Total Maximum Daily Load

Powder River Basin TMDL for *E. coli*

May 2024

State of Oregon
DEQ Department of Environmental Quality

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Table of Contents

List of Tables

List of Figures

1. Introduction

The Oregon Department of Environmental Quality (DEQ) has developed a Total Maximum Daily Load (TMDL) rule for the Powder River Basin that addresses pollution of surface waters by human and animal feces. The rule focuses on a specific type of fecal indicator bacteria (*Escherichia coli*; hereafter *E. coli*) that indicates sources originating from humans and other warm-blooded animals. The TMDL outlines a structured approach for cleaning up polluted waters in the basin. Target values presented in the rule describe the maximum amount of pollution a body of water can receive and still meet state water quality standards for *E. coli*. The TMDL may be referred to as either the Powder River Basin Bacteria TMDL or the Powder River Basin TMDL for *E. coli*.

1.1 TMDL history

The Powder River Basin lies in eastern Oregon on the border with Idaho. The US Geological Survey (USGS) refers to the basin as a six-digit Hydrologic Unit Code (HUC) numbered 170502 and as the Middle-Snake Powder Basin. Subbasins (eight-digit HUCs) include the Oregon portion of the Brownlee Subbasin (17050201), Burnt River Subbasin (17050202), and Powder River Subbasin (17050203). All streams in the basin drain ultimately to the Snake River.

The TMDL described here represents the first one to be issued for the Powder River Basin individually. The Water Quality Management Plan (WQMP) developed for this TMDL will be updated as additional water quality concerns are addressed in future TMDLs. Issuance of the Powder River Basin Bacteria TMDL does not impact or represent a revision to existing Snake River Basin TMDLs that encompass the Powder River Basin.

1.2 TMDL administrative and public participation processes

Following completion of the TMDL development process, including the engagement of a rule advisory committee on fiscal impacts and other aspects of the rule, DEQ will propose the Powder River Basin TMDL for adoption by Oregon's Environmental Quality Commission, by reference, into rule as OAR 340-042-0090(2)(a). Any subsequently amended or renumbered rules cited in this document apply.

DEQ provided interpretations of data analyses prior to TMDL development to the Powder Basin Watershed Council, Powder Valley Water Control District, Burnt and Powder-Brownlee Agriculture Local Advisory Groups, and Oregon Department of Agriculture. DEQ provided draft TMDL documents for review by rule advisory committee members in early April 2023, followed by two opportunities for public review and submission of comments. The initial 91-day public comment period was open from June 2, 2023, through August 31, 2023, and was followed by a second 78-day public comment period that was open from January 3, 2024 through Mar 22, 2024. DEQ also held a public hearing in Baker City on August 15, 2023. Assistance from the above-mentioned groups, along with the public comment periods and public hearing, fulfills the public participation requirements specified in OAR 340-042-0050. DEQ considered all input received during public participation, used input to guide the analyses, preparation, and revision

of the TMDL, and provided response to comments (available at https://www.oregon.gov/deq/rulemaking/Pages/PowderTMDL.aspx).

2. TMDL name and location

Per Oregon Administrative Rule 340-042-0040(a), this element describes the geographic area where the TMDL applies. This Powder River Basin TMDL covers all freshwater perennial and intermittent streams in the Powder River Basin.

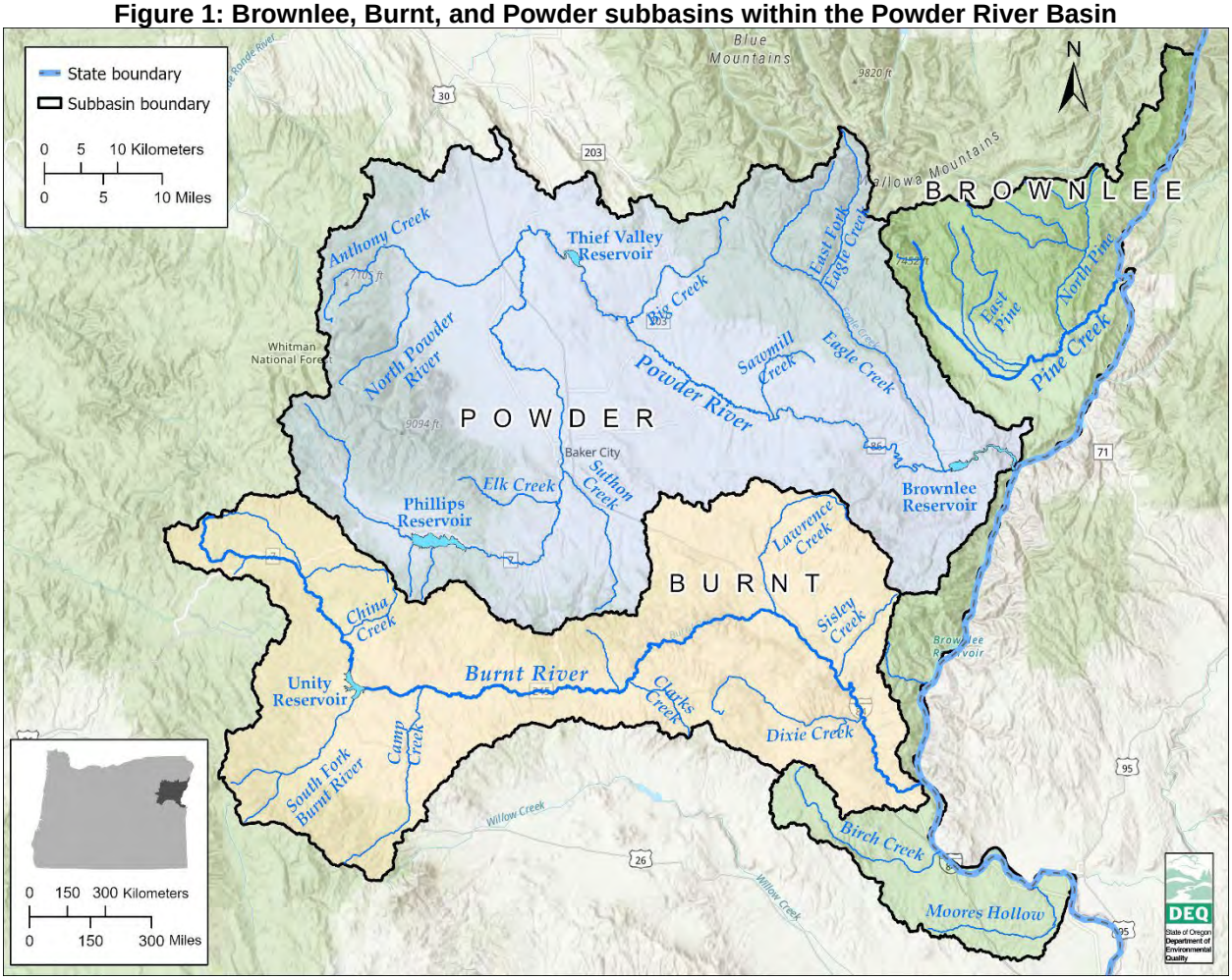
The Powder River Basin makes up one of 20 drainage basins in Oregon with basin-specific water quality standards described in OAR 340-041-0260 (originally described as the Powder/Burnt Basins) and mapped in Figure 260A. The US Geological Survey (USGS) refers to the basin as a six-digit Hydrologic Unit Code (HUC) numbered 170502 and as the Middle-Snake Powder Basin. Subbasins (eight-digit HUCs) include the Oregon portion of the Brownlee Subbasin (17050201), Burnt River Subbasin (17050202), and Powder River Subbasin (17050203) (Table 1).

Table 1: Powder River Basin subbasins

HUC8 Code	Subbasin Name
17050201	Brownlee Subbasin
17050202	Burnt River Subbasin
17050203	Powder River Subbasin

The basin forms a portion of the border of Oregon with Idaho and lies mostly within Baker County, with small portions in Union, Wallowa, and Malheur Counties. A portion of the Brownlee Subbasin also lies in Idaho and is not covered by the TMDL. The Oregon portion of the basin drains 3,444 square miles (8,925 square kilometers). Elevation ranges from 1,640 feet (500 meters) above sea level at the junction with the Snake River to 9,563 feet (2,914 meters) above sea level in the Wallowa Mountains. The average elevation is 4,237 feet (1,291 meters) above sea level (Figure 1). In 1988, two river reaches in the basin were designated as Scenic under the federal Wild and Scenic Rivers Act of 1968. These reaches include a 6.4-mile reach of the North Powder River from its headwaters in the Elkhorn Mountains to the Wallowa-Whitman National Forest boundary and an 11.7-mile reach of the Powder River from Thief Valley Dam to the Highway 203 bridge (National Wild and Scenic River System 2024).

Figure 1: Brownlee, Burnt, and Powder subbasins within the Powder River Basin



2.1 Climate

The climate of the Powder River Basin falls under the Temperate Continental-Cool Summer Phase in the Köppen-Geiger Climate Classification System (Kottek et al, 2006). Light precipitation, low relative humidity, rapid evaporation, abundant sunshine, and large fluctuations of temperature and precipitation characterize this climate. Over the past 30 years (1991 – 2020), mean annual temperature in the basin was 45.3°F (7.4°C), with a mean annual minimum temperature of 33.3°F (0.8°C) and a mean annual maximum temperature of 64.9°F (18.3°C) (PRISM Climate Group 2022).

Most annual precipitation falls as snow during winter. Over the past 30 years (1991 – 2020), annual precipitation has averaged 22.0 inches (56.0 cm) across the Powder Basin, with an average of 10.2 inches (25.9 cm) in the valleys and foothills an average of 78.2 inches (198.6 cm) at the highest elevations of the Elkhorn, Wallowa, and Blue Mountains (PRISM Climate Group 2022). Portions of the basin commonly experience rain-on snow events, which reduce the snowpack and can cause localized flooding.

2.2 Hydrology

Major drainages in the Powder River Basin originate in mountainous areas in the western portion of the basin and flow east into Brownlee, Oxbow, or Hells Canyon Reservoirs on the Snake River (Figure 1). The two major rivers in the basin, the Powder and Burnt Rivers, begin in the Blue Mountains and flow for 144 and 100 miles, respectively, until the confluence with Brownlee Reservoir on the Snake River. Southern and middle drainages in the Brownlee Subbasin also drain to Brownlee Reservoir while ones north of Brownlee dam, including Pine Creek, drain into Oxbow or Hells Canyon Reservoirs on the Snake River.

The Powder River headwaters originate in the Blue Mountains (Elkhorn Range) west of Baker City near the town of Sumpter. Cracker Creek and McCully Fork join to form the Powder River. The river flows southwest before entering Phillips Reservoir. Downstream of the reservoir, the river turns north through the Baker Valley and enters Thief Valley Reservoir to the east of the town of North Powder. Downstream of Thief Valley, the river turns southeast and flows the Keating Valley, eventually entering Brownlee Reservoir on the Snake River near the town of Richland. Major tributaries include the North Powder River and Eagle Creek (Figure 1).

The headwaters of the Burnt River include the North, West, Middle, and South Forks of the Burnt River that headwater in the southern Blue Mountains (Figure 1). The forks flow into Unity Reservoir; the mainstem Burnt River begins immediately downstream. The Burnt River flows east/southeast to join the Snake River downstream of the town of Huntington. Major tributaries include Clarks Creek, Lawrence Creek, and Dixie Creek (Figure 1).

The Brownlee Subbasin includes all the streams that drain directly to the Snake River from just north of the Wallowa County-Baker County line south to the town of Ontario. The largest stream in the Brownlee Subbasin is Pine Creek located in the northern portion of the subbasin near the town of Halfway (Figure 1).

The timing and magnitude of stream flows in the Powder River Basin depend on seasonal patterns of temperature and precipitation. Generally, most precipitation occurs from late fall through early spring in the basin as snow (November-April), although thunderstorms with intense, localized rainfall can occur during the summer months. Except for periodic summertime storms, dry and warm conditions persist from late spring through early fall in the basin (May-October). Stream flows typically peak in late spring for rivers in the basin with significant winter snowpacks and decline throughout the summer through late fall. From late spring through early fall, a portion of stream flow and water stored in reservoirs enters the irrigation conveyance system within the basin.

Reservoir operations and irrigation systems in the basin further influence the timing, amount, and duration of flows in the Powder River Basin. According to the Oregon Water Resources Department (OWRD), 69 dams greater than 10 feet in height exist in the Powder River Basin. OWRD documents that most of the water stored in reservoirs enters irrigation conveyance systems. Three districts manage irrigation water in the Powder Subbasin: the Baker Valley Irrigation District, the Lower Powder Irrigation District, and the Powder Valley Water Control District (divided into the Wolf Creek and Pilcher Creek sub-districts). The Burnt River Irrigation District manages irrigation water in the Burnt River Subbasin. Formal irrigation or water control districts do not exist in the Brownlee Subbasin; individuals or informal user groups manage irrigation water there. Available water is fully appropriated in the Powder River Basin. In low water years, all users may not receive adequate water supplies despite managers drawing reservoirs down to minimum levels.

The Powder River Basin contains five reservoirs with storage capacities greater than 5,000 acre-feet. These include one (Unity) in the Burnt Subbasin and four (Thief Valley, Phillips, Pilcher Creek, and Wolf Creek) in the Powder Subbasin. The U.S. Bureau of Reclamation constructed Unity, Thief Valley, and Phillips Reservoirs; all are now operated by local irrigation districts. Pilcher Creek and Wolf Creek Dams are owned and operated by the Powder Valley Water Control District.

2.2.1 Burnt River Irrigation Project

Unity Reservoir is located on the Burnt River about 40 miles southwest of Baker City (Figure 1). Lands served by the irrigation project are scattered along the Burnt River downstream from Unity Reservoir near the towns of Hereford, Bridgeport, Durkee, Weatherby, Dixie, Lime, and Huntington. In addition, some lands upstream from the reservoir are included in the project.

Unity Dam is a zoned earth fill dam 82 feet high and 694 feet long. The maximum reservoir capacity is 25,800 acre-feet with a surface area of 926 acres. Unity Dam was completed in 1937 and the reservoir has since been operated and maintained by the Burnt River Irrigation District.

2.2.2 Baker Irrigation Project

The Upper Division of the Baker Project furnishes irrigation water from Phillips Reservoir to 18,500 acres of land along both sides of the Powder River just north of Baker City. The Lower Division provides a supplemental water supply from Thief Valley Reservoir to about 7,300 acres of land along the Powder River in the Keating Valley about 10 miles northeast of Baker City.

Mason Dam on the Powder River near Sumpter, Ore., is a zone earth and rockfill embankment dam measuring 173 feet high and 895 feet long. Mason dam creates Phillips Reservoir, which has a maximum capacity of 95,500 acre-feet and a surface area of 2,235 acres. Stored water is released into the Powder River for diversion downstream into existing distribution canals and laterals. Operation and maintenance of Upper Division facilities was transferred to the Baker Valley Irrigation District on August 23, 1968.

Thief Valley Dam is a concrete slab and buttress dam 390 feet long and 73 feet high with a maximum reservoir capacity of 17,600 acre-feet and a surface area of 740 acres. Water stored in Thief Valley Reservoir is released for diversion downstream into existing distribution canals and laterals. The operation of Thief Valley Dam and facilities of the Lower Division were taken over by the Lower Powder River Irrigation District on June 1, 1932.

2.2.3 Powder Valley Water Control District

The Powder Valley Water Control District owns and operates Wolf Creek and Pilcher Creek Reservoirs. These systems provide irrigation water to land located in the North Powder and Baker valleys in the vicinity of the City of North Powder (Figure 1 for general location). Completed in 1974, the reservoir behind Wolf Creek dam is approximately 220 acres in area and stores approximately 12,000 acre-feet. Pilcher Creek Reservoir was completed in 1984 and is approximately 222 acres in area and stores approximately 5,900 acre-feet. Operated as one pool, Wolf Creek Reservoir usually draws down quicker than Pilcher Creek Reservoir, so to balance out the system, water is transferred via a canal between the two sites. Additional water from Pilcher Creek Reservoir is also put instream via the North Powder River for irrigation both to the north and south of the river. Due to the connectivity of the system, the project is often referred to as the Wolf Creek Reservoir Complex.

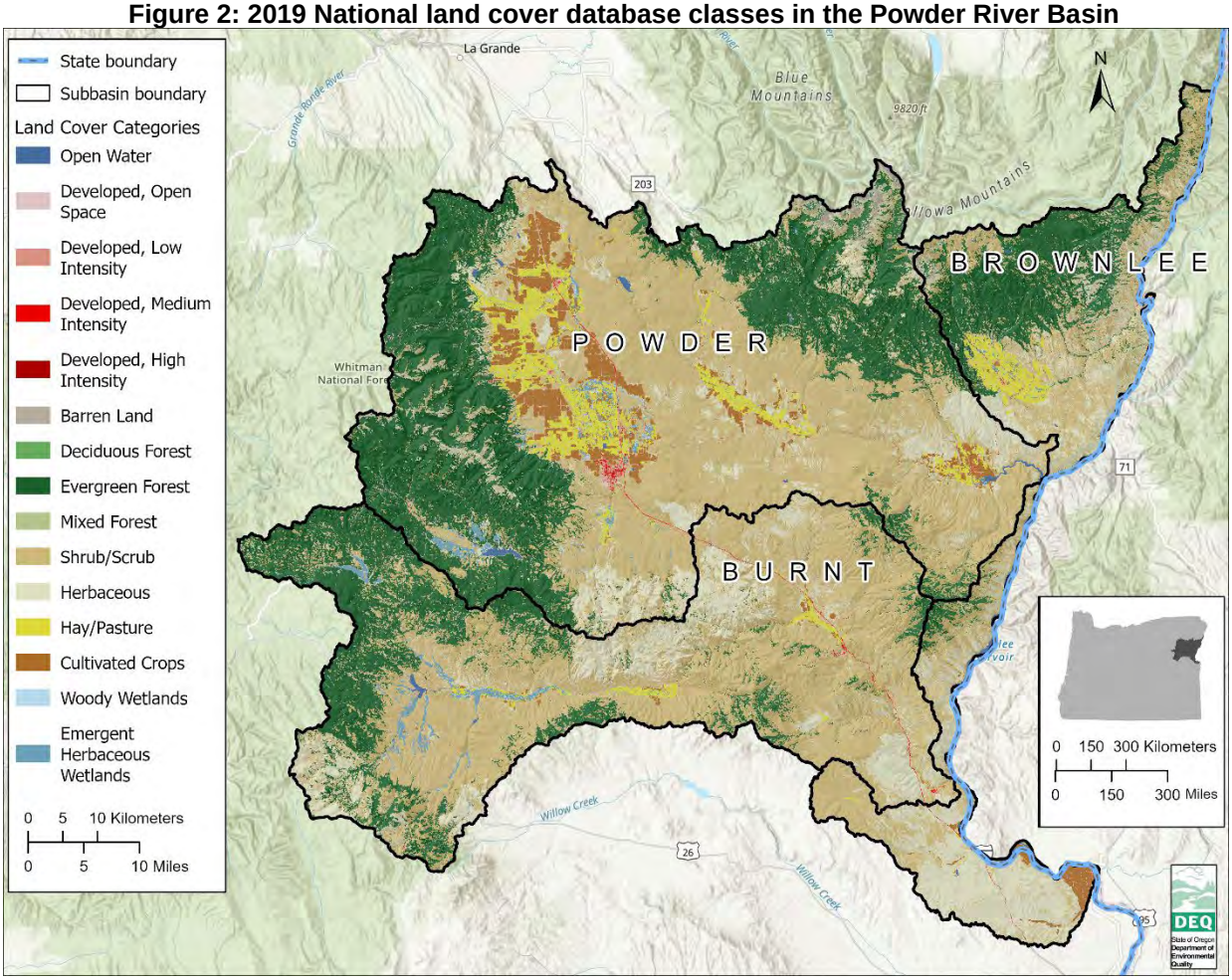
2.3 Land use/land cover

The largest percentage of land use/land cover in Powder River Basin consists of scrub-shrub, followed by forest and grasslands (Table 2). Developed urban areas are minimal, with the largest being Baker City (population approximately 9,700). Land ownership is divided equally between private and federal. Areas of irrigated agriculture are found along the Burnt River, the North Powder River, the Powder River north of Baker City, in the Keating Valley, and near Richland, and along Pine Creek near Halfway (Figure 2). Grassland/shrub areas occur in the valley plains and foothill areas while forested areas are concentrated in the mountains.

Table 2: 2019 Land cover classes and percentages in the Powder River Basin (Dewitz, J., and U.S. Geological Survey, 2021)

NLCD Land Cover Class	Acres	Percent of the basin
Shrub/Scrub	1016650	46.1
Evergreen Forest	593939	26.9
Herbaceous	366166	16.6
Hay/Pasture	78513	3.6
Cultivated Crops	65532	3.0
Developed, Open Space	24548	1.1
Emergent Herbaceous Wetlands	20737	0.9
Open Water	13869	0.6
Barren Land	7770	0.4
Developed, Low Intensity	6675	0.3
Woody Wetlands	5871	0.3
Developed, Medium Intensity	3527	0.2
Developed, High Intensity	215	<0.1
Deciduous Forest	103	<0.1
Mixed Forest	45	<0.1
Total:	2204160	100.0

Figure 2: 2019 National land cover database classes in the Powder River Basin



3. Pollutant identification

As stated in OAR 340-042-0040(4)(b), this element identifies the pollutants causing impairment of water quality that are addressed by this TMDL. The associated water quality standards and beneficial uses are identified in Chapter 4.

Table 3 and Figure 3 present stream and watershed assessment units in the Powder River Basin that were listed as impaired for *E. coli* and fecal coliform on DEQ's 2022 Clean Water Act Section 303(d) List (as part of DEQ's Integrated Report), which was approved by EPA on September 1, 2022 (DEQ 2022a). One assessment unit within the Powder River Basin is listed as impaired for fecal coliform (Table 3). This assessment unit was added to the 303(d) list in 1998 and is based on a previously applicable criterion. Additional information about the fecal coliform listing is included in Section 3 of the TMDL Technical Support Document. Sections 305(b) and 303(d) of the Clean Water Act assigns status categories. Section 3 of the TMDL Technical Support Document summarizes the assigned categories in the Powder River Basin. Assessment units listed as Category 5 (data indicate a designated use is not supported or a water quality standard is not attained) require a TMDL.

DEQ's evaluations include data and information collected within the basin from 1990 to 2024 and includes consideration of past EPA-approved Integrated Reports, specifically the 2012 and 2018-20 impairment listings and categories. Comparisons between these and the 2022 impairments indicate some differences. Tabulated comparisons and explanations are provided in the TMDL Technical Support Document (DEQ 2024a). DEQ developed this TMDL to be implemented to achieve attainment of the applicable water quality criteria to support the designated beneficial uses, as specified in Section 4 of this document.

DEQ developed the Powder River Basin Bacteria TMDL to address Category 5 listed assessment units and to serve as a protection plan for all other assessment categories in the basin, including unimpaired and unassessed. The allocations and implementation framework apply year-round to all freshwater perennial and intermittent streams in the basin (Sections 5, 8, and 9). The implementation framework presented in the WQMP (DEQ 2024b) describes potential implementation activities, timeframes to achieve water quality targets, and measures of success (Section 12).

Table 3 describes the relevant *E. coli* 303(d) listings and the assessment units where the proposed TMDL applies. Figure 3 displays the locations of assessment units listed as Category 5 in the 2022 EPA-approved Integrated Report (DEQ 2022a). Section 3 of the Technical Support Document provides information on these listings (DEQ 2024a).

Table 3: Powder River Basin *E. coli* and fecal coliform assessment units and status on Oregon's 2022 Integrated Report

Assessment Unit	Assessment Unit Name	Assessment Unit Type	Pollutant	Listing Category
Brownlee Subbasin				
OR_LK_1705020102_05_100576	Love Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020102_05_100577	---	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020103_05_100578	Brownlee Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020106_05_100579	Clear Creek Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020106_05_100580	Fish Lake	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020106_05_100581	Crow Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020107_05_100582	Hells Canyon Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020107_05_100583	Oxbow Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_SR_1705020101_02_103229	Snake River	River and stream	*E. coli*	Unassessed
OR_SR_1705020102_05_102789	Birch Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020106_05_102790	Pine Creek	River and stream	*E. coli*	2
OR_SR_1705020106_05_102791	Lake Fork Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020106_05_102792	North Pine Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020106_05_102793	Pine Creek	River and stream	*E. coli*	2
OR_SR_1705020106_05_102794	Dry Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020106_05_102795	Pine Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020106_05_102796	North Pine Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020107_05_102797	McGraw Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020107_05_102798	Spring Creek	River and stream	*E. coli*	Unassessed
OR_WS_170502010101_05_103097	HUC12 Name: Moores Hollow	Watershed Unit (1st through 4th order streams)	*E. coli*	4A[1]
OR_WS_170502010106_05_103227	HUC12 Name: Bridge Gulch-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010201_05_103226	HUC12 Name: Road Gulch-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010202_05_103098	HUC12 Name: Upper Birch Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010203_05_103099	HUC12 Name: Love Reservoir	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010204_05_103100	HUC12 Name: Lower Birch Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010205_05_103101	HUC12 Name: Benson Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010206_05_103225	HUC12 Name: Grouse Creek-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed

Assessment Unit	Assessment Unit Name	Assessment Unit Type	Pollutant	Listing Category
OR_WS_170502010301_05_103224	HUC12 Name: Ryan Gulch-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010303_05_103223	HUC12 Name: Morgan Creek-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010304_05_103222	HUC12 Name: Dennett Creek-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010306_05_103221	HUC12 Name: Raft Creek-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010307_05_103220	HUC12 Name: Jackson Gulch-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010401_05_103219	HUC12 Name: Cottonwood Creek-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010403_05_103218	HUC12 Name: Dukes Creek-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010601_05_103102	HUC12 Name: Headwaters Pine Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010602_05_103103	HUC12 Name: McMullen Slough	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010603_05_103104	HUC12 Name: Clear Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010604_05_103105	HUC12 Name: Deer Creek-Pine Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010605_05_103106	HUC12 Name: East Pine Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010606_05_103107	HUC12 Name: Fish Creek-Pine Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010607_05_103108	HUC12 Name: Upper North Pine Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010608_05_103109	HUC12 Name: Lake Fork Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010609_05_103110	HUC12 Name: Lower North Pine Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010610_05_103111	HUC12 Name: Sheep Creek-Pine Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010701_05_103228	HUC12 Name: Oxbow Dam-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010703_05_103217	HUC12 Name: Herman Creek-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010704_05_103216	HUC12 Name: McGraw Creek-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502010705_05_103215	HUC12 Name: Hells Canyon Dam-Snake River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
Powder Subbasin				
OR_LK_1705020301_05_100588	Phillips Lake	Lake/Reservoir	*E. coli*	2
OR_LK_1705020303_05_100589	Smith Lake	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020303_05_100590	---	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020303_05_100591	---	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020304_05_100592	Rock Creek Lake	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020305_05_100593	Pilcher Creek Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020306_05_100594	Wolf Creek Reservoir	Lake/Reservoir	*E. coli*	Unassessed

Assessment Unit	Assessment Unit Name	Assessment Unit Type	Pollutant	Listing Category
OR_LK_1705020306_05_100595	Shaw Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020306_05_100596	Jimmy Creek	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020306_05_100597	Thief Valley Reservoir	Lake/Reservoir	*E. coli*	2
OR_LK_1705020307_05_100598	Fisk Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020308_05_100599	Balm Creek Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020308_05_100600	Love Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020308_05_100601	---	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020310_05_100602	Echo Lake	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020310_05_100603	Lookingglass Lake	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020310_05_100604	Eagle Lake	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020311_05_100605	Brownlee Reservoir	Lake/Reservoir	*E. coli*	2
OR_LK_1705020303_02_107258	Highway 203 Pond	Lake/Reservoir	*E. coli*	Unassessed
OR_SR_1705020301_05_102812	Cracker Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020301_05_102813	McCully Fork	River and stream	*E. coli*	Unassessed
OR_SR_1705020301_05_102814	Powder River	River and stream	*E. coli*	2
OR_SR_1705020302_05_102815	Powder River	River and stream	Fecal coliform	5
OR_SR_1705020302_05_102815	Powder River	River and stream	*E. coli*	2
OR_SR_1705020303_05_102816	Powder River	River and stream	*E. coli*	2
OR_SR_1705020305_05_102817	North Powder River	River and stream	*E. coli*	5
OR_SR_1705020304_05_102818	Powder River	River and stream	*E. coli*	2
OR_SR_1705020306_05_102819	Powder River	River and stream	*E. coli*	Unassessed
OR_SR_1705020306_05_102820	Antelope Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020306_05_102821	Powder River	River and stream	*E. coli*	3
OR_SR_1705020307_05_102822	Big Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020307_05_102823	Big Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020307_05_102824	Beagle Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020308_02_102825	Clover Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020308_05_102826	Powder River	River and stream	*E. coli*	2
OR_SR_1705020308_05_102827	Clover Creek	River and stream	*E. coli*	Unassessed

Assessment Unit	Assessment Unit Name	Assessment Unit Type	Pollutant	Listing Category
OR_SR_1705020308_05_102828	Goose Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020309_05_102829	Powder River	River and stream	*E. coli*	5
OR_SR_1705020310_05_102830	Eagle Creek	River and stream	*E. coli*	5
OR_SR_1705020311_05_102831	Powder River	River and stream	*E. coli*	Unassessed
OR_WS_170502030101_05_103151	HUC12 Name: Cracker Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030102_05_103152	HUC12 Name: McCully Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030103_05_103153	HUC12 Name: Hawley Gulch-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030104_05_103154	HUC12 Name: Clear Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030105_05_103155	HUC12 Name: Deer Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030106_05_103156	HUC12 Name: Union Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030201_05_103157	HUC12 Name: Lake Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030202_05_103158	HUC12 Name: Stices Gulch-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030203_05_103159	HUC12 Name: Beaver Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030204_05_103160	HUC12 Name: Elk Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030205_05_103161	HUC12 Name: Ebell Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030206_05_103162	HUC12 Name: Sutton Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030207_05_103163	HUC12 Name: Blue Canyon-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030301_05_103164	HUC12 Name: Upper Baldock Slough	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030302_05_103165	HUC12 Name: Lower Baldock Slough	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030303_05_103166	HUC12 Name: Old Settlers Slough	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030304_05_103167	HUC12 Name: Estes Slough-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030401_05_103168	HUC12 Name: Upper Salmon Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030402_05_103169	HUC12 Name: Lower Salmon Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030403_05_103170	HUC12 Name: Willow Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030404_05_103171	HUC12 Name: Rock Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030405_05_103172	HUC12 Name: Big Muddy Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030406_05_103173	HUC12 Name: Sand Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030407_05_103174	HUC12 Name: Warm Springs Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030408_05_103175	HUC12 Name: Gentry Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed

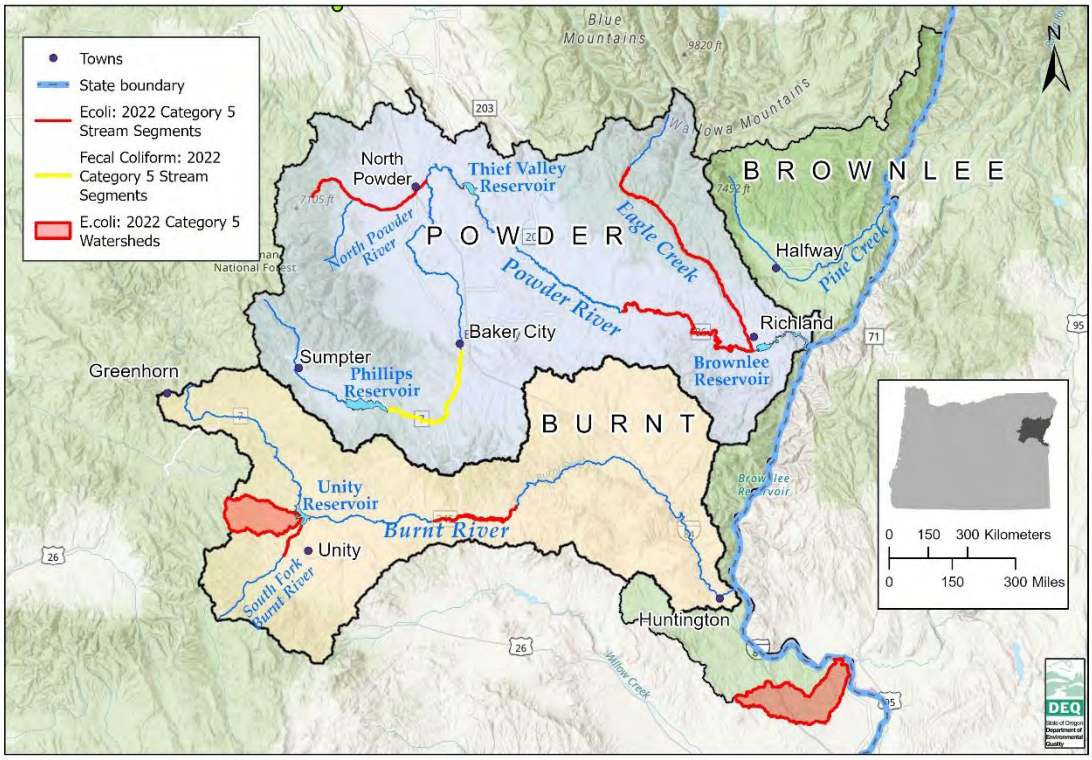
Assessment Unit	Assessment Unit Name	Assessment Unit Type	Pollutant	Listing Category
OR_WS_170502030501_05_103176	HUC12 Name: Upper North Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030502_05_103177	HUC12 Name: Middle North Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030503_05_103178	HUC12 Name: Upper Anthony Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030504_05_103179	HUC12 Name: Lower Anthony Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030505_05_103180	HUC12 Name: Lower North Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030601_05_103181	HUC12 Name: Upper Wolf Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030602_05_103182	HUC12 Name: Lower Wolf Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030603_05_103183	HUC12 Name: Jimmy Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030604_05_103184	HUC12 Name: Antelope Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030605_05_103185	HUC12 Name: Thief Valley Reservoir-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030606_05_103186	HUC12 Name: Magpie Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030701_05_103187	HUC12 Name: Upper Big Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030702_05_103188	HUC12 Name: Middle Big Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030703_05_103189	HUC12 Name: Beagle Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030704_05_103190	HUC12 Name: Lower Big Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030801_05_103191	HUC12 Name: Salt Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030802_05_103192	HUC12 Name: Crews Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030803_05_103193	HUC12 Name: Tucker Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030804_05_103194	HUC12 Name: Ruckles Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030805_05_103195	HUC12 Name: Balm Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030806_05_103196	HUC12 Name: Clover Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030807_05_103197	HUC12 Name: Goose Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030808_05_103198	HUC12 Name: Ritter Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030901_05_103199	HUC12 Name: Love Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030902_05_103200	HUC12 Name: Fivemile Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030903_05_103201	HUC12 Name: Maiden Gulch-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030904_05_103202	HUC12 Name: Hyall Gulch-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502030905_05_103203	HUC12 Name: Chalk Creek-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502031001_05_103204	HUC12 Name: Headwaters Eagle Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed

Assessment Unit	Assessment Unit Name	Assessment Unit Type	Pollutant	Listing Category
OR_WS_170502031002_05_103205	HUC12 Name: West Eagle Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502031003_05_103206	HUC12 Name: Bennett Creek-Eagle Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502031004_05_103207	HUC12 Name: East Fork Eagle Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502031005_05_103208	HUC12 Name: Paddy Creek-Eagle Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502031006_05_103209	HUC12 Name: Little Eagle Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502031007_05_103210	HUC12 Name: Lower Eagle Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502031101_05_103211	HUC12 Name: Daly Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502031102_05_103212	HUC12 Name: Immigrant Gulch-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502031103_05_103213	HUC12 Name: Foster Gulch-Powder River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
Burnt Subbasin				
OR_LK_1705020201_05_100584	Unity Reservoir	Lake/Reservoir	*E. coli*	2
OR_LK_1705020202_05_100585	Whited Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020202_05_100586	Elms Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_LK_1705020203_05_100587	Higgins Reservoir	Lake/Reservoir	*E. coli*	Unassessed
OR_SR_1705020201_05_102799	tributary to Trout Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020201_05_102800	North Fork Burnt River	River and stream	*E. coli*	Unassessed
OR_SR_1705020201_05_102801	Trout Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020201_05_102802	North Fork Burnt River	River and stream	*E. coli*	Unassessed
OR_SR_1705020202_05_103265	South Fork Burnt River	River and stream	*E. coli*	5
OR_SR_1705020202_05_103266	South Fork Burnt River	River and stream	*E. coli*	Unassessed
OR_SR_1705020203_05_103267	Camp Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020203_05_103268	Camp Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020204_05_102803	Burnt River	River and stream	*E. coli*	2
OR_SR_1705020204_05_102804	Big Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020205_05_102805	Burnt River	River and stream	*E. coli*	5
OR_SR_1705020205_05_102806	Clarks Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020205_05_102807	Auburn Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020207_05_102808	Durkee Creek	River and stream	*E. coli*	Unassessed
OR_SR_1705020206_05_102809	Burnt River	River and stream	*E. coli*	Unassessed

Assessment Unit	Assessment Unit Name	Assessment Unit Type	Pollutant	Listing Category
OR_SR_1705020208_05_102810	Burnt River	River and stream	*E. coli*	2
OR_SR_1705020208_05_102811	Dixie Creek	River and stream	*E. coli*	2
OR_WS_170502020101_05_103112	HUC12 Name: Headwaters North Fork Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020102_05_103113	HUC12 Name: Camp Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020103_05_103114	HUC12 Name: Patrick Creek-North Fork Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020104_05_103115	HUC12 Name: Trout Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020105_05_103116	HUC12 Name: Petticoat Creek-North Fork Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020106_05_103117	HUC12 Name: West Fork Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	2
OR_WS_170502020107_05_103118	HUC12 Name: Middle Fork Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	5
OR_WS_170502020108_05_103119	HUC12 Name: Antelope Creek-North Fork Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020201_05_103120	HUC12 Name: Upper South Fork Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020202_05_103121	HUC12 Name: Middle South Fork Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020203_05_103262	HUC12 Name: Lower South Fork Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020204_05_103122	HUC12 Name: Job Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020301_05_103123	HUC12 Name: West Camp Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020302_05_103124	HUC12 Name: East Camp Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020303_05_103125	HUC12 Name: Higgins Reservoir-Camp Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020401_05_103126	HUC12 Name: Pine Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020402_05_103127	HUC12 Name: Rock Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020403_05_103128	HUC12 Name: Upper Big Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020404_05_103129	HUC12 Name: Lower Big Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020405_05_103130	HUC12 Name: Independence Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020501_05_103131	HUC12 Name: Mill Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020502_05_103132	HUC12 Name: Clarks Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020503_05_103133	HUC12 Name: Auburn Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020601_05_103134	HUC12 Name: Dark Canyon-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020602_05_103135	HUC12 Name: Cave Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020603_05_103136	HUC12 Name: Powell Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020701_05_103137	HUC12 Name: Lawrence Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed

Assessment Unit	Assessment Unit Name	Assessment Unit Type	Pollutant	Listing Category
OR_WS_170502020702_05_103138	HUC12 Name: Upper Alder Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020703_05_103139	HUC12 Name: Lower Alder Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020704_05_103140	HUC12 Name: Durkee Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020705_05_103141	HUC12 Name: Pritchard Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020801_05_103142	HUC12 Name: Manning Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020802_05_103143	HUC12 Name: Swayze Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020803_05_103144	HUC12 Name: Shirttail Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020804_05_103145	HUC12 Name: Sisley Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020805_05_103146	HUC12 Name: North Fork Dixie Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020806_05_103147	HUC12 Name: South Fork Dixie Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020807_05_103148	HUC12 Name: Dixie Creek	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020808_05_103149	HUC12 Name: Jett Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
OR_WS_170502020809_05_103150	HUC12 Name: Durbin Creek-Burnt River	Watershed Unit (1st through 4th order streams)	*E. coli*	Unassessed
Note: [1]Listed as Category 4A under the Malheur Basin TMDL. It will be reassigned to the Powder River Basin Bacteria TMDL.				

Figure 3: Powder River Basin *E. coli* and fecal coliform Category 5 assessment units (2022)



4. Water quality standards and beneficial uses

As stated in OAR 340-042-0040(4)(c), this element identifies the beneficial uses in the basin, specifying the most sensitive beneficial use, and the relevant water quality standards established in OAR 340-041-0202 through 340-041-0975. Achieving water quality standards for a pollutant that protects the beneficial use in the basin most sensitive to impairment by that pollutant ensures that all beneficial uses are also protected. Table 4 describes beneficial uses in the Powder River Basin.

Fecal contamination can affect multiple beneficial uses, including water contact recreation and fish and aquatic life (Table 5). In the Powder River Basin, water contact recreation is designated the most sensitive beneficial use affected by fecal contamination. Exposure to waters contaminated by fecal material during swimming, boating, fishing, other water sports, or recreating on beaches/river banks increases the risk of contracting mild to severe illnesses. *E. coli* is an indicator of fecal contamination from human or other warm-blooded animals in Oregon's freshwaters.

Water with high levels of fecal contamination can also pose a disease risk to livestock and wildlife. Infections such as Johne's disease result from ingestion of fecal material from sick animals. This potentially fatal disease decreases weight gain in cattle and causes wasting symptoms in deer. Fecal contamination of water used for irrigation water increases the risk of

pathogen contamination of food crops. Although the TMDL addresses water quality standards designed to protect water recreational contact, beneficial uses of irrigation and livestock watering will also be protected through implementation.

Tables 4 and Table 5 identify designated beneficial uses of surface waters in the Powder River Basin specified in OAR 340-041-0260. Table 260A, applicable numeric and narrative water quality standards addressed by the TMDL, and the most sensitive beneficial use related to each standard. Elevated *E. coli* concentrations in surface waters indicate impairments of water contact recreation (the most sensitive beneficial use) in the basin (Section 3 and Section 4 of the Technical Support Document). The TMDL sets acceptable levels of *E. coli* in surface waters that allow water contact recreation use to be supported. Therefore, the TMDL protects all beneficial uses in the basin related to fecal contamination.

Table 4: Powder River Basin designated beneficial uses (from OAR 340-041-0260 Table 260A)

All Basin Waters
Public Domestic Water Supply
Private Domestic Water Supply
Industrial Water Supply
Irrigation
Livestock Watering
Fish and Aquatic Life
Wildlife and Hunting
Fishing
Boating
Water Contact Recreation
Aesthetic Quality

Table 5: Applicable water quality standards and most sensitive beneficial uses

Parameter	Citation	Summary of applicable standards	Applicable water	Most sensitive beneficial use
Bacteria	OAR 340-041-009(1)(a)	(A) 90-day geometric mean (of 5 or more samples) of 126 *E. coli* organisms per 100 mL (B) No single sample may exceed 406 *E. coli* organisms per 100 mL	Fresh water	Water contact recreation
Statewide Narrative Criteria	OAR 340-041-0007(1)	The highest and best practicable treatment and/or control of wastes, activities, and flows must in every case be provided to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor and other deleterious factors at the lowest possible levels.	All waters of the state	Fish and aquatic life

From 2000-2024, exceedances of the water contact recreation criteria for *E.coli*, including both geometric mean (126 *E. coli* organisms/100 mL) and single sample criterion (406 *E. coli*

organisms/100 mL) have both been observed (see the Technical Support Document). DEQ used both criteria to identify and set the percent reduction needed to achieve water quality standards across all flow conditions (Section 4.5 of the Technical Support Document).

The Powder River, Burnt River, and streams in the Brownlee Subbasin drain to reservoirs on the Snake River, forming the border between Oregon and Idaho. Therefore, DEQ considered downstream water quality standards, identified impairments, and effects of implementing the TMDL. The mainstem Snake River does not currently have Category 5 listing for *E. coli* downstream of the Powder River Basin in Oregon or Idaho. Oregon and Idaho share similar criteria for *E. coli* criteria (IDEQ 2023). Thus, implementation of the TMDL in Powder, Burnt, and Brownlee subbasins will result in attainment of both state's *E. coli* water quality criteria at the points of discharge into reservoirs on the Snake River.

5. Seasonal variation and critical conditions for *E. coli*

Per OAR 340-042-0040(4)(j) and 40 Code of Federal Regulation130.7(c)(1), TMDLs must identify seasonal variation and the critical condition or period for each pollutant if applicable.

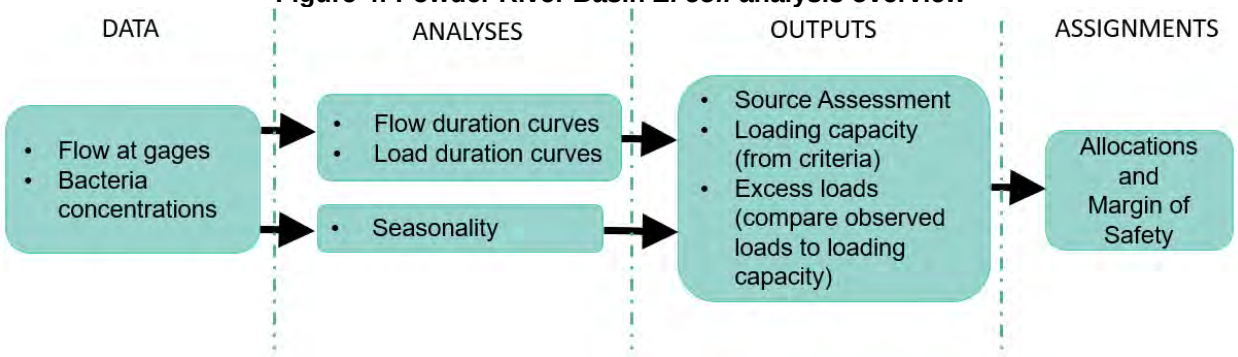
DEQ evaluated *E. coli* concentrations and loads during two periods defined as late spring through early fall (May-October) and late fall through early spring (November-April). These periods are based on differences in climate, hydrology, and water management practices, including irrigation (Section 2). As described in the Technical Support Document, DEQ calculated *E. coli* load duration curves for each of the two periods. The analysis found exceedances of *E. coli* concentration criteria year-round. However, more frequent exceedances occurred from May-October.

DEQ's analyses suggest that critical conditions for *E. coli* loads occur from May-October in the basin. However, due to potential differences in the timing of when deposition of nonpoint source fecal material occurs on land and transport to surface waters occurs, DEQ applied allocations and recommended management year-round.

6. *E. coli* water quality data evaluation overview

DEQ used the load duration curve method recommended by the EPA to determine pollutant loading capacity, assess current conditions, and calculate the pollutant reductions needed to comply with Oregon's *E. coli* water quality criteria (Figure 4; DEQ, 2024a). The method quantifies observed *E. coli* loads and water quality criteria under various flow and seasonal conditions. Comparisons between observations and criteria identify appropriate restoration activities for different areas.

Figure 4: Powder River Basin *E. coli* analysis overview



Flow duration curves describe the probability that a measured flow will be equal to or greater than that flow over the period of record for a specific stream or river gage. DEQ used the categories to define flow duration intervals to define in basin streams and rivers: High Flows (flows equal or greater 0% to 10% of the time), Medium-High Flows (flows equal or greater 10% to 40% of the time), Medium Flows (flows equal or greater 40% to 60% of the time), Medium-Low Flows (flows equal or greater 60% to 90% of the time), and Low Flows (flows equal or greater 90% to 100% of the time) (DEQ 2024a).

Load duration curves were calculated by multiplying paired water quality concentrations and flows across a flow duration curve. DEQ developed load duration curves for specific reaches in the Powder River basin that describe 1) water quality standards for *E. coli* (geometric mean and single sample criteria) and 2) *E. coli* loads calculated from DEQ TMDL project described in the Technical Support document (DEQ 2024a). Comparisons of loads based on water quality standards and observed loads allowed DEQ to calculate the amount of *E. coli* load reduction, expressed as a percent, needed to meet water quality standards (DEQ 2024a). Load duration curves for *E. coli* and calculations of the percent reductions in *E. coli* loads needed provided the basis for calculating contributions of point and nonpoint sources in the basin. Information on *E. coli* analyses is provided in Section 4 of the TMDL Technical Support Document (DEQ 2024a).

7. Pollutant sources or source categories

As noted in OAR 340-042-0040(4)(f) and OAR 340-042-030(12), a source consists of any process, practice, activity, or resulting condition that causes or may cause pollution or the introduction of pollutants to a waterbody. This section identifies pollutant sources and contributions, to the extent existing data allow estimates, of the significance of pollutant loading from existing sources.

Sources of pollutants to streams include point and nonpoint sources. OAR 340-045-0010(17) defines point source as “any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged.” OAR 340-41-0002(42) defines nonpoint sources as “diffuse or

unconfined sources of pollution where wastes can either enter, or be conveyed by the movement of water, into waters of the state."

By definition (OAR 340-042-0030(1)), background sources include all sources of pollution or pollutants not originating from human activities. Background sources may also include anthropogenic sources of a pollutant that the DEQ or another Oregon state agency does not have authority to regulate, such as pollutants emanating from another state, tribal lands, or sources otherwise beyond the jurisdiction of the state.

There are several potential human or human-influenced sources of fecal contamination to surface waters of the Powder River Basin. Each source varies in magnitude based on type, extent, proximity to surface waters, and mechanism of transport to surface waters. Based on permit limits set for point sources, DEQ concluded that nonpoint sources contribute the majority of *E. coli* observed in surface waters. Further information on source assessment is available in Section 5 of the TMDL Technical Support Document (DEQ 2024a).

7.1 *E. coli* nonpoint and background sources

The combined category of nonpoint and background sources of *E. coli* in the Powder River Basin includes wildlife, leaching from failing residential or business septic systems, stormwater runoff from roads not managed by the Oregon Department of Transportation, and runoff (including stormwater and irrigation water) from agricultural and forest lands with annual or seasonal livestock populations.

DEQ's analyses suggest that runoff from agricultural areas constitute a source of *E. coli* in the Powder River Basin. Concentrations of *E. coli* exceeded both geometric mean and single sample criteria in areas of the Powder and Burnt River subbasins downstream of irrigated pastures and areas occupied annually or seasonally by livestock. Further details can be found in the source assessment provided in Section 5 of the Technical Support Document.

DEQ concluded that transfer of *E. coli* from a variety of land uses to surface waters could be addressed using nonpoint source management strategies. DEQ concluded potential loading of *E. coli* from failing septic systems in rural residential areas could be addressed with DEQ's Onsite Septic Program. Input of *E. coli* from pet waste can be addressed through existing ordinances. Further information is available in Section 5.2.2 of the TMDL Technical Support Document.

DEQ concluded that wildlife, including resident ungulates such as elk and mule deer, beavers, and resident and migratory waterfowl, constitute a source of *E. coli* to surface waters in the basin. Wildlife management practices, such as the Oregon Department of Fish and Wildlife elk feeding station in the Elkhorn Wildlife Area, could be *E. coli* sources as well.
There are 12 registrants under the NPDES and Water Pollution Control Facility (WPCF) Confined Animal Feedlot Operation (CAFO) general permits in the Powder River Basin. CAFO permittees are prohibited from discharging manure, litter, or process wastewater to surface waters and ground waters of the state, except as allowed under conditions of an extreme rainfall event, defined in the permit as greater than the 25-year, 24-hour rainfall. The CAFO extreme weather event definition is similar to, but applied differently, then an "upset" and "overflow" events identified for NPDES permitted wastewater treatment plants.

DEQ administers WPCF Domestic Permits in the Powder River Basin that are issued for land irrigation of wastewater, wastewater lagoons, onsite sewage disposal systems, and

underground injection control systems (i.e., dry wells, sumps, etc.). Discharge to surface water is not allowed under a WPCF permit. Current WPCF domestic permits in the basin are listed in Table 56 of the Technical Support Document.

Permit conditions and TMDL requirements for appropriate management measures of CAFO and domestic WPCF sources of *E. coli* are included in sections 5.2.1.2 and 5.2.3.3 of the Technical Support Document (DEQ 2024a).

Information is available in Section 5.2.4 of the TMDL Technical Support Document. DEQ did not separate background from human and human-influenced sources in the load duration curve analyses. Instead, background sources were grouped with all nonpoint sources of *E. coli* in the analyses.

7.2 *E. coli* point sources

Table 6 lists the Nonpoint Discharge Elimination System (NPDES) permitted point sources with potential to discharge *E. coli* directly to surface waters in the basin. These include three permitted point source domestic wastewater discharges and Oregon Department of Transportation's statewide MS4 permit, which regulates stormwater discharges from highways following collection, treatment, and conveyance. Information is available in Section 5.2.3 of the TMDL Technical Support Document to support DEQ's conclusion that point sources contribute lesser amounts of *E. coli* loads to surface waters than nonpoint sources in the basin.

Table 6: Point sources with *E. coli* contributions in the Powder River Basin

DEQ file number	EPA number	Permittee	Facility type	Permit type	Receiving water	River Mile
40981	OR0020052	City of Huntington	Sewage treatment	DOM-Db	Burnt River	2
61600	OR0022403	City of North Powder	Sewage treatment	DOM-Db	Powder River	82.4
5324	OR0020699	City of Baker City	Sewage treatment	DOM-C1b	Powder River	116.3
101822	ORS110870	Oregon Department of Transportation	Highway stormwater	MS4 - Phase I	various	NA

8. *E. coli* loading capacity and excess load

Summarizing OAR 340-042-0040(4)(d) and 40 CFR 130.2(f), loading capacity is the amount of a pollutant or pollutants that a waterbody can receive and still meet water quality standards. In accordance with OAR 340-042-0040(4)(e), the excess load calculation evaluates, to the extent existing data allow, the difference between the actual pollutant load in a waterbody and the loading capacity of that waterbody.

Table 7 presents a summary of *E. coli* loading capacities and excess loads calculated for monitoring locations and named stream reaches based on the flow category with the highest observed exceedance of the applicable *E. coli* criteria. Excess loads are presented as the percent reduction needed from the current loads (calculated with the most recently available data) to achieve the applicable *E. coli* criteria in each stream reach for the identified flow category. DEQ applied the percent reduction needed for each reach across all flow categories and seasons to ensure that both geometric mean and single sample criteria would be met throughout the year (DEQ 2024a). Loading capacities, based on the geometric mean criterion to ensure the single sample criterion is also met, for each flow category and each of the named stream reaches are present in Tables 10-14.

Estimated loading capacities for individual assessment units within the basin (DEQ 2022a) can be calculated for either criterion using the following equations:

(1) Geometric mean loading capacity (organisms/day) = 126 organisms/100 mL x Flow x CF
(2) Single Sample loading capacity (organisms/day) = 406 organisms/100 mL x Flow x CF

Where CF is the appropriate conversion factor for units of volume and time needed to convert units of flow for calculations of loading capacities in terms of organisms/day.

Section 4.5 of the TMDL Technical Support Document presents the calculated amounts of *E. coli* loading that the Powder River Basin stream reaches can receive and still meet water quality standards.

Table 7: *E. coli* loading capacities and excess loads as highest percent reductions needed

Downstream station	Stream reach	Measured Load (orgs/day)	Loading capacity (orgs/day)	Excess Load (percent reduction)	Flow Category (for highest reduction)	Criterion (for highest reduction)
Brownlee Subbasin						
36382-ORDEQ: Pine Creek at Hwy 71	Brownlee Subbasin streams confluence with Snake River	1.17E+13	1.30E+13	0	All	Both
Powder Subbasin						
34250-ORDEQ: Powder River above Phillips Reservoir Dam	Powder River upstream of Philips Reservoir	1.18E+11	4.58E+11	0	All	Both
11490-ORDEQ: Powder River at Hwy 7 (in Baker City)	Powder River from Phillips Reservoir to Baker City	4.20E+12	7.05E+11	83	Medium	Single sample
36192-ORDEQ: North Powder River at Miller Rd. Bridge	North Powder River from USFS Boundary to Miller Rd	3.26E+12	5.46E+11	83	Medium-High and Medium-Low	Single sample
36191-ORDEQ: North Powder River at Hwy 30 Bridge	North Powder River from Miller Road to Confluence with Powder River	2.48E+11	1.25E+10	95	Low	Geometric mean
36193-ORDEQ: Eagle Creek at Snake River Rd	Eagle Creek from New Bridge to Brownlee Reservoir	2.97E+10	1.08E+10	64	Low	Geometric mean
11857-ORDEQ: Powder River at Snake River Rd. (Richland)	Powder River from Baker City to confluence with Snake River	4.34E+11	1.07E+11	75	Medium-Low	Geometric mean
Burnt Subbasin						
36195-ORDEQ: Burnt River at Unity Reservoir Dam	Burnt River upstream of Unity Reservoir Dam	3.83E+11	2.63E+12	0	All	both
34256-ORDEQ: Burnt River at Clarks Cr. Bridge	Burnt River from Unity Reservoir to Clarks Creek Rd	4.61E+12	7.74E+11	83	Medium-High	Single sample
11494-ORDEQ: Burnt River at Snake River Rd (Huntington)	Burnt River from Clarks Creek Rd to confluence with Snake River	5.12E+12	3.10E+12	40	High	Geometric mean

9. Allocations, reserve capacity, and margin of safety

OAR 340-042-0040(4)(g), (h), (i), and (k) [and 40 CFR 130.2(h) and (g) and 130.7(c)(2)] define the required TMDL elements of apportionment of the allowable pollutant load: point source wasteload allocations (WLAs), nonpoint source load allocations (LAs), margin of safety (MOS), and reserve capacity (RC). Collectively, these elements add up to the maximum pollutant load that allows a waterbody to meet water quality standards. OAR 304-042-0040(5) and (6) describe the potential considerations for determining and distributing allocations of the allowable pollutant loading capacities. Water quality data analysis must be conducted to determine allocations, potentially including statistical analysis and mathematical modeling.

9.1 *E. coli* allocations

Allocations are the amount of *E. coli* allowed in discharges from each source. Table 8 presents *E. coli* allocations as a relative percentage of the maximum *E. coli* load that Powder River Basin streams can receive and still meet the *E. coli* criteria, distributed among the known point and nonpoint sources in the basin and after taking into account a MOS with both implicit and explicit components.

Allocations for individual assessment units (DEQ 2022b) may be calculated using the following equations:

(3) Geometric mean allocation (organisms/day) = 126 organisms/100 mL x Flow x CF x 0.9
(4) Single sample allocation (organisms/day) = 406 organisms/100 mL x Flow x CF x 0.9

Where CF is the appropriate conversion factor for units of volume and time needed to convert units of flow for calculations of allocations in terms of organisms/day and the multiplier of 0.9 reflects the 10% explicit MOS and 0% RC. The scheme for distributing the calculated allocation among LAs and WLAs is presented in Table 9.

Future *E. coli* water quality impairments detected in assessment units identified in Table 3 will receive allocations consistent with the calculations determined from equations 3 and 4 and the scheme in Table 9.

Tables 10-14 present the daily loads allowable from sources to each named stream reach relative to the daily flow ranges measured for each flow category. Background sources were separated from other human or human-influence nonpoint sources. However, in keeping with the definition of background sources in OAR 340-042-0030(1), actions to implement the LAs will be focused on sources arising from human activities.

E. coli LAs in Tables 10-14 correspond to the loading capacities based on a maximum *E. coli* concentration of 126 organisms/100 mL and apply to all streams tributary to each stream reach

described in association with each downstream monitoring station. Using the geometric mean criterion ensures that single sample loading capacity will also be met.

E. coli wasteload allocations apply at the point of discharge. The three industrial wastewater permits and the NPDES 1200Z industrial stormwater general permit registrants are not sources of *E. coli* and are not assigned numeric WLAs (Sections 5.2.3 and 6.1 of the Technical Support Document). Instead, the permittees and 1200Z registrants must meet permit conditions to show compliance with *E. coli* allocations and requirements of the TMDL.

Wastewater treatment plants are allocated permitted effluent limits at the *E. coli* standard (Table 5) and maximum permitted discharge (1 MGD for North Powder and Huntington and 2 MGD for Baker City), to ensure that recreation-based criteria are attained. Individual NPDES permits issued to the cities of Huntington, Baker City and North Powder for treatment of domestic wastewater do not require further modification at renewal as they currently implement the *E. coli* criteria as permit limits. Registrants of general wastewater permits (NPDES and WPCF CAFO) must meet permit conditions to show compliance with *E. coli* allocations and requirements of the TMDL.

Table 8: *E. coli* allocations by sources and areas as a relative percentage of loading capacity

Stream reach description	Allocations (percent)			RC (percent)	MOS (percent)	Total (percent)
	Nonpoint source and background LA	ODOT MS4 WLA	Wastewater treatment WLA			
Brownlee Subbasin						
Confluence of Brownlee Subbasin streams with Snake River	89.0	1.0	0.0	0.0	10.0	100.0
Powder Subbasin						
Powder River upstream of Philips Reservoir	89.0	1.0	0.0	0.0	10.0	100.0
Powder River from Phillips Reservoir to Baker City	89.0	1.0	0.0	0.0	10.0	100.0
North Powder River from USFS Boundary to Miller Rd	89.0	1.0	0.0	0.0	10.0	100.0
North Powder River from Miller Rd to Confluence with Powder River	89.0	1.0	0.0	0.0	10.0	100.0
Eagle Creek from New Bridge to Brownlee Reservoir	89.0	1.0	0.0	0.0	10.0	100.0
Powder River from Baker City to confluence with Snake River	42.9-88.7	1.0	0.3-46.1	0.0	10.0	100.0
Burnt Subbasin						
Burnt River from Unity Reservoir to Clarks Creek Rd	89.0	1.0	0.0	0.0	10.0	100.0
Burnt River upstream of Unity Reservoir Dam	89.0	1.0	0.0	0.0	10.0	100.0
Burnt River from Clarks Creek Rd to confluence with Snake River	80.3-88.8	1.0	0.2-8.7	0.0	10.0	100.0

Notes: Ranges of values represent the range of relative allocations from Low to High flow categories. LA = load allocation; WLA = wasteload allocation; RC = reserve capacity; MOS = margin of safety.

Table 9: Distribution of *E. coli* allocations among loads and wasteloads for individual assessment units

State highway MS4 Phase I Permit present	NPDES permit for sewage treatment discharge present	Percent of allocation		
		Nonpoint source and background load	ODOT MS4 wasteload	Wastewater treatment wasteload
No	No	100.0	0.0	0.0
Yes	No	98.9	1.1	0.0
No	Yes	Difference between 100.0% and the percent of permitted wasteload that contributes to allocation[1]	0.0	Percent of permitted wasteload that contributes to the alloctation[1]
Yes	Yes	Difference between 98.9% and the percent of permitted wasteload that contributes to allocation[2]	1.1	Percent of permitted wasteload that contributes to the allocation[2]

Notes: Assessment units are described in Methodology for Oregon's 2022 Water Quality Report and List of Water Quality Limited Waters (DEQ 2022b) and include watersheds, rivers and streams, and lakes/reservoirs.
Percents may be used to determine individual load and wasteload allocations from the calculated allocations in Equations 3 and 4
Presence of a state highway MS4 Phase I or sewage treatment discharge NPDES permit includes those intersecting and upstream of the assessment unit.
[1]Percent of permitted wasteload that contributes to allocation must be ≤ 100.0%
[2]Percent of permitted wasteload that contributes to allocation must be ≤ 98.9%

Table 10: High flow *E. coli* allocations by source and named stream reach

Stream reach description	Mean daily flow ranges (cubic feet/ second)	Loading capacity (organisms/ day)	Excess load (maximum percent reduction needed)	Nonpoint source and background LAs (organisms/ day)	Point source WLAs (organisms/day)		RC (organisms/ day)	MOS (organisms/ day)
					ODOT MS4	Wastewater treatment		
Brownlee Subbasin								
Confluence of Brownlee Subbasin streams with Snake River	1,010.00 to 7,000.00	8.26E+12	0	7.36E+12	8.26E+10	0	0	8.26E+11
Powder Subbasin								
Powder River upstream of Philips Reservoir	191.35 to 906.00	1.53E+12	0	1.36E+12	1.53E+10	0	0	1.53E+11
Powder River from Phillips Reservoir to Baker City	226.0 to 669.00	1.31E+12	83	1.17E+12	1.31E+10	0	0	1.31E+11
North Powder River from USFS Boundary to Miller Rd	83.50 to 904.00	1.23E+12	83	1.10E+12	1.23E+10	0	0	1.23E+11
North Powder River from Miller Rd to Confluence with Powder River	83.50 to 904.00	1.23E+12	95	1.10E+12	1.23E+10	0	0	1.23E+11
Eagle Creek from New Bridge to Brownlee Reservoir	754.40 to 3,000.00	5.32E+12	64	4.73E+12	5.32E+10	0	0	5.32E+11
Powder River from Baker City to confluence with Snake River	592.00 to 3,300.00	4.65E+12	75	4.12E+12	4.65E+10	1.43E+10	0	4.65E+11
Burnt Subbasin								
Burnt River upstream of Unity Reservoir Dam	160.00 to 1,390.00	1.99E+12	0	1.77E+12	1.99E+10	0	0	1.99E+11
Burnt River from Unity Reservoir to Clarks Creek Rd	155.00 to 1,840.00	2.39E+12	83	2.12E+12	2.39E+10	0	0	2.39E+11
Burnt River from Clarks Creek Rd to confluence with Snake River	249.00 to 2,130.0	3.10E+12	40	2.75E+12	2.79E+10	4.77E+09	0	3.10E+11

Note: LA = load allocation; WLA = wasteload allocation; RC = reserve capacity; MOS = margin of safety

Table 11: Medium-High flow *E. coli* allocations by source and named stream reach

Stream reach description	Mean daily flow ranges (cubic feet/ second)	Loading capacity (organisms/ day)	Excess load (maximum percent reduction needed)	Nonpoint source and background LAs (organisms/ day)	Point source WLAs (organisms/day)		RC (organisms /day)	MOS (organisms/ day)
					ODOT MS4	Wastewater treatment		
Brownlee Subbasin								
Confluence of Brownlee Subbasin streams with Snake River	262.00 to 1,009.99	1.81E+12	0	1.61E+12	1.81E+10	0	0	1.81E+11
Powder Subbasin								
Powder River upstream of Philips Reservoir	27.03 to 191.34	2.64E+11	0	2.35E+11	2.64E+09	0	0	2.64E+10
Powder River from Phillips Reservoir to Baker City	80.25 to 225.99	4.66E+11	83	4.15E+11	4.66E+09	0	0	4.66E+10
North Powder River from USFS Boundary to Miller Rd	19.00 to 83.49	1.19E+11	83	1.06E+11	1.19E+09	0	0	1.19E+10
North Powder River from Miller Rd to Confluence with Powder River	19.00 to 83.49	1.19E+11	95	1.06E+11	1.19E+09	0	0	1.19E+10
Eagle Creek from New Bridge to Brownlee Reservoir	157.00 to 754.39	1.18E+12	64	1.05E+12	1.18E+10	0	0	1.18E+11
Powder River from Baker City to confluence with Snake River	110.00 to 591.99	8.83E+11	75	7.72E+11	8.83E+09	1.43E+10	0	8.83E+10
Burnt Subbasin								
Burnt River from Unity Reservoir to Clarks Creek Rd	49.80 to 154.99	2.40E+11	0	2.13E+11	2.40E+09	0	0	2.40E+10
Burnt River upstream of Unity Reservoir Dam	80.00 to 159.99	3.59E+11	83	3.20E+11	3.59E+09	0	0	3.59E+10
Burnt River from Clarks Creek Rd to confluence with Snake River	71.70 to 248.99	3.63E+11	40	3.19E+11	3.27E+09	4.77E+09	0	3.63E+10

Note: LA = load allocation; WLA = wasteload allocation; RC = reserve capacity; MOS = margin of safety

Table 12: Medium flow *E. coli* allocations by source and named stream reach

Stream reach description	Mean daily flow ranges (cubic feet/ second)	Loading capacity (organisms /day)	Excess load (maximum percent reduction needed)	Nonpoint source and background LAs (organisms/ day)	Point source WLAs (organisms/day)		RC (organisms /day)	MOS (organisms/ day)
					ODOT MS4	Wastewater treatment		
Brownlee Subbasin								
Confluence of Brownlee Subbasin streams with Snake River	100.00 to 261.99	5.41E+11	0	4.82E+11	5.41E+09	0	0	5.41E+10
Powder Subbasin								
Powder River upstream of Philips Reservoir	12.00 to 27.02	5.86E+10	0	5.22E+10	5.86E+08	0	0	5.86E+09
Powder River from Phillips Reservoir to Baker City	30.00 to 80.24	4.66E+11	83	4.15E+11	4.66E+09	0	0	4.66E+10
North Powder River from USFS Boundary to Miller Rd	14.00 to 18.99	5.22E+10	83	4.64E+10	5.22E+08	0	0	5.22E+09
North Powder River from Miller Rd to Confluence with Powder River	14.00 to 18.99	5.22E+10	95	4.64E+10	5.22E+08	0	0	5.22E+09
Eagle Creek from New Bridge to Brownlee Reservoir	88.30 to 156.99	3.84E+11	64	3.42E+11	3.84E+09	0	0	3.84E+10
Powder River from Baker City to confluence with Snake River	48.00 to 109.99	2.31E+11	75	1.91E+11	2.31E+09	1.43E+10	0	2.31E+10
Burnt Subbasin								
Burnt River from Unity Reservoir to Clarks Creek Rd	34.10 to 49.79	1.33E+11	0	1.19E+11	1.33E+09	0	0	1.33E+10
Burnt River upstream of Unity Reservoir Dam	13.00 to 79.99	1.28E+11	83	1.14E+11	1.28E+09	0	0	1.28E+10
Burnt River from Clarks Creek Rd to confluence with Snake River	52.50 to 71.69	1.98E+11	40	1.71E+11	1.78E+09	4.77E+09	0	1.98E+10

Note: LA = load allocation; WLA = wasteload allocation; RC = reserve capacity; MOS = margin of safety

Table 13: Medium-Low flow *E. coli* allocations by source and named stream reach

Stream reach description	Mean daily flow ranges (cubic feet/ second)	Loading capacity (organisms /day)	Excess load (maximum percent reduction needed)	Nonpoint source and background LAs (organisms/ day)	Point source WLAs (organisms/day)		RC (organisms /day)	MOS (organisms/ day)
					ODOT MS4	Wastewater treatment		
Brownlee Subbasin								
Confluence of Brownlee Subbasin streams with Snake River	33.00 to 99.99	2.06E+11	0	1.83E+11	2.06E+09	0	0	2.06E+10
Powder Subbasin								
Powder River upstream of Philips Reservoir	1.70 to 11.99	1.98E+10	0	1.76E+10	1.98E+08	0	0	1.98E+09
Powder River from Phillips Reservoir to Baker City	12.81 to 29.99	1.64E+11	83	1.46E+11	1.64E+09	0	0	1.64E+10
North Powder River from USFS Boundary to Miller Rd	5.40 to 13.99	3.00E+10	83	2.67E+10	3.00E+08	0	0	3.00E+09
North Powder River from Miller Rd to Confluence with Powder River	5.40 to 13.99	3.00E+10	95	2.67E+10	3.00E+08	0	0	3.00E+09
Eagle Creek from New Bridge to Brownlee Reservoir	5.59 to 88.29	1.24E+11	64	1.10E+11	1.24E+09	0	0	1.24E+10
Powder River from Baker City to confluence with Snake River	18.80 to 47.99	1.07E+11	75	8.07E+10	1.07E+09	1.43E+10	0	1.07E+10
Burnt Subbasin								
Burnt River from Unity Reservoir to Clarks Creek Rd	17.80 to 34.09	8.25E+10	0	7.34E+10	8.25E+08	0	0	8.25E+09
Burnt River upstream of Unity Reservoir Dam	4.10 to 12.99	2.54E+10	83	2.26E+10	2.54E+08	0	0	2.54E+09
Burnt River from Clarks Creek Rd to confluence with Snake River	28.00 to 52.49	1.29E+11	40	1.10E+11	1.16E+09	4.77E+09	0	1.29E+10

Note: LA = load allocation; WLA = wasteload allocation; RC = reserve capacity; MOS = margin of safety

Table 14: Low flow *E. coli* allocations by source and named stream reach

Stream reach description	Mean daily flow ranges (cubic feet/ second)	Loading capacity (organisms /day)	Excess load (maximum percent reduction needed)	Nonpoint source and backgroun d LAs (organisms /day)	Point source WLAs (organisms/day)		RC (organisms/ day)	MOS (organisms/ day)
					ODOT MS4	Wastewater treatment		
Brownlee Subbasin								
Confluence of Brownlee Subbasin streams with Snake River	0.01 to 32.99	8.02E+10	0	7.13E+10	8.02E+08	0	0	8.02E+09
Powder Subbasin								
Powder River upstream of Philips Reservoir	0.03 to 1.69	2.38E+09	0	2.12E+09	2.38E+07	0	0	2.38E+08
Powder River from Phillips Reservoir to Baker City	3.20 to 12.80	3.02E+10	83	2.68E+10	3.02E+08	0	0	3.02E+09
North Powder River from USFS Boundary to Miller Rd	0.01 to 5.39	1.25E+10	83	1.12E+10	1.25E+08	0	0	1.25E+09
North Powder River from Miller Rd to Confluence with Powder River	0.01 to 5.39	1.25E+10	95	1.12E+10	1.25E+08	0	0	1.25E+09
Eagle Creek from New Bridge to Brownlee Reservoir	0.00 to 5.59	1.08E+10	64	9.62E+09	1.08E+08	0	0	1.08E+09
Powder River from Baker City to confluence with Snake River	0.00 to 18.79	3.11E+10	75	1.33E+10	3.11E+08	1.43E+10	0	3.11E+09
Burnt Subbasin								
Burnt River from Unity Reservoir to Clarks Creek Rd	5.90 to 17.79	4.30E+10	0	3.83E+10	4.30E+08	0	0	4.30E+09
Burnt River upstream of Unity Reservoir Dam	0.00 to 4.09	4.98E+09	83	4.43E+09	4.98E+07	0	0	4.98E+08
Burnt River from Clarks Creek Rd to confluence with Snake River	0.00 to 27.99	5.51E+10	40	4.43E+10	4.96E+08	4.77E+09	0	5.51E+09

Note: LA = load allocation; WLA = wasteload allocation; RC = reserve capacity; MOS = margin of safety

9.2 Reserve capacity

DEQ did not specify a RC of *E. coli* to account for future growth and new or expanded sources. DEQ reserved zero percent of the *E. coli* loading capacity. Future permitted sources may discharge effluent containing *E. coli* at concentrations in compliance with water quality standard criteria (Table 5), which aligns with the requirements in the TMDL for permitted sources.

9.3 Margin of safety

As required by OAR 340-042-0040(4)(i), this element explains how a MOS was derived and incorporated into the TMDL to account for uncertainty in available data or in the actual effect controls will have on loading reductions and receiving water quality. For *E. coli* in the Powder River Basin, DEQ used both explicit and implicit margins of safety. The TMDL calculation included an explicit MOS of 10% (Tables 8-13). A description of the MOS calculations appears in Section 6.4 of the Powder River Basin TMDL Technical Support Document.

In addition, the following conservative assumptions provided an additional implicit MOS. DEQ used scenarios for each part of the analysis to ensure that calculated loads would be the maximum potential loads from sources. Die-off of *E. coli* during transport from land based sources to surface waters and establishment of naturally-reproducing *E. coli* populations in surface waters from a fecal source were not modeled. DEQ assumed that all measured *E. coli* concentrations originated from point or nonpoint sources because optimal growth conditions for *E. coli* exist in animal intestines. Thus, elevated *E. coli* concentrations in surface water suggest a direct input or land based source of fecal contamination (IDEQ 2020). In calculating WLAs for wastewater treatment facilities, DEQ used permitted discharge limits for *E. coli* without considering the *E. coli* reduction from chlorination or other treatments used to remove pathogens from effluent. To account for the potential disconnect between the land surface deposition and transport through runoff into surface waters, DEQ applied the maximum percent reduction needed to meet either geometric mean or single sample criteria for in an individual flow category-season combination across all flow categories and both seasons. This approach ensures that source reduction will be accomplished during flows other than those with the maximum observed concentration.

10. Water quality management plan

As described in OAR 340-042-0040(4)(l)(A)-(O), an associated WQMP is an required element of a TMDL and must include the following components: (A) Condition assessment and problem description; (B) Goals and objectives; (C) Proposed management strategies design to meet the TMDL allocations; (D) Timeline for implementing management strategies; (E) Explanation of how TMDL implementation will attain water quality standards; (F) Timeline for attaining water quality standards; (G) Identification of persons, including Designated Management Agencies, responsible for TMDL implementation; (H) Identification of existing implementation plans; (I) Schedule for submittal of implementation plans and revision triggers; (J) Description of reasonable assurance of TMDL implementation; (K) Plan to monitor and evaluate progress

toward achieving TMDL allocations and water quality standards; (L) Plan for public involvement in TMDL implementation; (M) Description of planned efforts to maintain management strategies over time; (N) General discussion of costs and funding for TMDL implementation; and, (O) citation of legal authorities relating to TMDL implementation.

DEQ sought and considered input from various persons, including DMAs responsible for TMDL implementation and other interested public, and prepared the Powder River Basin WQMP as a stand-alone document. DEQ intends to propose the draft WQMP as an element of the Powder River Basin TMDL for adoption as rule by the Oregon Environmental Quality Commission [OAR 340-042-0090(2)(b)].

11. Reasonable assurance

OAR 340-042-0030(9) defines Reasonable Assurance as "a demonstration that a TMDL will be implemented by federal, state or local governments or individuals through regulatory or voluntary actions including management strategies or other controls." EPA's TMDL guidance describes that when a TMDL is developed for waters impaired by both point and nonpoint sources and WLAs assume that NPS load reductions will occur, the TMDL must provide "reasonable assurances" that NPS control measures will achieve expected load reductions (USEPA 1991). Comprehensive explanations of reasonable assurances of implementation are provide in Section 7 of the Powder River Basin TMDL Water Quality Management Plan.

12. Protection plan

The scope of the *E. coli* TMDL includes all perennial and intermittent streams in the Powder River Basin. As such, this TMDL also serves as a "protection plan" to prevent impairment in waters currently attaining the applicable water quality standards, whether those waters are assessed or not, and waters that have not been assessed yet. The protection of these unimpaired waters has basin-wide benefits such as:

- Clarity and consistency for implementation of management strategies throughout the basin.
- Proactive application of management strategies and protections to waters where data is not available for establishing listing status.
- Improvement of TMDL outcomes by maintaining or improving water quality in streams that are tributary to listed streams.
- Creation of efficient transfers between TMDL and protection plan implementation (including monitoring, evaluating progress, adaptive management, enforcement, and leveraging partner efforts).
- Assisting with funding opportunities for implementation when grants require projects to be part of a larger watershed plan.

Protection plan core elements, as described in materials available from the EPA (EPA 2023a and 2023b), are fulfilled by the statements and references to specific sections of the TMDLs, WQMP, and Technical Support Document in the subsections that follow.

12.1 Identification of specific waters to be protected and risks to their condition

Table 3 lists the 2022 Integrated Report assessment status for all the assessments units in the basin. Assessment units with the status of Category 2, Category 3, or unassessed are included in the protection plan. Therefore, the plan includes all waters in the basin that may have impairments for *E. coli* identified in the future. The same sources and processes described in Section 7 that have caused *E. coli* impairments to some reaches in the basin also pose a risk to unimpaired and unassessed waters.

12.2 Quantification of loads and activities expected to resist degradation

The implementation of management practices specified in Sections 2 and 5 of the WQMP also protect against risks to unimpaired and unassessed waters.

Monitoring stations where *E. coli* data were collected for the TMDLs analyses and associated flow data are described in Section 5.1 of the Technical Support Document. These data and flow measurements were used to calculate loading duration curves and loading capacities of *E. coli* in the basin (Section 4.5 of the Technical Support Document). Applicable loading capacities for unimpaired stream reaches that fall within the studied reaches are shown in Table 7 and Tables 10-14. Methods for calculating loading capacities for unimpaired stream reaches outside the studied reaches are provided in Section 8.

As with loading capacities, relative percentages of the *E. coli* loading capacity are allocated to sources to any stream reach within the basin in Table 9. Allocations for all sources of *E. coli* loads are shown by studied reach in Tables 10-14.

12.3 Timeframes for protection

Timelines for basin-wide implementation of the TMDLs are described in Section 5 of the WQMP and estimated timelines for attainment of water quality standards in the impaired stream reaches are provided in Section 4 of the WQMP. DEQ's basin-wide approach ensures that the TMDLs and the protection plan will be implemented in a prioritized manner over the same timeframe that will be required to demonstrate effectiveness of management strategies in reducing excess pollutant loads.

12.4 Measures of success

The WQMP describes DEQ's approach to quantitative and qualitative measures of progress in attaining and maintaining water quality standards basin wide. Section 6 of the WQMP discusses quantitative and qualitative evaluation of implementation of management strategies, development of a plan for periodic monitoring, and an approach to adaptive management. Section 7 of the WQMP describes the framework for accountability of implementation, including: engaging with sources, setting measurable objectives, evaluating progress, conducting enforcement, and tracking status and trends.

13. References

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