APPENDIX A
MAPS AND FIGURES

Figure 2-1. 303 (d) Listed Waters in the Upper Gallatin TMDL Planning Area............................ 3
Figure 2-2. Overview Map: Upper Gallatin TMDL Planning Area .............................................. 4
Figure 2-3. Level IV Ecoregions in the Upper Gallatin TMDL Planning Area ............................ 5
Figure 2-4. Topography of the Upper Gallatin TMDL Planning Area ........................................... 6
Figure 2-5. Geologic map of the Upper Gallatin TMDL Planning Area................................. 7
Figure 2-6. Soil permeability in the Upper Gallatin TMDL Planning Area ............................... 8
Figure 2-7. Soil erodibility in the Upper Gallatin TMDL Planning Area .................................... 9
Figure 2-8. Hydrography and stream gaging stations in the Upper Gallatin TMDL Planning Area ................................................................. 10
Figure 2-10. Groundwater wells in the Upper Gallatin TMDL Planning Area .......................... 11
Figure 2-11. Average annual precipitation in the Upper Gallatin TMDL Planning Area ............ 12
Figure 2-12. Land cover in the Upper Gallatin TMDL Planning Area ........................................ 13
Figure 2-13. Fish species distribution in the Upper Gallatin TMDL Planning Area ................. 14
Figure 2-14. Wildfire history in the Upper Gallatin TMDL Planning Area ................................. 15
Figure 2-15. Population in the Upper Gallatin TMDL Planning Area (2000 Census) ............... 16
Figure 2-16. Land Ownership .................................................................................................. 17
Figure 2-17. Land Use .............................................................................................................. 18
Figure 2-18. Transportation networks ...................................................................................... 19
Figure 2-19. Abandoned and inactive mines are present ........................................................... 20
Figure 5-1. Macroinvertebrate sampling sites in the West Fork Gallatin Watershed ............... 21
Figure 5-2. 2008 DEQ sediment and habitat assessment sites in the West Fork Gallatin Watershed .................................................................................................................. 22
Figure 5-3. 2008 DEQ sediment and habitat assessment sites Middle Fork Watershed .......... 23
Figure 5-4. 2008 DEQ sediment and habitat assessment sites South Fork Watershed ......... 24
Figure 5-5. 2008 DEQ sediment and habitat assessment sites West Fork Watershed ............. 25
Figure 5-10. Storm water construction permits in the West Fork Watershed as of January 28, 2010............................................................................................................................. 26
Figure 6-1. 2006-2008 Nutrient sampling sites in the West Fork Gallatin watershed .......... 27
Figure 6-2. Nutrient Assessment Reaches ............................................................................... 28
Figure 6-6. South Fork West Fork Gallatin River: Nutrient Sampling Sites ............................. 29
Figure 6-7. Upper Middle Fork West Fork Gallatin River watershed showing resort land use... 30
Figure 6-8. Lake Levinsky, looking upstream. Upper Middle Fork West Fork Gallatin River watershed .......................................................................................................................... 31
Figure 6-9a. Areas served by sewer and septic systems in the upper Middle Fork West Fork Gallatin River .................................................................................................................. 32
Figure 6-9b. Sewer and Septic coverage, West Fork Gallatin River watershed .......................... 33
Figure 6-17a. Substrate at site WFGR01 August 2008 .............................................................. 34
Figure 6-17b. Stream cobbles at site WFGR01 August 2008 ..................................................... 34
Figure 6-17c. Substrate at site WFGR04 August 2008 ................................................................. 34
Figure 6-17d. Stream cobbles at site WFGR04 August 2008 ..................................................... 34
Figure 6-17e. Substrate at site WFGR06 August 2008 ............................................................... 35
Figure 6-17f. Stream cobbles at site WFGR06 August 2008 ..................................................... 35
Figure 6-17g. Substrate at site WFGR03 August 2008 ............................................................... 35
The West Fork Gallatin River Watershed Total Maximum Daily Loads (TMDLs) and Framework Watershed Water Quality Improvement Plan – Appendix A

Figure 6-17h. Stream cobbles at site WFGR03 August 2008 ....................................................... 35
Figure 6-19. August 18th, 2006 NO₂⁺NO₃ Loads, West Fork Gallatin River ................................. 36
Figure 6-20. August 22nd 2006 NO₂⁺NO₃ Loads, West Fork Gallatin River ................................. 36
Figure 6-21. August 27th 2008 NO₂⁺NO₃ Loads, West Fork Gallatin River ................................. 37
Figure 6-22. November 17th 2006 NO₂⁺NO₃ Loads, West Fork Gallatin River ............................ 37
Figure 6-23. March 1st, 2007 NO₂⁺NO₃ Loads, West Fork Gallatin River ................................. 38
Figure 6-24. Cross-drain on the Big Sky Golf Course fairway ..................................................... 39
Figure 6-25. Cross-drain discharges to the West Fork Gallatin River ......................................... 39
Figure 6-28. August 27th 2008 TN Loads, West Fork Gallatin River ......................................... 40
Figure 6-29. August 27th 2008 TN Loads with wastewater load removed ................................. 40
Figure 6-31. Algae-free substrate at site SFWF01 September 2005 ............................................ 41
Figure 6-32. Substrate at site SFWF01 August 2008 ................................................................. 41
Figure 6-33. Stream cobbles at site SFWF01 August 2008 .......................................................... 41
Figure 6-34. Substrate at site SFWF02 September 2005 ............................................................. 42
Figure 6-35. Substrate at site SFWF02 August 2008 ................................................................. 42
Figure 6-36. Stream cobbles at site SFWF02 August 2008 .......................................................... 42
Figure 6-37. Substrate at site SFWF03 September 2005 ............................................................. 43
Figure 6-38. Substrate at site SFWF03 August 2008 ................................................................. 43
Figure 6-39. Stream cobbles at site SFWF03 August 2008 .......................................................... 43
Figure 6-40. Substrate at site SFWF03 August 2010 ................................................................. 44
Figure 7-1. 2006-2008 E. coli sampling sites in the West Fork Gallatin watershed .................... 45
Figure 7-2. E. Coli Assessment Reaches ..................................................................................... 46
Figure 7-9. E. Coli concentrations on 08/18/06 ................................................................. 47
Figure 7-10. E. Coli concentrations on 07/23/08 ....................................................................... 48
Figure 7-11. E. Coli concentrations on 08/27/08 ..................................................................... 49
Figure 2-1. 303 (d) Listed Waters in the Upper Gallatin TMDL Planning Area
Figure 2-2. Overview Map: Upper Gallatin TMDL Planning Area
Figure 2-3. Level IV Ecoregions in the Upper Gallatin TMDL Planning Area
Figure 2-4. Topography of the Upper Gallatin TMDL Planning Area
Figure 2-5. Geologic map of the Upper Gallatin TMDL Planning Area
Figure 2-6. Soil permeability in the Upper Gallatin TMDL Planning Area
Figure 2-7. Soil erodibility in the Upper Gallatin TMDL Planning Area
Figure 2-8. Hydrography and stream gaging stations in the Upper Gallatin TMDL Planning Area
Figure 2-10. Groundwater wells in the Upper Gallatin TMDL Planning Area
Figure 2-11. Average annual precipitation in the Upper Gallatin TMDL Planning Area
Figure 2-12. Land cover in the Upper Gallatin TMDL Planning Area

Land use and land cover data are from the USGS NLCD 2001.
Figure 2-13. Fish species distribution in the Upper Gallatin TMDL Planning Area
Figure 2-14. Wildfire history in the Upper Gallatin TMDL Planning Area
Figure 2-15. Population in the Upper Gallatin TMDL Planning Area (2000 Census)
Figure 2-16. Land Ownership
Figure 2-17. Land Use
Figure 2-18. Transportation networks
Figure 2-19. Abandoned and inactive mines are present
Figure 5-1. Macroinvertebrate sampling sites in the West Fork Gallatin Watershed
Figure 5-2. 2008 DEQ sediment and habitat assessment sites in the West Fork Gallatin Watershed
Figure 5-3. 2008 DEQ sediment and habitat assessment sites Middle Fork Watershed
Figure 5-4. 2008 DEQ sediment and habitat assessment sites South Fork Watershed
Figure 5-5. 2008 DEQ sediment and habitat assessment sites West Fork Watershed
Figure 5-10. Storm water construction permits in the West Fork Watershed as of January 28, 2010
Figure 6-1. 2006-2008 Nutrient sampling sites in the West Fork Gallatin watershed
Figure 6-2. Nutrient Assessment Reaches
Figure 6-6. South Fork West Fork Gallatin River: Nutrient Sampling Sites
Figure 6-7. Upper Middle Fork West Fork Gallatin River watershed showing resort land use
Figure 6-8. Lake Levinsky, looking upstream. Upper Middle Fork West Fork Gallatin River watershed
Figure 6-9a. Areas served by sewer and septic systems in the upper Middle Fork West Fork Gallatin River
Figure 6-9b. Sewer and Septic coverage, West Fork Gallatin River watershed
The West Fork Gallatin River Watershed Total Maximum Daily Loads (TMDLs) and Framework Watershed Water Quality Improvement Plan – Appendix A

Figure 6-19. August 18\textsuperscript{th}, 2006 NO\textsubscript{2}+NO\textsubscript{3} Loads, West Fork Gallatin River

Figure 6-20. August 22\textsuperscript{nd}, 2006 NO\textsubscript{2}+NO\textsubscript{3} Loads, West Fork Gallatin River
Figure 6-21. August 27th 2008 NO₂+NO₃ Loads, West Fork Gallatin River

Figure 6-22. November 17th 2006 NO₂+NO₃ Loads, West Fork Gallatin River
Figure 6-23. March 1st, 2007 NO₂+NO₃ Loads, West Fork Gallatin River
Figure 6-24. Cross-drain on the Big Sky Golf Course fairway

Figure 6-25. Cross-drain discharges to the West Fork Gallatin River
Figure 6-28. August 27th 2008 TN Loads, West Fork Gallatin River

Figure 6-29. August 27th 2008 TN Loads with wastewater load removed
Figure 6-31. Algae-free substrate at site SFWF01 September 2005

Figure 6-32. Substrate at site SFWF01 August 2008

Figure 6-33. Stream cobbles at site SFWF01 August 2008
Figure 6-34. Substrate at site SFWF02 September 2005

Figure 6-35. Substrate at site SFWF02 August 2008

Figure 6-36. Stream cobbles at site SFWF02 August 2008
Figure 6-37. Substrate at site SFWF03 September 2005

Figure 6-38. Substrate at site SFWF03 August 2008

Figure 6-39. Stream cobbles at site SFWF03 August 2008
Figure 6-40. Substrate at site SFWF03 August 2010
Figure 7-1. 2006-2008 E. coli sampling sites in the West Fork Gallatin watershed
Figure 7-2. E. Coli Assessment Reaches
Figure 7-9. E. Coli concentrations on 08/18/06
Figure 7-10. E. Coli concentrations on 07/23/08
Figure 7-11. E. Coli concentrations on 08/27/08