

## APPENDIX 3

### A-3.0 HARLAN RUN AND JORDAN RUN

#### A-3.1 Watershed Information

Harlan Run and Jordan Run are two small watersheds in the northern portion of the Potomac Direct Drains watershed TMDL study area. Harlan Run drains approximately 17 square miles (10,840 acres), and Jordan Run drains approximately 1.6 square miles (1,022 acres), as shown in Figure A-3-1. The dominant landuse in the Harlan Run watershed is grassland, which covers 27 percent of the watershed. Other important landuse types include forest (18 percent), pasture (18 percent), cropland/orchards (16 percent), and urban/residential (16 percent). The dominant landuse in the Jordan Run watershed is forest, which covers 52 percent of the watershed. Other important landuse types include grassland (21 percent), and urban/residential (22 percent). Three impaired streams, Harlan Run, Tullis Branch, and Jordan Run, are addressed in this TMDL development effort. Figure A-3-2 shows the impaired streams and associated pollutants. Before establishing Total Maximum Daily Loads (TMDLs), WVDEP performed monitoring throughout the Potomac Direct Drains watershed to better characterize water quality and refine impairment listings. Monthly samples were taken at five stations in the Harlan Run watershed and three stations on Jordan Run (station locations can be viewed using the ArcExplorer project) from July 1, 2003 through June 30, 2004. Monitoring suites at each site were determined based on the types of impairments observed in each stream. Monthly samples from streams impaired by fecal coliform bacteria were analyzed for fecal coliform bacteria, pH, and specific conductance. In addition, benthic macroinvertebrate assessments were performed at specific locations on the biologically impaired streams during the pre-TMDL monitoring period. Instantaneous flow measurements were also taken at strategic locations during pre-TMDL monitoring.

#### A-3.2 Fecal Coliform Bacteria Sources

This section identifies and examines the potential sources of fecal coliform bacteria in the Harlan Run and Jordan Run watersheds. Sources can be classified as either point sources or nonpoint sources. Point sources include the permitted discharges from sewage treatment facilities and discharges from Municipal Separate Storm Sewer Systems (MS4s). Nonpoint sources of fecal coliform bacteria include failing or nonexistent on-site sewage disposal systems, stormwater runoff from pasture and cropland, and direct deposition of wastes from livestock.

##### A-3.2.1 Fecal Coliform Bacteria Point Sources

In the Harlan Run watershed, there is one private entity that operates a sewage treatment plant under an Individual NPDES Permit. The location of this NPDES permit is shown in Figure A-3-3. The Jordan Run watershed does not contain any permitted discharges from sewage treatment facilities.

Runoff from residential and urbanized areas during storm events can be a significant fecal coliform source. USEPA's stormwater permitting regulations require public entities to obtain

NPDES permit coverage for stormwater discharges from MS4s in specified urbanized areas. Berkeley County is a designated MS4 entity with areas of responsibility in the watersheds of Harlan Run and Jordan Run. The West Virginia Department of Transportation (WVDOT) has MS4 areas of responsibility in the Jordan Run watershed. Both entities will be registered under, and subject to, the requirements of General Permit Number WV0110625. MS4 source representation was based upon precipitation and runoff from landuses determined from the modified GAP 2000 landuse data, the jurisdictional boundary of Berkeley County, and the associated drainage area for the WVDOT MS4s.

The pollutant loadings associated with precipitation and runoff from most land within the corporate boundaries of Berkeley County were aggregated to represent baseline MS4 conditions and wasteload allocations. Only the precipitation-induced loadings from the drainage areas associated with agricultural landuses and the WVDOT MS4s were excluded from the County's allocations. The WVDOT MS4 baseline conditions and wasteload allocations were based upon the drainage areas associated with the roads and MS4s for which WVDOT is responsible, as determined by information provided in their application for registration under General NPDES Permit Number WV0110625. Under this approach, the fecal coliform bacteria loading associated with precipitation and runoff from approximately 74 percent of the land area of the Harlan Run watershed is subject to MS4 wasteload allocations. The fecal coliform bacteria loading associated with precipitation and runoff from approximately 99 percent of the land area of the Jordan Run watershed is subject to MS4 wasteload allocations.

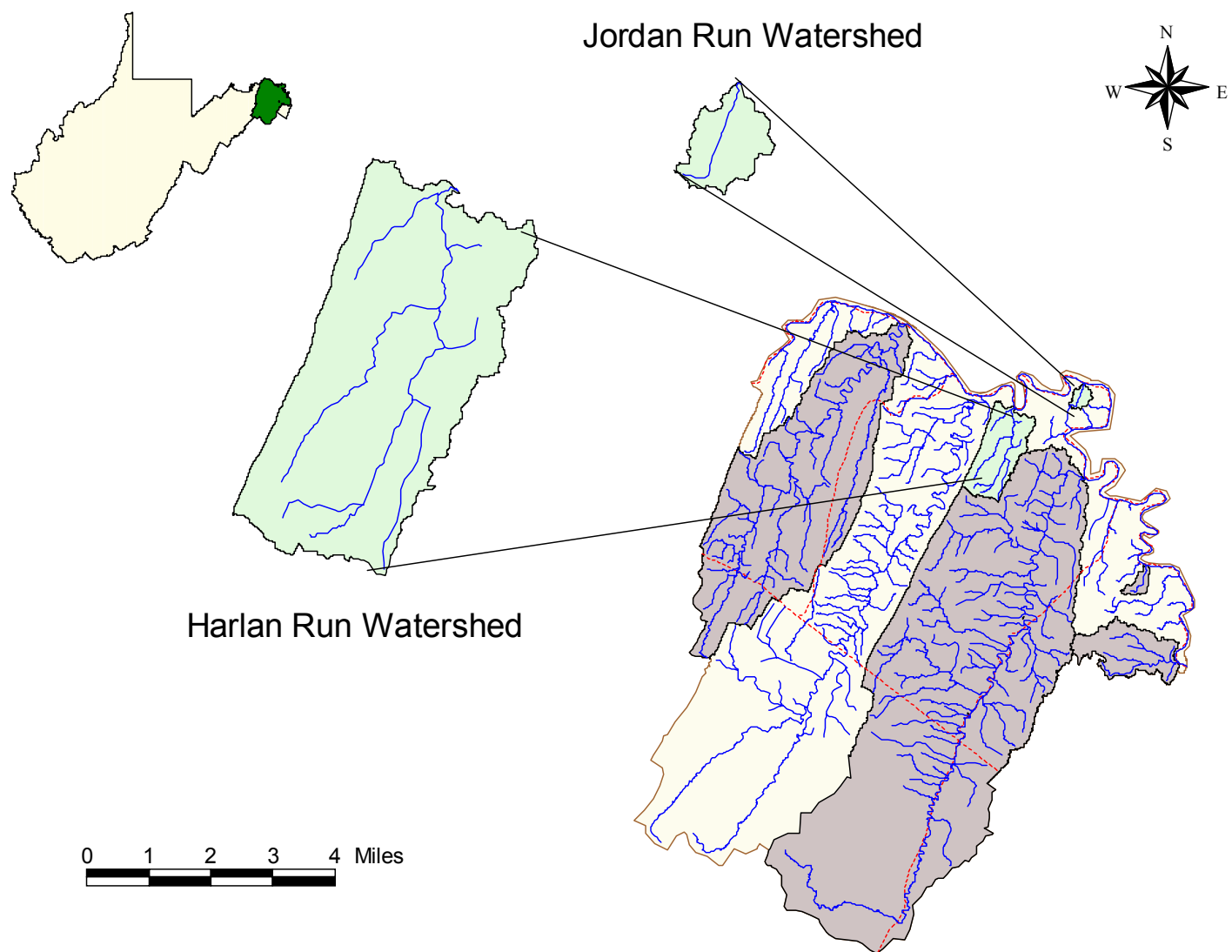


Figure A-3-1. Location of the Harlan Run and Jordan Run watersheds

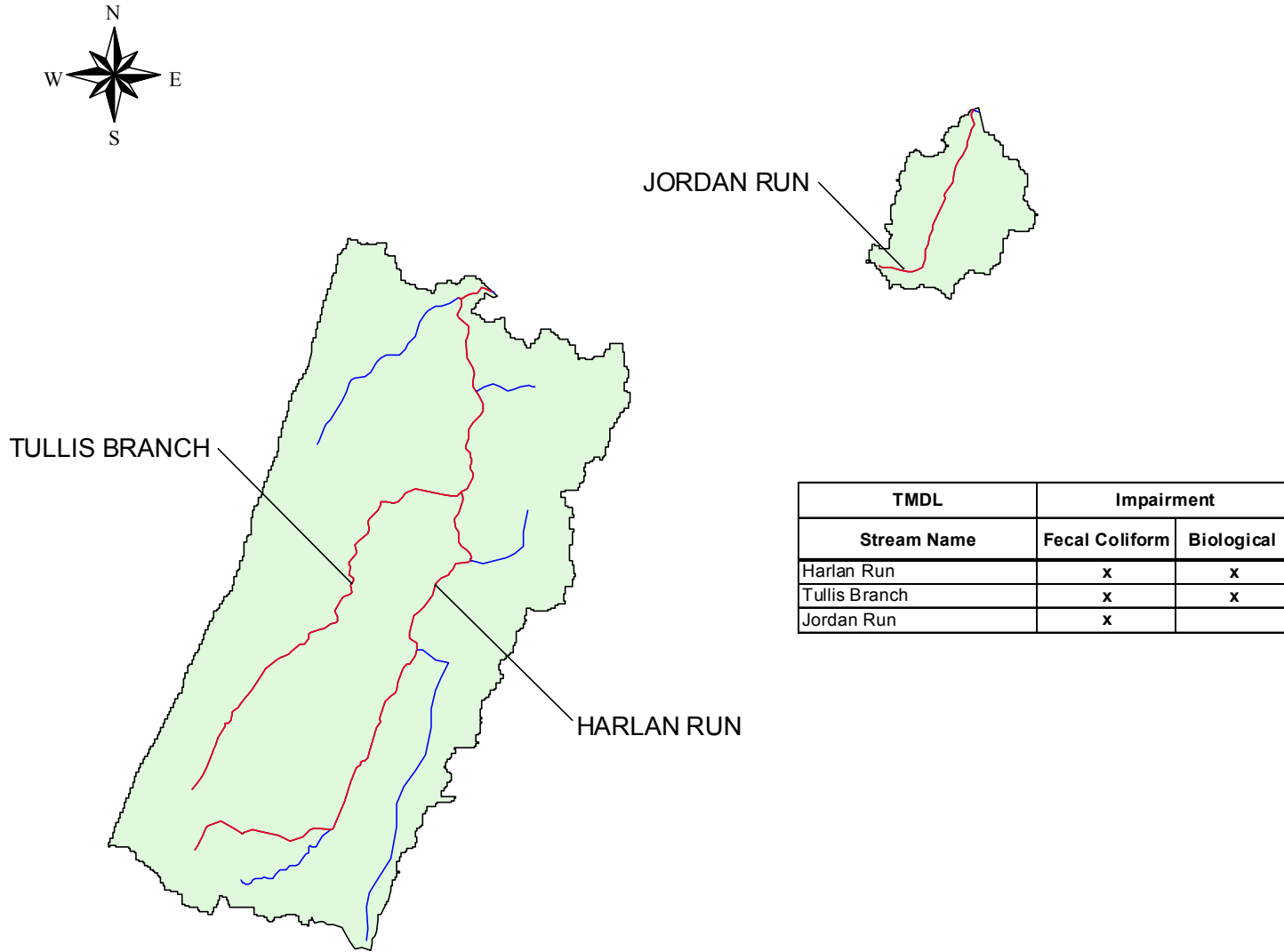


Figure A-3-2. Waterbodies and impairments under TMDL development in the Harlan Run and Jordan Run watersheds

### A-3.2.2 Fecal Coliform Bacteria Nonpoint Sources

Pollutant source tracking by WVDEP personnel identified scattered areas of high population density without access to public sewers in the Harlan Run and Jordan Run watersheds. Human sources of fecal coliform bacteria in these areas include sewage discharges from failing septic systems, and possible direct discharges of sewage from residences (straight pipes). An analysis of 911 emergency response addressable structure data combined with WVDEP source tracking information yielded an estimate of 1,215 unsewered homes in the Harlan Run watershed, and 223 unsewered homes in the Jordan Run watershed. A septic system failure rate derived from geology and soil type was applied to the number of unsewered homes to calculate nonpoint source fecal coliform loading from failing septic systems. For a more detailed description of failing septic system fecal coliform modeling, please refer to the Potomac Direct Drains Watershed TMDL Technical Report. Figure A-3-3 shows the estimated cumulative untreated flow from failing septic systems in each modeled subwatershed.

In rural areas, agricultural activities can contribute fecal coliform bacteria to receiving streams through surface runoff or direct deposition. Cropland and pasture landuses are a significant nonpoint source and constitute 26 percent of the Harlan Run watershed drainage area. Agricultural activity is not prevalent in the Jordan Run watershed.

A certain “natural background” contribution of fecal coliform bacteria can be attributed to deposition by wildlife in forested areas. Accumulation rates for fecal coliform bacteria in forested areas were developed using reference numbers from past TMDLs, incorporating wildlife estimates obtained from West Virginia’s Division of Natural Resources (DNR). In addition, WVDEP conducted storm sampling on a 100 percent forested subwatershed (Shrewsbury Hollow) within the Kanawha State Forest, Kanawha County, West Virginia to determine wildlife contributions of fecal coliform. These results were used during the model calibration process. On the basis of the low fecal accumulation rates for forested areas, the stormwater sampling results, and model simulations, wildlife is not considered to be a significant nonpoint source of fecal coliform bacteria in the Harlan Run and Jordan Run watersheds.

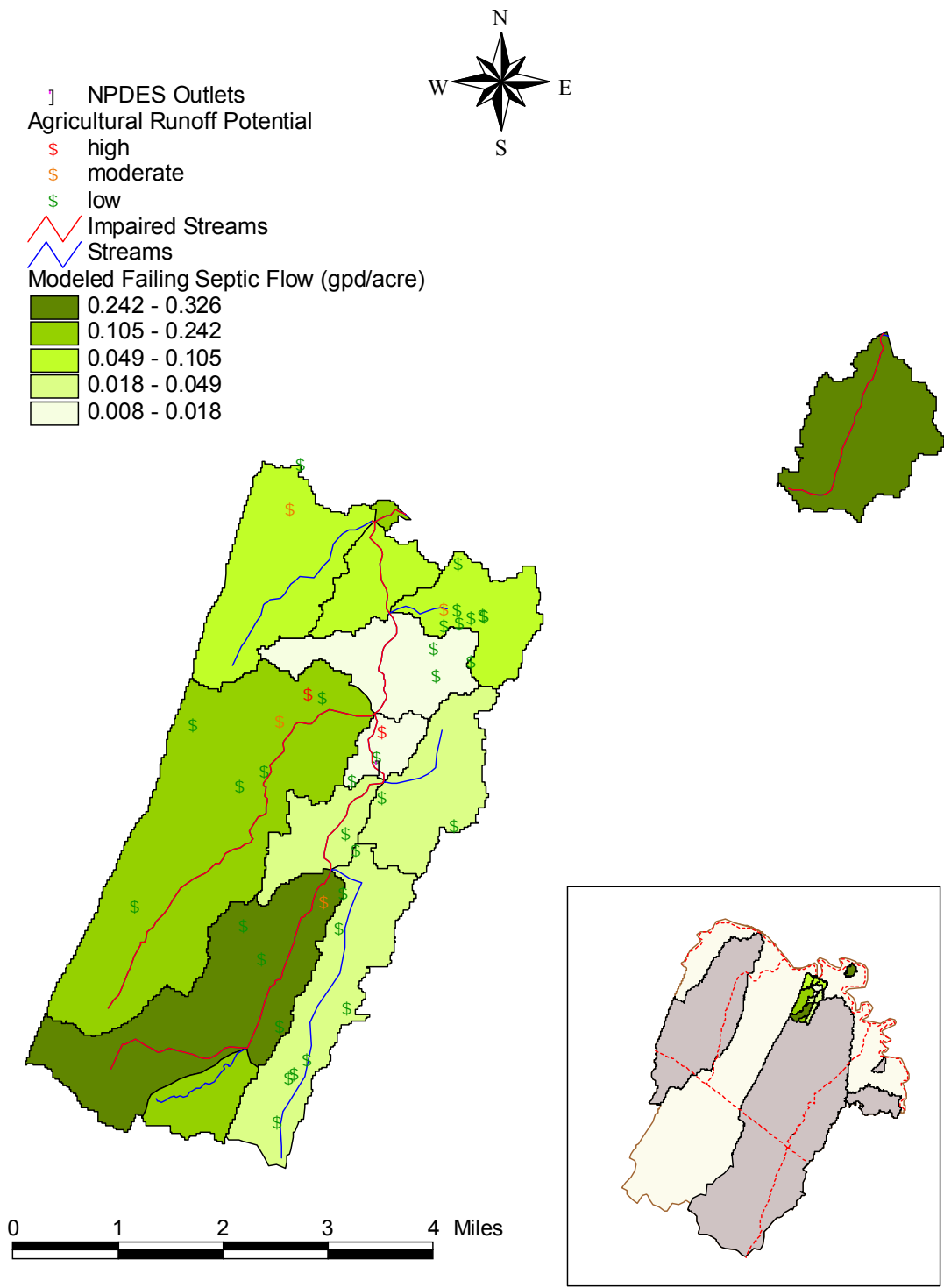


Figure A-3-3. Fecal coliform sources in the Harlan Run and Jordan Run watersheds

### A-3.3 Sediment Sources

Sediment TMDLs are presented herein for Harlan Run and its tributary, Tullis Branch. Excess sediment has been identified as a significant stressor in relation to biological impairment of those waters.

Table A-3-1 displays the areas of those landuses considered to be significant sediment sources in the watersheds of the sediment-impaired waters of Harlan Run and Tullis Branch. This section discusses the point and nonpoint sources of sediment that are present in the watersheds.

**Table A-3-1.** Upland sediment sources in the Harlan Run and Tullis Branch TMDL watersheds

Stream	Total Watershed Area (acres)	Cropland Area (acres)	Pasture Area (acres)	Residential/Urban/Roads Area (acres)	Existing Stormwater Construction General Permit Sites (acres)
Harlan Run	10,058	910	1,899	1,837	499
Tullis Branch	3,122	265	199	489	187

#### A-3.3.1 Sediment Point Sources

Point sources of sediment include permitted loadings from traditional NPDES permit outlets with effluent limitations for Total Suspended Solids (TSS), and the precipitation-induced loadings associated with stormwater NPDES permits.

Individual and General NPDES Permits for sewage treatment facilities contain technology based TSS effluent limitations. One such permit is located in the Harlan Run watershed. It is recognized in the sediment modeling process and is assigned a wasteload allocation that authorizes continued discharge under existing permit conditions.

Berkeley County is designated as an MS4 entity in the Harlan Run watershed. Similar to the fecal coliform bacteria source representation described in Section A-3.2.1, the sediment pollutant loadings associated with precipitation and runoff from most of the land within the corporate boundaries of Berkeley County were aggregated to represent baseline MS4 conditions and wasteload allocations. Upland sediment sources related to pasture and croplands were excluded from MS4 wasteload allocations and prescribed as load allocations to nonpoint sources. The baseline and allocated loads associated with bank erosion were generally included in the MS4 wasteload allocations. Only in a limited number of MS4 subwatersheds, where WVDEP source tracking determined moderate and high water quality impact from agricultural landuses, were the bank erosion components prescribed as nonpoint source load allocations.

Site registrations under the Construction Stormwater General Permit are the most significant sediment point sources in the Harlan Run watershed. 23 existing and pending site registrations under the Construction Stormwater General Permit, constituting 499 disturbed acres, were represented. Of that area, 187 acres are located in the Tullis Branch watershed. Model

representation is precipitation-based and couples the design precipitation with the disturbed acreages and an assumption that proper installation and implementation of the Best Management Practices (BMPs) associated with the permit will achieve an approximate 60 percent reduction of barren land sediment loadings.

**A-3.3.2 Sediment Nonpoint Sources**

Land disturbance can increase sediment loading to impaired waters. Significant upland nonpoint sources of sediment in the watershed include barren land, cropland, unpaved roads, and pasture lands, for which pre-TMDL source tracking determined moderate or high water quality impact. Residential and urban landuses are not considered significant upland sediment sources. Streambank erosion was not considered to be a significant sediment source.

Agricultural landuses are the most significant sediment nonpoint sources in Harlan Run and Tullis Branch. Crop and pasture lands make up 28 percent of the land area of the Harlan Run watershed and 15 percent of the land area in Tullis Branch watershed.

The sediment loadings from non-pasture grassland and forested areas are not considered to be significant sediment sources and their sediment contributions are categorized as “background” in the load allocations. Forestry and oil and gas production are not prevalent in the watershed and are also categorized in the background loadings.

**A-3.4 Stressors of Biologically Impaired Streams**

The Harlan Run watershed has two biologically impaired streams for which TMDLs have been developed: Harlan Run and Tullis Branch. A stressor identification process was used to evaluate and identify the significant stressors of the impaired benthic communities in these streams. The stressor identification process is detailed in Section 6 of the main report with additional information provided in the Technical Report. Table A-3-2 displays the biological stressors of these streams’ benthic communities and the TMDLs required to address these impairments.

Where identified as the biological stressor, organic enrichment was linked to violations of the numeric criteria for fecal coliform bacteria. WVDEP determined that the implementation of fecal coliform TMDLs would remove untreated sewage and animal waste, thereby reducing the organic and nutrient loading causing the biological impairment. Therefore, fecal coliform TMDLs will serve as a surrogate where organic enrichment was identified as a stressor. Where the stressor identification process indicated sedimentation as a causative stressor, WVDEP developed sediment TMDLs. The stressor identification process is detailed in Section 6 of the main TMDL Report with additional information provided in the Technical Report.

**Table A-3-2.** Significant stressors of biologically impaired streams in the Harlan Run watershed

Stream	Biological Stressors	TMDLs Required
Harlan Run	Sedimentation Organic enrichment	Sediment Fecal coliform
Tullis Branch	Sedimentation Organic enrichment	Sediment Fecal coliform



## **A-3.5 TMDLs for the Harlan Run and Jordan Run Watersheds**

### **A-3.5.1 TMDL Development**

TMDLs and source allocations were developed for the impairments displayed in Figure A-3-2. Refer to Section 7 of the main TMDL report for a detailed description of the allocation methodologies used in developing the pollutant-specific TMDLs.

The TMDLs for fecal coliform bacteria and sediment are shown in Tables A-3-3 and A-3-4. The TMDLs for fecal coliform bacteria are presented in number of colonies per day. The TMDLs for sediment are presented in tons per day. The TMDLs in the Allocation Spreadsheet are presented as average daily loads and average annual loads because they were developed to meet TMDL endpoints under a range of conditions observed throughout the year.

Detailed source allocations are provided in the allocation spreadsheets associated with this report. The filterable spreadsheets include multiple display formats that allow comparison of pollutant loadings among categories and facilitate implementation. Displays include mass-based allocations for point and nonpoint sources, concentration-based allocations for traditional point sources, and area allocations for Construction Stormwater General Permit registrations. Displays also include mass-based allocations by source category, subwatershed and jurisdiction, and source category area by subwatershed and jurisdiction. A brief description of the information presented is included on the “Introduction” tab of each spreadsheet. Sections 7.4.1 and 7.4.2 of the main TMDL report provides a more detailed discussion and identifies the operable allocations for point sources.

### A-3.6 TMDL Tables: Fecal Coliform Bacteria

**Table A-3-3.** Fecal coliform bacteria TMDLs for the Harlan Run and Jordan Run watersheds

Major Watershed	Stream Code	Stream Name	Parameter	Load Allocation	Wasteload Allocation	Margin of Safety	TMDL
				(counts/day)	(counts/day)	(counts/day)	(counts/day)
Harlan Run	WVP-5	Harlan Run	Fecal coliform	2.81E+10	3.28E+10	3.21E+09	6.42E+10
Harlan Run	WVP-5-A	Tullis Branch	Fecal coliform	3.69E+09	9.30E+09	6.84E+08	1.37E+10
Jordan Run	WVP-4.5	Jordan Run	Fecal coliform	1.17E+07	5.21E+09	2.75E+08	5.49E+09

NA = not applicable; UNT = unnamed tributary.

“**Scientific notation**” is a method of writing or displaying numbers in terms of a decimal number between 1 and 10 multiplied by a power of 10. The scientific notation of 10,492, for example, is  $1.0492 \times 10^4$ .

**A-3.7 TMDL Tables: Biological**

**Table A-3-4.** Biological TMDLs for the Harlan Run watershed

Stream	Biological Stressor	Parameter	Load Allocation	Wasteload Allocation	Margin of Safety	TMDL	Units
Harlan Run	Sedimentation	Sediment	12.75	40.94	2.83	56.52	tons/day
	Organic enrichment	Fecal coliform	2.81E+10	3.28E+10	3.21E+09	6.42E+10	counts/day
Tullis Branch	Sedimentation	Sediment	1.98	4.48	0.34	6.79	tons/day
	Organic enrichment	Fecal coliform	3.69E+09	9.30E+09	6.84E+08	1.37E+10	counts/day