AGENDA TITLE: Agenda Item – Stormwater Quality Program Update on E. coli TMDL Implementation

PRESENTERS:
Joe Taddeucci, Director of Utilities
Meghan Wilson, Water Quality and Environmental Services Manager
Candice Owen, Stormwater Quality Supervisor
Michael Lawlor, Water Quality Compliance Coordinator

EXECUTIVE SUMMARY

This memo serves as the 2020 update on the Boulder Creek E. coli TMDL Implementation Plan, which was updated in 2019 following a presentation to and feedback from WRAB (see the April and May 2019 WRAB memos for additional background). Since that time, staff have completed the top priority sewershed management plan, conducted a microbial source tracking study, coordinated with the University of Colorado – Boulder to plan for the next sewershed management plan, continued a robust monitoring program and installed educational signage at high-recreation points along Boulder Creek. While the results of the sewershed management plan and source tracking study did not identify any point (discrete) sources of E. coli, they provide additional insights into nonpoint sources and will help to further staff’s efforts to mitigate these sources.

In addition to the TMDL efforts, stormwater quality staff continue to implement other aspects of the city’s municipal separate storm sewer (MS4) permit, including education and outreach, development review, spill response, and ensuring stormwater quality compliance at the city’s operations facilities. Highlights from the past year include implementing enhanced compliance processes for construction and post-construction stormwater, initiating a study to better link nutrients and habitat to macroinvertebrate data, and additional training and education efforts for city crews and staff.

BACKGROUND

More than 90 streams are listed on the impaired waters or further monitoring & evaluation lists for E. coli in Colorado, including segments in neighboring Front Range communities. Escherichia coli (E. coli) are indicator bacteria, and most strains are not pathogenic but are used to identify potential fecal contamination. The state’s E. coli Water Quality Standard for
recreational water bodies, including Boulder Creek, is 126 colony forming units per 100 milliliters (CFU/100 mL).

In 2011, the City of Boulder was one of the first Colorado communities to voluntarily develop a total maximum daily load (TMDL), which sets the allowable daily maximum of a pollutant that can be discharged to a waterbody and still comply with water quality standards. TMDL monitoring and reporting requirements were added to the city’s MS4 permit in 2016. The City and County of Denver is the only MS4 permittee outside of the Boulder Creek Basin that currently has *E. coli* requirements in its permit. The University of Colorado – Boulder’s updated permit will also likely include requirements related to the *E. coli* TMDL.

While levels of *E. coli* are highly variable, data collected over the past decade show that there have been no substantial changes in *E. coli* concentrations for the TMDL segment of Boulder Creek (2b_B), or for the newly listed 303d (2b_D) and M&E (2b_G) segments just upstream (see Figure 1).

The city’s current TMDL Implementation Plan, updated in 2019, provides a systematic approach to addressing controllable sources of *E. coli*. The plan lays out a list of outfalls to investigate, prioritized based on factors including risk of exposure to human source bacteria, dry weather flow and *E. coli* concentrations, and risk to recreators. It includes the following actions:

- developing a sewershed management plan for each of the nine outfalls that identifies sources of *E. coli* to the sewershed,
- conducting special studies, as time and resources allow, to provide additional understanding of the *E. coli* issue, such as specific dry weather flow source analyses and non-human bacteria source analyses, and
- ultimately, identifying and mitigating controllable and human sources of *E. coli* that are believed to pose the greatest risk to human health.

In addition to work related to the *E. coli* TMDL, the Stormwater Quality Program implements other activities through the framework of the MS4 permit, which requires pollution prevention elements related to education and outreach, illicit discharges (spills), development both during construction and post-construction (control measures/best management practices), and the city’s municipal operations. The program is part of the Water Quality and Environmental Services (WQES) group within Utilities, which provides technical expertise and services to ensure that the city meets and exceeds federal and state regulations related to source water quality, drinking water, stormwater quality, wastewater and industrial discharges.
ANALYSIS
The TMDL Implementation Plan lists numerous potential urban sources of *E. coli* and distinguishes between controllable and uncontrollable sources, as well as between human-related sources and other sources. Ultimately, the goal of the plan is to identify controllable, human-related sources, as these are both possible to mitigate and pose the greatest risk to human health. The plan also acknowledges that meeting the water quality standard in the city’s discharges to the creek may not be possible, as some sources are not easily controllable, such as some wildlife activity and *E. coli* that persists in the sediment and biofilms.

The investigation for the University Hill sewershed management plan, completed earlier in 2020, found that the only direct source of dry weather flow was a suspected groundwater sump pump, which was sampled directly and confirmed not to be a source of *E. coli* (see Figure 2 for a study map). Staff found no evidence of illicit discharges from the sanitary sewer or other point sources of *E. coli*, but observed evidence of dispersed, or non-point, sources, most likely urban wildlife (raccoons), fat/oil/grease from food-related establishments, and persistent *E. coli* regrowth. These results will inform future mitigation actions and education efforts as staff complete additional sewershed management plans.
Figure 2. University Hill Sewershed Monitoring Locations
In January 2020, staff conducted a microbial source tracking and pipe cleaning study in a sub-sewershed identified as high priority by the University Hill area sewershed management plan. Microbial source tracking, used to identify specific sources of bacteria, has been used as a cost-effective method to determine where such sources are present and then prioritize mitigation efforts. While the microbial source tracking results indicated the presence of human sources of bacteria, a thorough investigation and sampling of the pipe did not reveal direct point sources of *E. coli*. At the same time, staff found evidence of raccoons in the pipes. Further research suggests the possibility of cross-reactivity; that is, the presence of raccoon feces could lead to false-positive results. Staff will continue to investigate the efficacy of this testing, as well as additional microbial source tracking methods, to identify the best tools to aid the city’s understanding of *E. coli* sources.

Another special study in progress is a follow-up to the 2019 placement of segment 2b_D on the impaired waters list for *E. coli*. As shown in Figure 1, *E. coli* data for Boulder Creek have not significantly changed over time; however, the city is particularly interested in this reach because *E. coli* concentrations consistently show increases spatially between Eben G. Fine Park and 13th Street. It is also a popular location for recreators in Boulder Creek. Thus, better understanding *E. coli* contributions may help further the city’s goal of protecting recreators. The study seeks to better understand if there are consistent locations of increasing *E. coli* concentrations within this reach, as well as to identify the *E. coli* contributions that can be attributed to both point sources and dispersed non-point sources.

To augment education and outreach efforts to the public, staff also recently installed educational signage related to *E. coli* along the Boulder Creek multiuse path and has updated the Stormwater Quality web page.

**NEXT STEPS**

Staff is beginning the process of developing the next priority sewershed management plan associated with the 28th St. outfall, which is co-owned with the University of Colorado. The city is currently coordinating with the University of Colorado to verify that the MS4 system is mapped correctly and to definitively assess jurisdictional authority. *E. coli* and dry-weather flow sampling began in July 2020, and the sewershed management plan is expected to be completed in spring 2021. Staff will also continue work on the segment 2b_D special study to better understand sources of *E. coli* on this segment of the creek popular with recreators.