.00	5.38	17.88	37.88	2.86	2.20	6	30	88	102	24
02/11/2008	00:00:00	0.00	0.00	0.00	5.49	17.99	37.99	2.87	2.20	6	30	88	102	24
07/13/2008	00:00:00	0.00	0.00	0.00	5.85	18.35	38.35	2.89	2.20	6	30	88	102	24
12/30/2008	00:00:00	0.00	0.00	0.00	5.91	18.41	38.41	2.90	2.20	6	30	88	102	24

Table E.4. Smokey Creek event file summary. cms = m^3/s.

Smokey Creek Event File Summary														
		Time to Peak Discharge			Time to Peak Depth			Time to Peak Stage			Time to Peak F. Slope			
Date	Time	Date	Time	Peak Discharge	Date	Time	Peak Depth	Date	Time	Peak Stage	Date	Time	F. Slope
mm/dd/yyyy	hh:mm:ss	mm/dd/yyyy	hh:mm:ss	(cms)	mm/dd/yyyy	hh:mm:ss	(m)	mm/dd/yyyy	hh:mm:ss	(m)	mm/dd/yyyy	hh:mm:ss	
Initial	Initial												
01/01/2005	00:00:00	01/01/2005	02:26:00	0.50	01/01/2005	02:26:00	0.25	01/01/2005	02:26:00	28.09	03/01/0000	00:00:00	1.52E-03
01/02/2005	00:00:00	01/02/2005	04:30:55	1.70	01/02/2005	04:39:15	0.50	01/02/2005	04:39:15	28.34	01/02/2005	02:34:15	1.49E-03
05/19/2005	00:00:00	05/18/2005	23:58:40	0.50	05/18/2005	23:58:40	0.25	05/18/2005	23:58:40	28.10	05/18/2005	23:58:40	1.49E-03
03/26/2006	00:00:00	03/25/2006	04:20:00	0.51	03/25/2006	04:20:00	0.24	03/25/2006	04:20:00	28.07	03/26/2006	04:11:20	1.67E-03
07/15/2006	00:00:00	07/15/2006	02:08:22	31.27	07/15/2006	02:16:18	1.39	07/15/2006	02:16:18	29.21	07/15/2006	00:29:41	2.16E-03
04/03/2007	00:00:00	04/03/2007	06:41:36	1.69	04/03/2007	06:41:36	0.33	04/03/2007	06:41:36	28.03	04/03/2007	06:16:30	3.10E-03
02/11/2008	00:00:00	02/10/2008	23:58:26	0.50	02/10/2008	23:58:26	0.22	02/10/2008	23:58:26	27.84	02/11/2008	08:29:22	2.95E-03
07/13/2008	00:00:00	07/13/2008	01:33:35	42.98	07/13/2008	01:33:35	1.46	07/13/2008	01:33:35	29.08	07/13/2008	00:24:23	3.40E-03
12/30/2008	00:00:00	12/29/2008	04:36:40	0.51	12/29/2008	04:36:40	0.22	12/29/2008	04:36:40	27.77	12/29/2008	04:36:40	3.24E-03

Table E.4. Smokey Creek event file summary (*continued*). Tons are metric tons.

Smokey Creek Event File Summary									
		Storm event generated sediment yield				Cumulative sediment yield			
Date	Time	Silt YLD	Sand YLD	Gravel YLD	Total YLD	Silt YLD	Sand YLD	Gravel YLD	Total YLD
mm/dd/yyyy	hh:mm:ss	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)	(TONS)
Initial	Initial								
01/01/2005	00:00:00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
01/02/2005	00:00:00	9.10E+00	4.07E-41	0.00E+00	9.10E+00	9.08E+00	4.07E-41	0.00E+00	9.08E+00
05/19/2005	00:00:00	2.07E+00	0.00E+00	0.00E+00	2.07E+00	3.99E+03	5.70E+02	3.33E-02	4.56E+03
03/26/2006	00:00:00	7.84E-01	0.00E+00	0.00E+00	7.84E-01	1.18E+04	1.39E+03	7.75E+01	1.33E+04
07/15/2006	00:00:00	2.25E+02	1.42E-01	0.00E+00	2.25E+02	1.39E+04	1.47E+03	8.08E+01	1.54E+04
04/03/2007	00:00:00	3.65E+01	5.44E-02	0.00E+00	3.66E+01	2.22E+04	6.43E+03	6.17E+02	2.92E+04
02/11/2008	00:00:00	2.08E+00	0.00E+00	0.00E+00	2.08E+00	2.54E+04	6.85E+03	7.56E+02	3.30E+04
07/13/2008	00:00:00	5.40E+01	1.36E+01	4.73E-02	6.76E+01	2.97E+04	7.80E+03	8.48E+02	3.83E+04
12/30/2008	00:00:00	1.30E+00	0.00E+00	0.00E+00	1.30E+00	3.15E+04	8.28E+03	9.66E+02	4.08E+04

Table E.4. Smokey Creek event file summary (*continued*).

Smokey Creek Event File Summary														
		Cross sectional changes				Channel widths		Bank Heights		BED MATERIAL				
Date	Time	Bed Change	Cumulative bed change	Lat Change	Cumulative Lat change	Bottom	Floodplain	Left	Right	D16	D50	D84	D90	Dmean
mm/dd/yyyy	hh:mm:ss	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(mm)	(mm)	(mm)	(mm)	(mm)
Initial	Initial					16.16	31.00	2.64	3.16	44	75	108	115	70
01/01/2005	00:00:00	0.00	0.00	0.00	0.00	16.16	31.00	2.64	3.16	44	75	108	115	70
01/02/2005	00:00:00	0.00	0.00	0.00	0.00	16.16	31.00	2.64	3.16	44	75	108	115	70
05/19/2005	00:00:00	0.00	0.01	0.00	0.09	16.25	31.00	2.63	3.15	32	70	105	113	36
03/26/2006	00:00:00	0.00	-0.02	0.00	0.09	16.25	31.00	2.65	3.18	0.19	68	104	113	19
07/15/2006	00:00:00	0.00	-0.02	0.00	0.09	16.25	31.00	2.66	3.18	0.22	70	105	113	23
04/03/2007	00:00:00	0.00	-0.13	0.00	0.36	16.52	31.67	2.76	3.34	0.10	38	94	106	4
02/11/2008	00:00:00	0.00	-0.22	0.00	0.36	16.52	31.67	2.84	3.43	28	70	106	113	27
07/13/2008	00:00:00	0.00	-0.22	0.00	0.36	16.52	31.67	2.84	3.43	0.25	71	106	114	22
12/30/2008	00:00:00	0.00	-0.29	0.00	0.36	16.52	31.67	2.92	3.50	30	73	107	114	30

APPENDIX F:

Statistical Correlations Between AnnAGNPS Model Output and Streambed Fine Sediment

Correlations between AnnAGNPS Model Output and Streambed Fine Sediment

It was the objective of this statistical analysis to examine correlations of the measured sediment characteristics (percentage of clays, silts, sands, and gravels) obtained from a particle (grain) size particle analysis of 33 different streambed sediment deposition points, collected at all four study subwatersheds with that of the predicted sediment yield in terms of total weight and percentages of clays, silts, and sands for each location. The different combinations of variables that represent the measured stream bed sediment properties by particle grain size analysis and the annual average value of sediment yield for the drainage area above where the streambed sediment sample was taken can be seen in Table F.1. These variables were placed into the JMP Statistical Software to determine if a correlation exists between the bed sediment found in stream deposition points and the average annual sediment yield on the hillslopes. Note that in Table 19, there are average annual sediment yield variables for years 2006, 2007, and the combination of years 2006 and 2007. The streambed sediment was collected in the field during the spring, summer, and fall 2007, and it is thought that these stream bed sediment depositional points contain a historical amount of different amounts of sediment yield for a variable amount of time. Since the stream bed sediment was collected during the months of February through October 2007, the average annual sediment yield values were included.

Initially, the variables of interest were checked for outliers and normality. It was noticed that many of the variables used did not seem to represent a strong normal distribution; therefore, a nonparametric analysis was used. From the normal distribution plots, the JMP program suggested four different sites with possible outliers by box plot whiskers analysis. No outliers were declared from this pre-analysis assessment. All the measured and predicted variables were then placed in a nonparametric multivariate analysis to be used for the distinction of obvious correlations between variables. From the multivariate analysis, there was little correlation noticed among the stream bed sediment and the hillslope sediment yield variables. By comparing the measured with the predicted variables, Table F.2 was created to show the top 35 combinations with some correlation. In Table F.2, the Spearman's Rho represents the correlation between a combination of variables. The closer Spearman's Rho is to 1.0 or -1.0, the better the correlation. From using the multivariate analysis, there are no strong correlations independently between the measured and predicted variables. Also notice that the smallest p-value is just greater than 0.05 for the combination of different variables. Since there is no combination of measured and predicted variables that have a p-value less than 0.05, there are no significant variables that stand alone for the sediment collected in stream deposition points and the properties of hillslope sediment yield.

From analyzing these sediment deposits and hillslope sediment yield, some slightly significant relationships were observed between the modeled sediment output and instream streambed sediment characteristics. To further analyze the streambed sediment deposit and yield properties with the best correlation and relationship, a Stepwise Regression Model was used in JMP to see if there was a better relationship between the measured sediment deposit characteristics and the sediment yield when multiple variables are used together. Using the stepwise regression model through standard least squares analysis, four sediment yield variables produced from the AnnAGNPS model output created a significant relationship with pairs of different stream bed sediment deposit variables.

Table F.1. Statistical variables used in correlation analysis among sediment characteristics between measured and modeled output.

VARIABLES	DEFINITIONS
Site	Site Number of Analysis
Wtashd	Watershed of Site
Area	Drainage Area in Hectares
RGA	Rapid Geomorphic Assessment Score (1-36)
D50	Median Grain Size Diameter from Pebble Count (mm)
D84	84th Largest Grain Size Diameter from Pebble Count (mm)
MP-Cl	Particle Size Distribution - Measured Percent Clay (%)
MP-Si	Particle Size Distribution - Measured Percent Silt (%)
MP-Sa	Particle Size Distribution - Measured Percent Sand (%)
MP-Gr	Particle Size Distribution - Measured Percent Gravel (%)
MS-Cl	Particle Size Distribution - Measured Slope
MS-Si	Particle Size Distribution - Measured Slope
MS-Sa	Particle Size Distribution - Measured Slope
MS-Gr	Particle Size Distribution - Measured Slope
MP-ClSi	Particle Size Distribution - Measured Percent Clay & Silt (%)
MP-SiSa	Particle Size Distribution -Measured Percent Silt & Sand (%)
MP-ClSiSa	Particle Size Distribution - Measured Percent Clay, Silt, & Sand (%)
MP-Cl/Si	Particle Size Distribution - Measured Percent Ratio of Clays to Silts
MP-Cl/Sa	Particle Size Distribution - Measured Percent Ratio of Clays to Sands
MP-Cl/Gr	Particle Size Distribution - Measured Percent Ratio of Clays to Gravels
MP-Si/Cl	Particle Size Distribution - Measured Percent Ratio of Silts to Clays
MP-Si/Sa	Particle Size Distribution - Measured Percent Ratio of Silts to Sands
MP-Si/Gr	Particle Size Distribution - Measured Percent Ratio of Silts to Gravels
MP-Sa/Cl	Particle Size Distribution - Measured Percent Ratio of Sands to Clays
MP-Sa/Si	Particle Size Distribution - Measured Percent Ratio of Sands to Silts
MP-Sa/Gr	Particle Size Distribution - Measured Percent Ratio of Sands to Gravels
MP-Gr/Cl	Particle Size Distribution - Measured Percent Ratio of Gravels to Clays
MP-Gr/Si	Particle Size Distribution - Measured Percent Ratio of Gravels to Silts
MP-Gr/Sa	Particle Size Distribution - Measured Percent Ratio of Gravels to Sands
06-PP-Cl	2006 Annual Average Sediment Yield Predicted Percent Clay (%)
06-PP-Si	2006 Annual Average Sediment Yield Predicted Percent Silt (%)
06-PP-Sa	2006 Annual Average Sediment Yield Predicted Percent Sand (%)
06-PP-ClSi	2006 Annual Average Sediment Yield Predicted Percent Clay & Silt (%)
06-PP-SiSa	2006 Annual Average Sediment Yield Predicted Percent Silt & Sand (%)
06-PW-Cl	2006 Annual Average Sediment Yield Predicted Weight of Clay (Mg)
06-PW-Si	2006 Annual Average Sediment Yield Predicted Weight of Silt (Mg)
06-PW-Sa	2006 Annual Average Sediment Yield Predicted Weight of Sand (Mg)
06-PW-TSY	2006 Predicted Annual Average Sediment Yield (Mg)
06-P-TSY/A	2006 Predicted Annual Average Sediment Yield / Drainage Area (Mg/ha)
06-PW-ClSi	2006 Annual Average Sediment Yield Predicted Weight of Clays and Silts (Mg)
06-PW-SiSa	2006 Annual Average Sediment Yield Predicted Weight of Silts and Sands (Mg)
07-PP-Cl	2007 Annual Average Sediment Yield Predicted Percent Clay (%)
07-PP-Si	2007 Annual Average Sediment Yield Predicted Percent Silt (%)

Table F.1. *Continued: Statistical variable definitions…...*

VARIABLES	DEFINITIONS
07-PP-Sa	2007 Annual Average Sediment Yield Predicted Percent Sand (%)
07-PP-ClSi	2007 Annual Average Sediment Yield Predicted Percent Clay & Silt (%)
07-PP-SiSa	2007 Annual Average Sediment Yield Predicted Percent Silt & Sand (%)
07-PW-Cl	2007 Annual Average Sediment Yield Predicted Weight of Clay (Mg)
07-PW-Si	2007 Annual Average Sediment Yield Predicted Weight of Silt (Mg)
07-PW-Sa	2007 Annual Average Sediment Yield Predicted Weight of Sand (Mg)
07-PW-TSY	2007 Predicted Annual Average Sediment Yield (Mg)
07-P-TSY/A	2007 Predicted Annual Average Sediment Yield / Drainage Area (Mg/ha)
07-PW-ClSi	2007 Annual Average Sediment Yield Predicted Weight of Clays and Silts (Mg)
07-PW-SiSa	2007 Annual Average Sediment Yield Predicted Weight of Silts and Sands (Mg)
06+07-PW-Cl	2006 and 2007 Annual Average Sediment Yield Predicted Weight of Clay (Mg)
06+07-PW-Si	2006 and 2007 Annual Average Sediment Yield Predicted Weight of Silt (Mg)
06+07-PW-Sa	2006 and 2007 Annual Average Sediment Yield Predicted Weight of Sand (Mg)
06+07-PW-TSY	2006 and 2007 Predicted Annual Average Sediment Yield (Mg)
06+07-P-TSY/A	2006 and 2007 Predicted Annual Average Sediment Yield / Drainage Area (Mg/ha)

The four different dependant variables were the predicted sediment yield weight of clay (PW-Cl), predicted sediment yield weight of silt (PW-Si), predicted total sediment yield weight (PW-TSY), and the predicted weight of clays and silts combined (PW-ClSi). Each of these dependant variables contained a significant relationship with a combination of two predictor variables measured in the particle grain size analysis of the streambed sediment deposits. Of the stream bed sediment variables that established a significant relationship with different average annual hillslope sediment yield variables, the particle size distribution slopes for clays, silts, sands, and gravels did not provide a significant correlation or relationship with annual average hillslope sediment yield. Therefore, the essential stream bed sediment variables are the percentages of different sediment size classifications found in each sample. The multivariate analysis of these four dependant variables with their related independent measured variables can be seen in Figures F.1 through F.4. Using the JMP Stepwise Regression tool, the PW-Cl, PW-Si, PW-TSY, and PW-ClSi for years 2006, 2007, and the combination of the two were used to define a relationship with the set of measured particle size classifications found at each sediment deposition point in the stream. Interestingly enough, the same measured variables for the stream-bed sediment deposits contained a similar relationship to the PW-Cl, PW-Si, PWTSY, and PW-ClSi for both of the years 2006 and 2007, as well as the combination of the two. Since these relationships between the measured stream bed sediment and the predicted sediment yield are similar for the three sets of years, it was decided that this statistical analysis would primarily focus on the 2006 AnnAGNPS sediment yield variables that showed an association with a few of the measured stream bed sediment deposit variables. It is also worth noting that since the fine bed sediment collected in stream deposition points was obtained during the middle of 2007 and the sediment deposits should contain historical properties of hillslope and channel erosion, the 2006 sediment yield should be a more appropriate time frame to be compared with the measured data. Using the four 2006 predicted sediment yield variables in a regression analysis, a pair of measured sediment deposit characteristics seemed to provide a better relationship than the single combination of the measured versus predicted sediment values previously seen in the multivariate analysis. Figures F.5 through F.12 show the different model relationships observed by regression analysis for predicted average annual sediment yield and various measured sediment deposit characteristics.

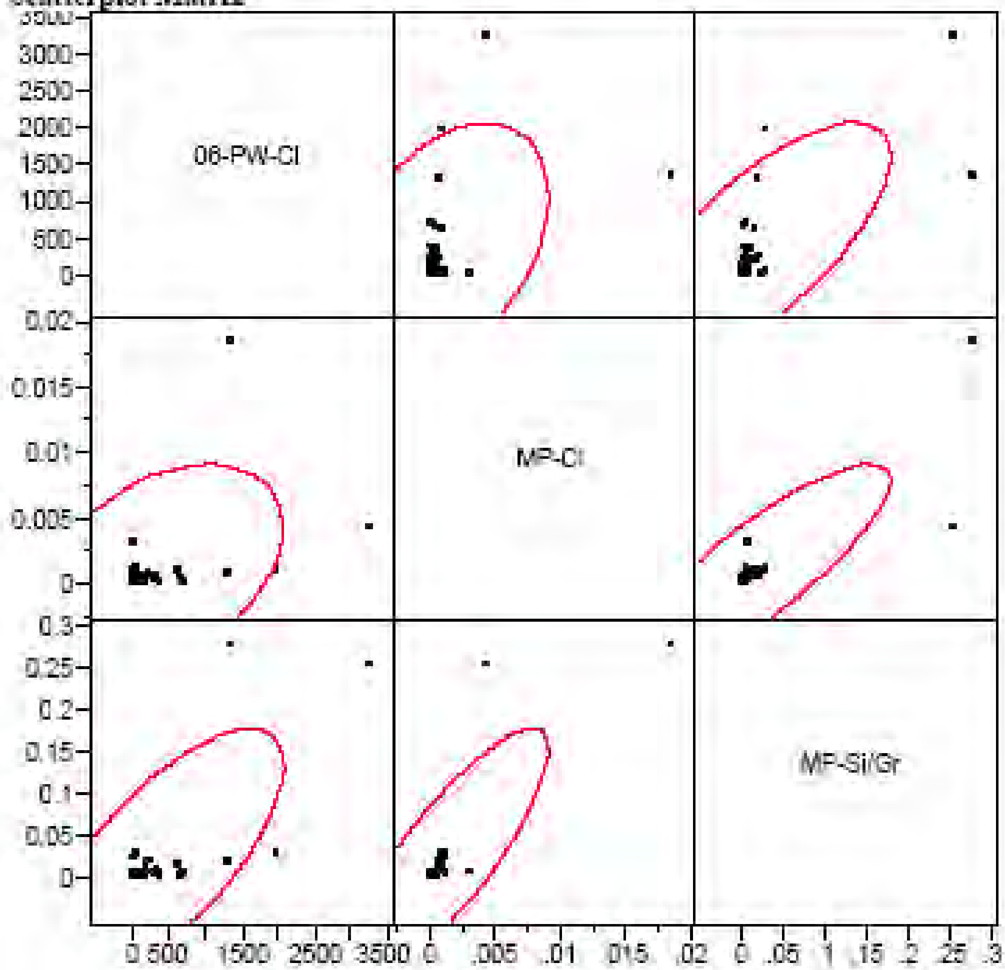
Table F.2. Results of nonparametric multivariate analysis with sediment data: A summary of significant correlations.

Number	Variable	by Variable	Spearman ρ	Prob>|ρ|
	06+07-PW-Cl	MP-Gr/Sa	-0.341	0.052
	06+07-PW-Cl	MP-Gr/Si	-0.341	0.052
	06+07-PW-Cl	MP-Sa/Gr	0.341	0.052
	06+07-PW-Cl	MP-SiSa	0.335	0.057
	07-PW-Cl	MP-Gr/Sa	-0.335	0.057
	07-PW-Cl	MP-Gr/Si	-0.335	0.057
	07-PW-Cl	MP-Sa/Gr	0.335	0.057
	07-PW-Cl	MP-Si/Gr	0.334	0.057
	06-PW-Cl	MP-Gr/Sa	-0.332	0.059
	06-PW-Cl	MP-Gr/Si	-0.332	0.059
	06-PW-Cl	MP-Sa/Gr	0.332	0.059
	06+07-PW-Cl	MP-Gr	-0.332	0.059
	06+07-PW-Cl	MP-ClSiSa	0.329	0.062
	07-PW-Cl	MP-SiSa	0.329	0.062
	07-PW-Cl	MP-Gr	-0.326	0.064
	06-PW-Cl	MP-SiSa	0.326	0.065
	06+07-PW-Cl	MP-Sa	0.325	0.065
	06+07-PW-Cl	MS-Sa	0.325	0.065
	06-PW-Si	MP-Gr/Sa	-0.324	0.066
	06-PW-Si	MP-Gr/Si	-0.324	0.066
	06-PW-Si	MP-Sa/Gr	0.324	0.066
	07-PW-Cl	MP-ClSiSa	0.323	0.067
	06-PW-Cl	MP-Gr	-0.322	0.067
	07-PW-TSY	MP-Si/Gr	0.322	0.068
	07-PP-ClSi	MP-Si/Gr	0.322	0.068
	06+07-PW-Cl	MP-Si/Gr	0.320	0.069
	07-PP-SiSa	MP-Si/Gr	0.320	0.070
	06-PW-Si	MP-Si/Gr	0.320	0.070
	06-PW-Cl	MP-ClSiSa	0.319	0.070
	07-PW-TSY	MP-Gr/Sa	-0.319	0.071
	07-PW-TSY	MP-Gr/Si	-0.319	0.071
	07-PW-TSY	MP-Sa/Gr	0.319	0.071
	06-PW-TSY	MP-Si/Gr	0.319	0.071
	07-PW-Cl	MP-Sa	0.317	0.072
	07-PW-Cl	MS-Sa	0.317	0.072

Multivariate Correlations

	06-PW-Cl	MP-Cl	MP-Si/Gr
06-PW-Cl	1.0000	0.3854	0.7214
MP-Cl	0.3854	1.0000	0.8435
MP-Si/Gr	0.7214	0.8435	1.0000

Scatterplot Matrix



Nonparametric: Spearman's ρ

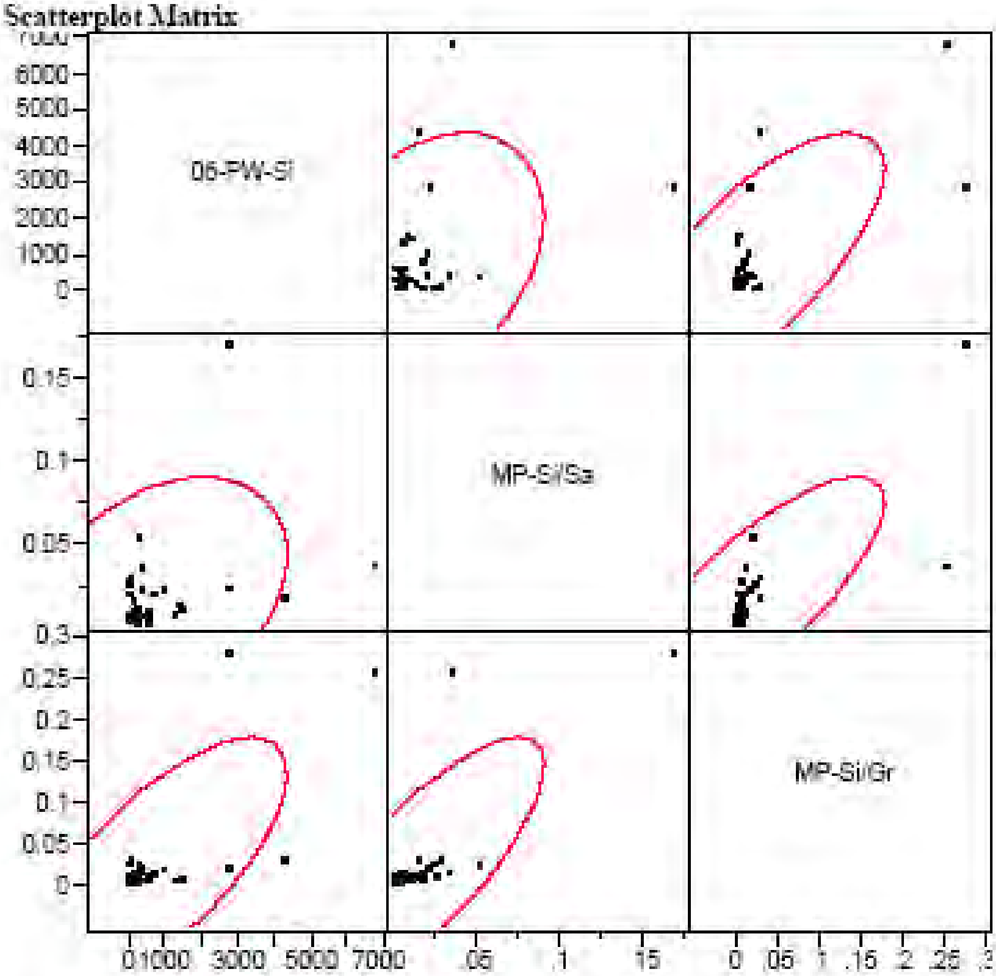
Variable	by Variable	Spearman ρ	Prob>|ρ|
MP-Cl	06-PW-Cl	0.1228	0.4961
MP-Si/Gr	06-PW-Cl	0.3108	0.0783
MP-Si/Gr	MP-Cl	0.7174	<.0001

Figure F.1. Nonparameteric multivariate results for 06-PW-Cl.

Multivariate Correlations

	06-PW-Si	MP-Si/Sa	MP-Si/Gr
06-PW-Si	1.0000	0.3414	0.7206
MP-Si/Sa	0.3414	1.0000	0.7874
MP-Si/Gr	0.7206	0.7874	1.0000

Scatterplot Matrix



Nonparametric: Spearman's ρ

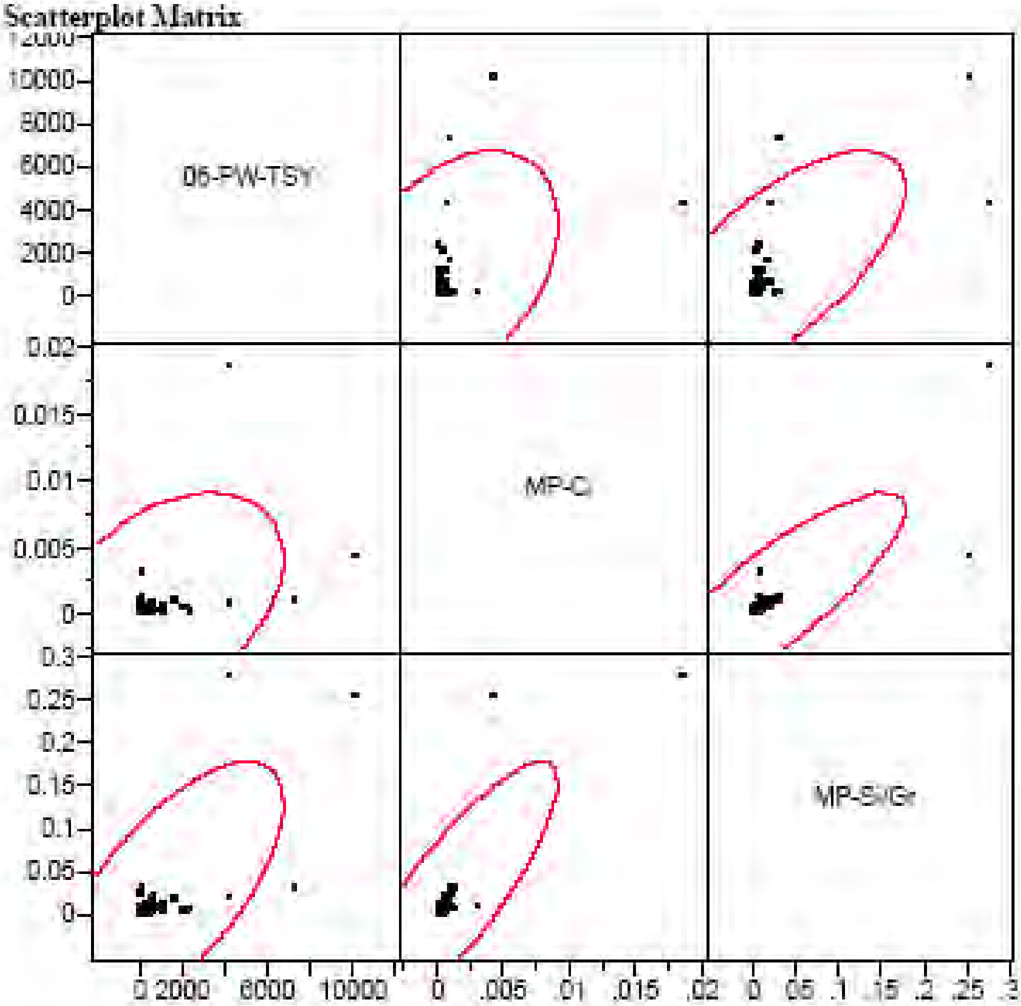
Variable	by Variable	Spearman ρ	Prob>|ρ|
MP-Si/Sa	06-PW-Si	0.3038	0.0856
MP-Si/Gr	06-PW-Si	0.3195	0.0699
MP-Si/Gr	MP-Si/Sa	0.7938	<.0001

Figure F.2. Nonparameteric multivariate results for 06-PW-Si.

Multivariate Correlations

	06-PW-TSY	MP-Cl	MP-Si/Gr
06-PW-TSY	1.0000	0.3681	0.6917
MP-Cl	0.3681	1.0000	0.8435
MP-Si/Gr	0.6917	0.8435	1.0000

Scatterplot Matrix



Nonparametric: Spearman's ρ

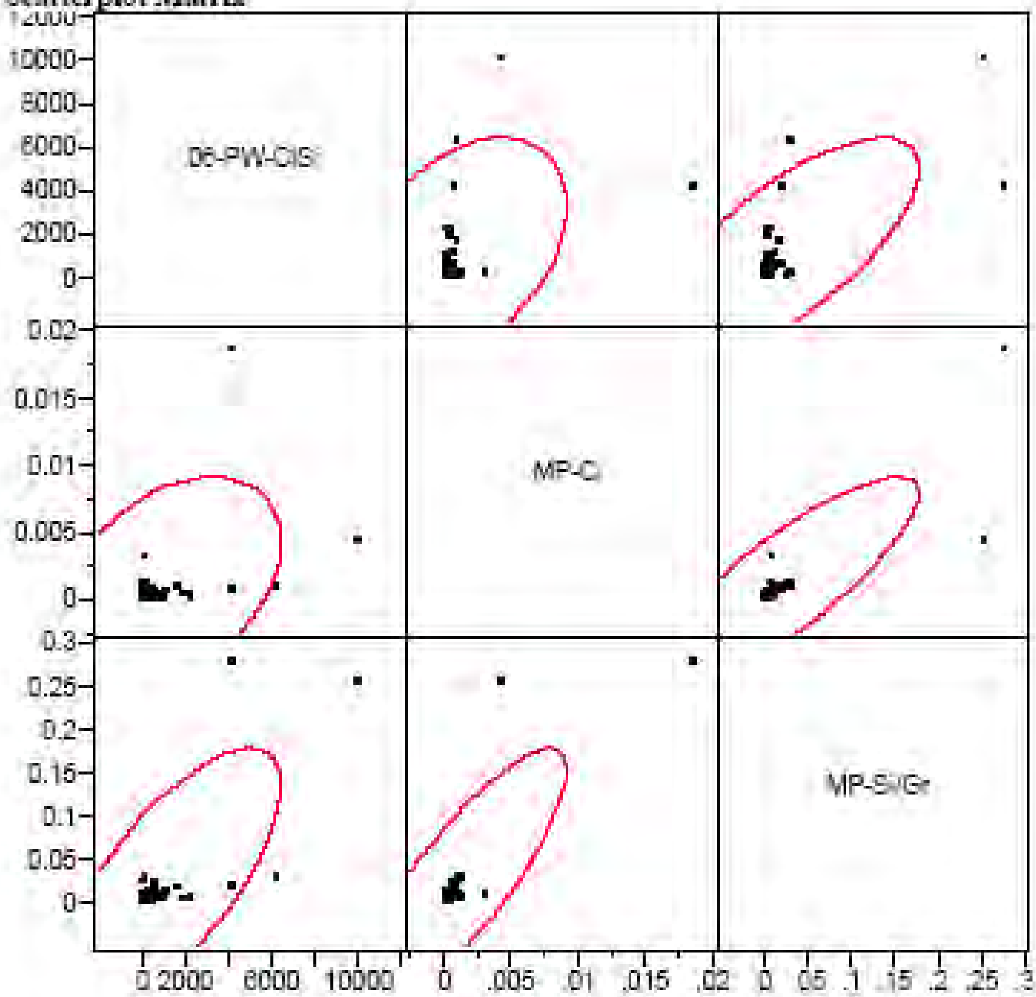
Variable	by Variable	Spearman ρ	Prob>|ρ|
MP-Cl	06-PW-TSY	0.1139	0.5280
MP-Si/Gr	06-PW-TSY	0.3189	0.0705
MP-Si/Gr	MP-Cl	0.7174	<.0001

Figure F.3. Nonparameteric multivariate results for 06-PW-TSY.

Multivariate Correlations

	06-PW-ClSi	MP-Cl	MP-Si/Gr
06-PW-ClSi	1.0000	0.3879	0.7212
MP-Cl	0.3879	1.0000	0.8435
MP-Si/Gr	0.7212	0.8435	1.0000

Scatterplot Matrix



Nonparametric: Spearman's ρ

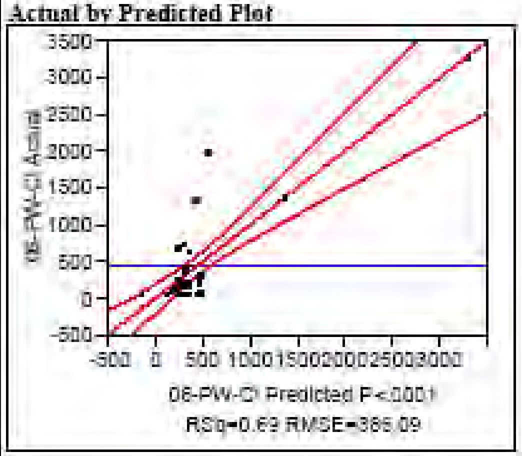
Variable	by Variable	Spearman ρ	Prob>|ρ|
MP-Cl	06-PW-ClSi	0.1122	0.5341
MP-Si/Gr	06-PW-ClSi	0.3112	0.0780
MP-Si/Gr	MP-Cl	0.7174	<.0001

Figure F.4. Nonparameteric multivariate results for 06-PW-ClSi.

Response 06-PW-Cl

Whole Model

Actual by Predicted Plot



Summary of Fit

RSquare	0.693024
RSquare Adj	0.672559
Root Mean Square Error	386.0925
Mean of Response	420.4902
Observations (or Sum Wgts)	33

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	10095969	5047985	33.8638
Error	30	4472024	149067	Prob > F
C. Total	32	14567993		<.0001

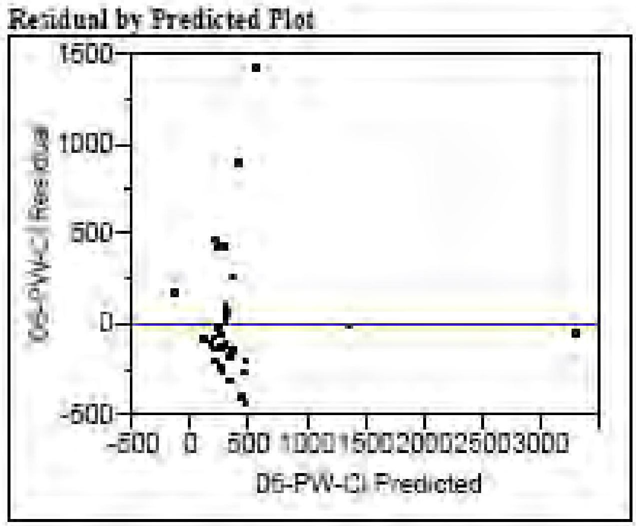
Parameter Estimates

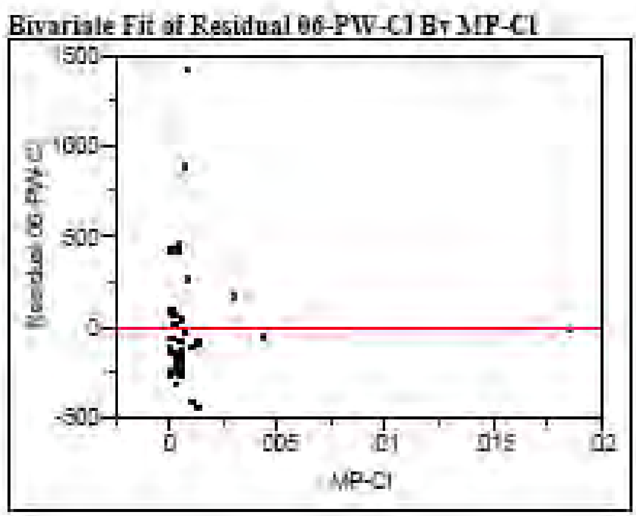
Term	Estimate	Std Error	t Ratio	Prob>|t|	Lower 95%	Upper 95%	VIF
Intercept	254.13227	72.63989	3.50	0.0015	105.78184	402.48271	.
MP-Cl	-162109.9	39475.45	-4.11	0.0003	-242729.5	-81490.23	3.4660464
MP-Si/Gr	14819.32	2031.528	7.29	<.0001	10670.386	18968.253	3.4660464

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation
1.8618406	33	0.0624

Figure F.5. Average annual sediment yield 2006 clay weigh regression model.





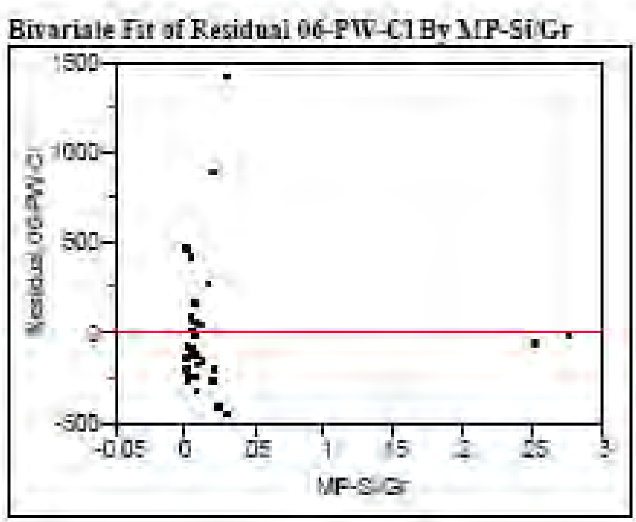
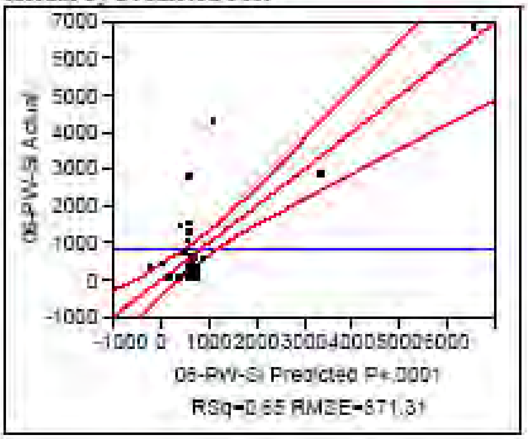


Figure F.6. Average annual sediment yield 2006 clay weight residual plots.

Response 06-PW-Si
Whole Model
Actual by Predicted Plot



Summary of Fit

RSquare	0.653621
RSquare Adj	0.63053
Root Mean Square Error	871.31
Mean of Response	842.8009
Observations (or Sum Wgts)	33

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	42977593	21488797	28.3052
Error	30	22775435	759181.17	Prob > F
C. Total	32	65753028		<.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|	Lower 95%	Upper 95%	VIF
Intercept	718.00424	183.0249	3.92	0.0005	344.21753	1091.791	.
MP-Si/Sa	-29125.19	8535.869	-3.41	0.0019	-46557.76	-11692.62	2.6318192
MP-Si/Gr	27247.061	3994.983	6.82	<.0001	19088.217	35405.905	2.6318192

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation
2.1055523	33	-0.0606

Figure F.7. Average annual sediment yield 2006 silt weigh regression model.

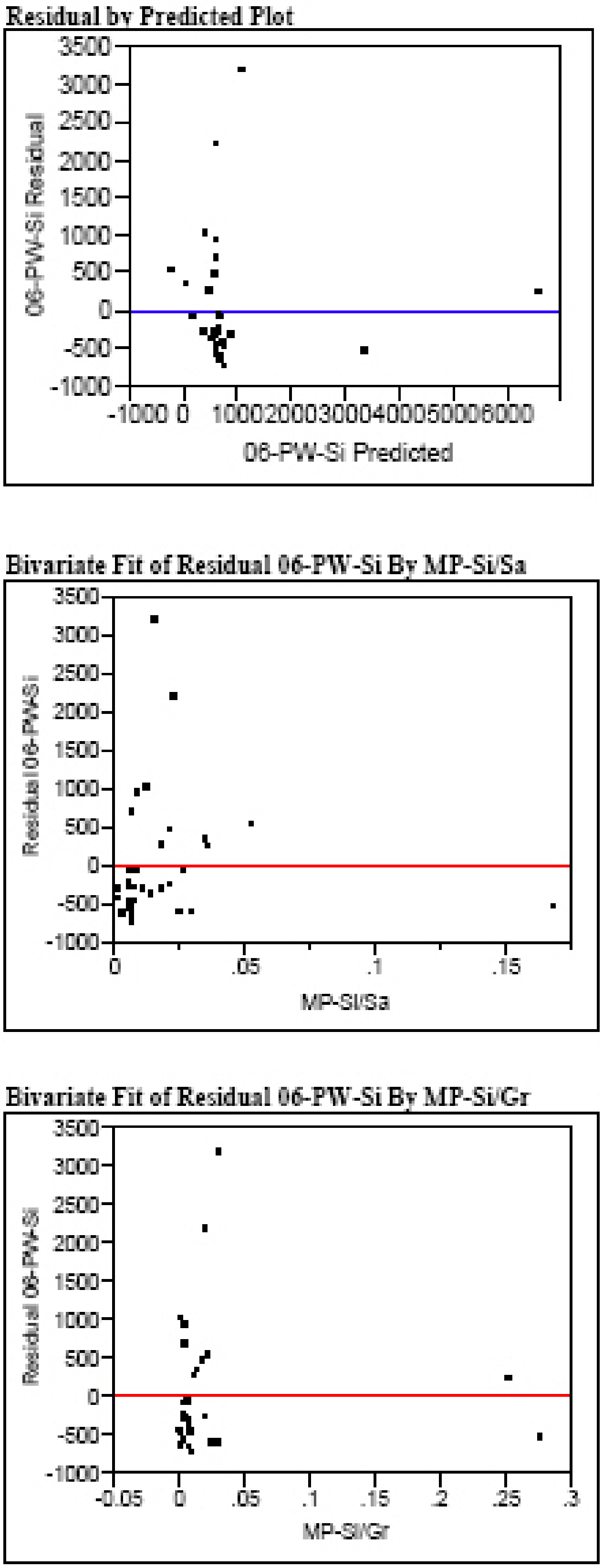
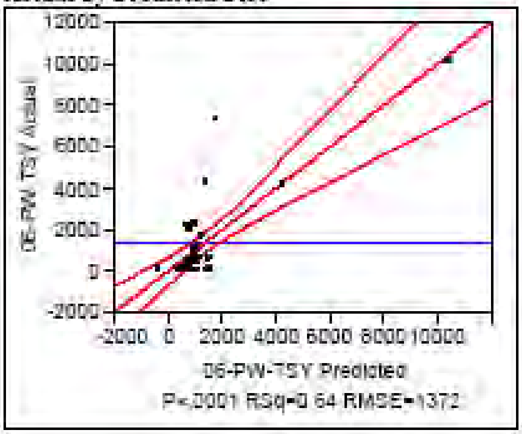


Figure F.8. Average annual sediment yield 2006 silt weight residual plots.

Response 06-PW-TSY
Whole Model
Actual by Predicted Plot



Summary of Fit

RSquare	0.639185
RSquare Adj	0.615131
Root Mean Square Error	1371.97
Mean of Response	1321.079
Observations (or Sum Wgts)	33

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	100035223	50017611	26.5726
Error	30	56469065	1882302.2	Prob > F
C. Total	32	156504288		<.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|	Lower 95%	Upper 95%	VIF
Intercept	798.7942	258.124	3.09	0.0042	271.63465	1325.9538	.
MP-Cl	-512783.3	140275	-3.66	0.0010	-799263.2	-226303.5	3.4660464
MP-Si/Gr	46716.336	7218.984	6.47	<.0001	31973.205	61459.468	3.4660464

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation
1.8883167	33	0.0478

Figure F.9. Average annual sediment yield 2006 total yield regression model.

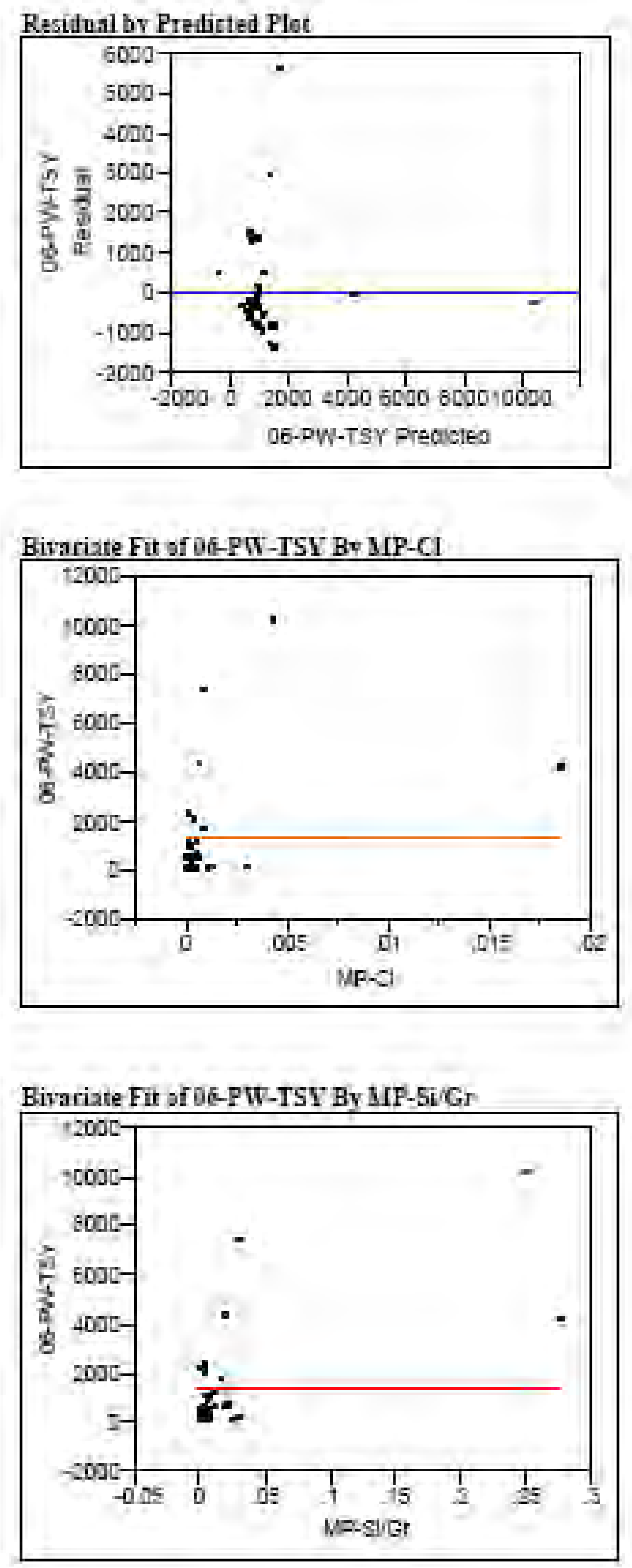
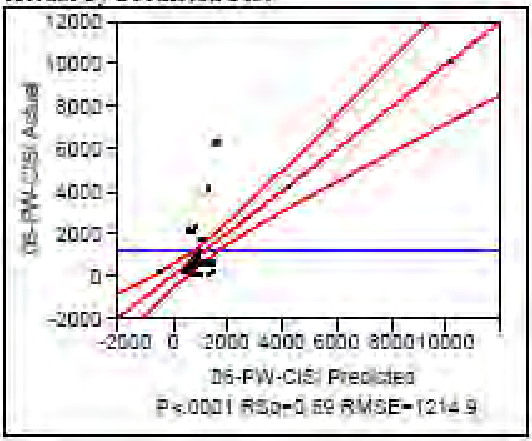


Figure F.10. Average annual sediment yield 2006 total yield residual plots.

Response 06-PW-ClSi
Whole Model
Actual by Predicted Plot



Summary of Fit

RSquare	0.688396
RSquare Adj	0.667623
Root Mean Square Error	1214.857
Mean of Response	1263.291
Observations (or Sum Wgts)	33

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	97815431	48907716	33.1380
Error	30	44276352	1475878.4	Prob > F
C. Total	32	142091783		<.0001

Parameter Estimates

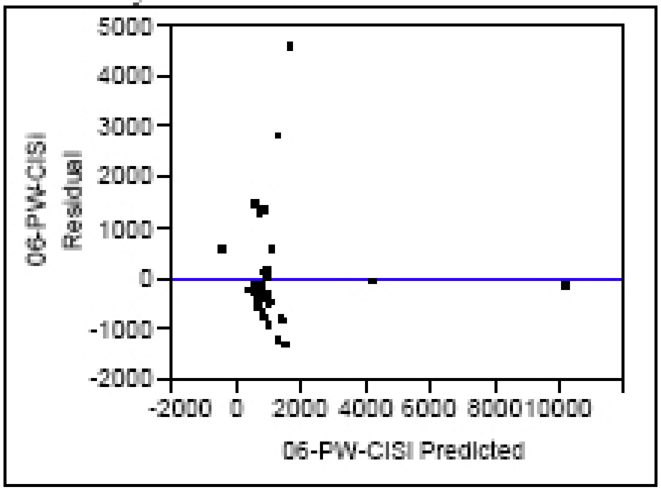
Term	Estimate	Std Error	t Ratio	Prob>|t|	Lower 95%	Upper 95%	VIF
Intercept	742.98869	228.5646	3.25	0.0028	276.19744	1209.7799	
MP-Cl	-500024.1	124211.3	-4.03	0.0004	-753697.4	-246350.9	3.4660464
MP-Si/Gr	46001.313	6392.293	7.20	<.0001	32946.509	59056.117	3.4660464

Durbin-Watson

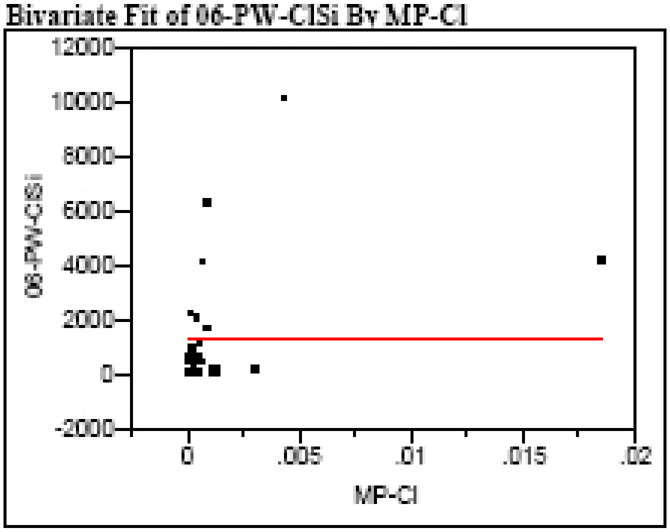
Durbin-Watson	Number of Obs.	AutoCorrelation
1.8558222	33	0.0621

Figure F.11. Average annual sediment yield 2006 clay and silt yield regression model.

Residual by Predicted Plot



Bivariate Fit of 06-PW-ClSi By MP-Cl



Bivariate Fit of 06-PW-ClSi By MP-Si/Gr

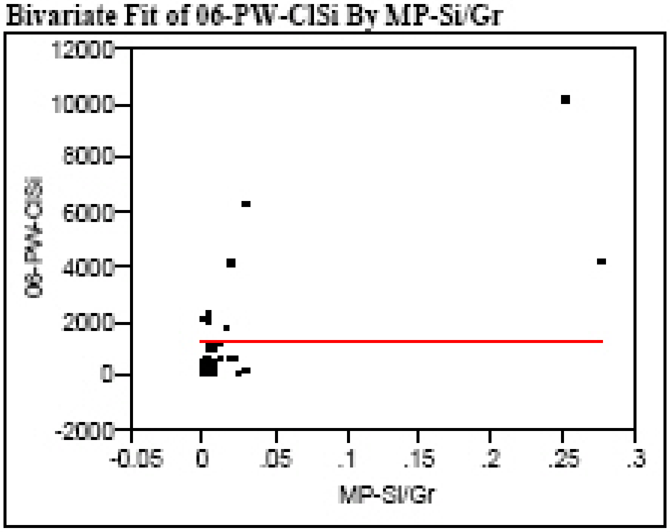


Figure F.12. Average annual sediment yield 2006 clay and silt yield residual plots.

After reviewing over all the stepwise standard least squares regression analysis results with the various stream bed sediment deposition properties and the average annual hillslope sediment yield properties, there seems to be a much better correlation and significance for the assembly of multiple variables combined than just one single pair of measured and predicted values as shown summarized in Table F.3.

For the PW-Cl, PW-TSY, and PW-ClSi variables, the two best response variables were the MP-Cl and MP-Si/Gr. With the PW-Si variable, the two response variables were MP-Si/Sa and MP-Si/Gr. The four stepwise regression equations created from the combination of stream bed sediment variables to predict a hillslope sediment yield variable are shown in equations listed below:

$$06\text{-}PW\text{-}Cl = 254.13 - 162{,}109.87(MP\text{-}Cl) + 14{,}819.32(MP\text{-}Si/Gr)$$

$$06\text{-}PW\text{-}Si = 718.01 - 29{,}125.19(MP\text{-}Si/Sa) + 27{,}247.06(MP\text{-}Si/Gr)$$

$$06\text{-}PW\text{-}TSY = 798.79 - 512{,}783.35(MP\text{-}Cl) + 46{,}716.34(MP\text{-}Si/Gr)$$

$$06\text{-}PW\text{-}ClSi = 742.99 - 500{,}024.15(MP\text{-}Cl) + 46{,}001.31(MP\text{-}Si/Gr)$$

Interesting, the measured ratio of silt to gravel seems to be a sediment deposition variable in the four stepwise models that contained an overall and individual p-value that was below 0.05, which showed a significant relationship between the variables placed in the stepwise regression model. Also note that in the four regression models shown, the VIF values were less than 10, which indicated that there were no major multicollinearity problems with the variables used. For all four of the models, the confidence interval does not contain a zero value, which would show that a variable would not have a significant relationship with the other values used in the model.

The best R-square value showed to be 0.69 with the PW-Cl and PW-ClSi, while the lowest R-square value came from the PW-TSY at 0.64. These R-square values show that the sediment

Table F.3. Summary of statistical relationships for sediment deposition and yield.

Sediment Yield	Stream Bed	Multivariate		Standard Least Squares Regression		
Response Variable	Sediment Variables	Spearman ρ	Prob > |ρ|	R-Square	F Ratio	Prob > F
06-PW-Cl	MP-Cl	0.1228	0.4961	0.69	33.86	< 0.0001
	MP-Si/Gr	0.3108	0.0783			
06-PW-Si	MP-Si/Sa	0.3038	0.0856	0.65	28.31	< 0.0001
	MP-Si/Gr	0.3195	0.0699			
06-PW-TSY	MP-Cl	0.1139	0.5280	0.64	26.57	< 0.0001
	MP-Si/Gr	0.3189	0.0705			
06-PW-ClSi	MP-Cl	0.1122	0.5341	0.69	33.14	< 0.0001
	MP-Si/Gr	0.3112	0.0780			

data used contains a good bit of variability, which is expected with measuring sediment characteristics. If viewed closely, the standard least squares regression plots reveal a leverage effect due to a possible outlier in the data. It is unclear with the limited amount of data available that this data point is an outlier or is acceptable.

Overall, the statistics of sediment from channel deposition points in the stream with the average annual sediment yield on the hillslope of all the sites contained in all four watersheds show that there is a significant relationship with clays, silts, sands, and gravels. More data would probably produce less variability and possibly a better prediction model with the stream sediment deposits and hillslope sediment yield on an average annual basis.