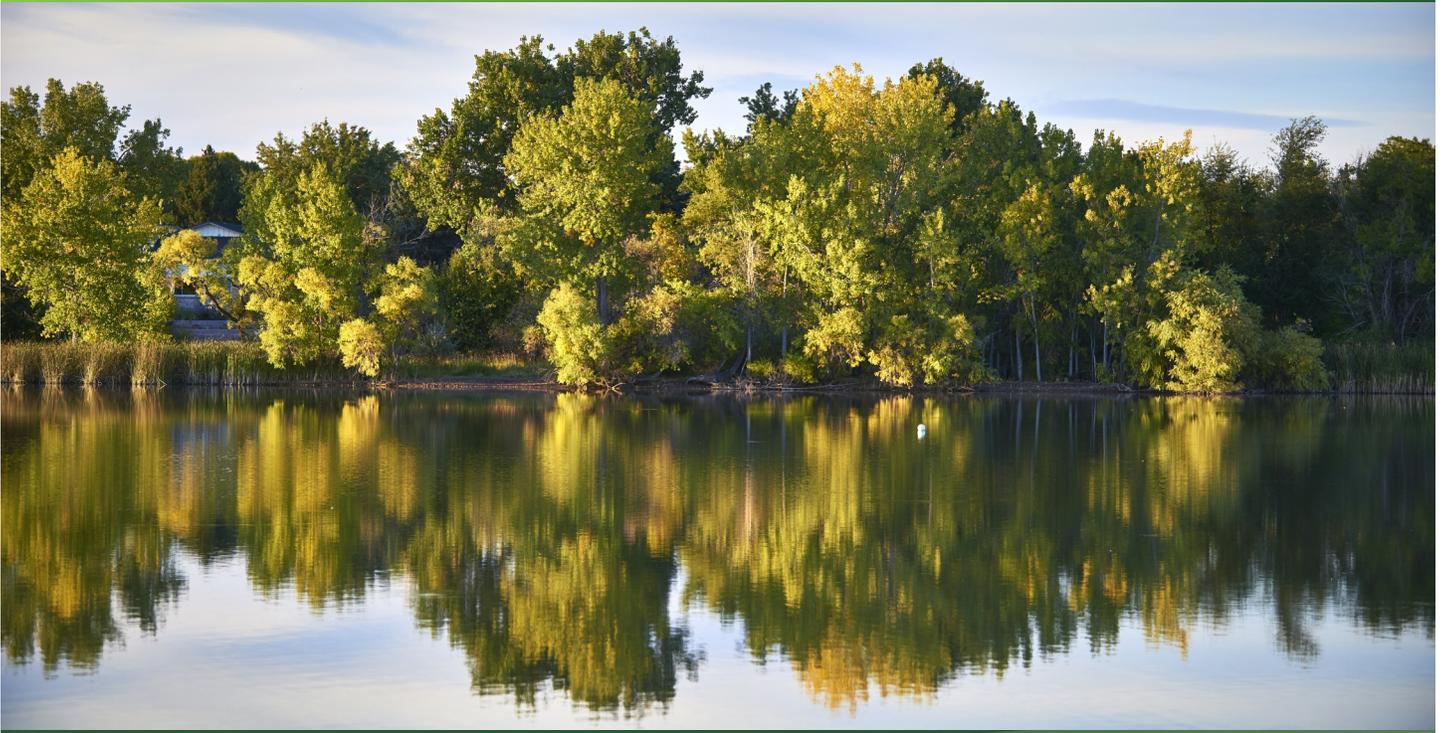




Lakewood
Public Works Department



Stormwater Management Utility

2018 Annual Report
April 2019

The Stormwater Management Utility provides services and improvements throughout the city including:

- Maintenance of existing drainage facilities
- Water quality monitoring, testing, and resolution of pollution issues
- Funding for improvements to the drainage system
- Replacement of older, deteriorated facilities
- Emergency response to street and drainageway flooding problems during and after significant storm events

Maintenance

Without maintenance, many drainage facilities lose their capacity to handle the amount of water for which they were designed. Debris is washed into the drainage system where it accumulates and decreases the capacity of inlets, channels, culverts and pipes. Reduced conveyance capacity increases flooding risk.

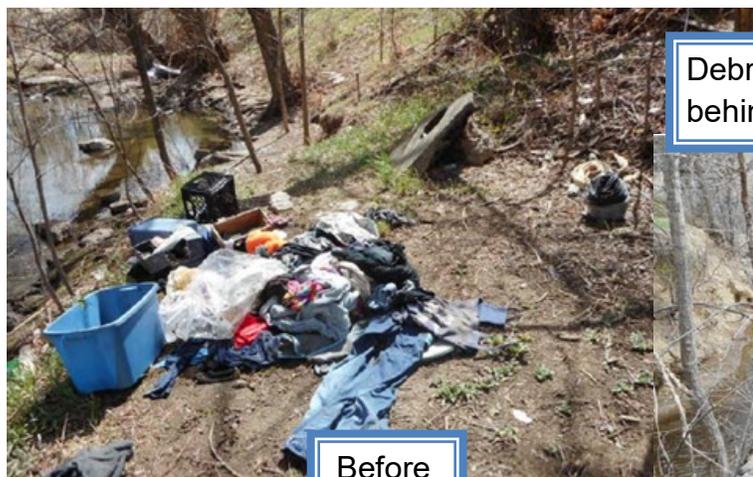
The Stormwater Management Utility is focused on minimizing damage to property by ensuring the stormwater system is clean and functioning properly. The maintenance program is a cyclical program that ensures certain facilities are inspected every two years. All obstructions are removed the same year as they are identified during inspection. Last year, the following routine work was completed:

- 1,264 inlets were inspected
- Over 6 miles of gulches were inspected
- Approximately 80 trash racks and grates were inspected after every storm



The effectiveness of inlets is reduced when the grates get plugged with debris.

Many abandoned camps were found along drainageways. Trash and debris creates environmental problems and can wash into the stream during storms, clogging culverts and polluting the stormwater. In 2018 Stormwater Utility crews and contractors removed over 40 cubic yards of trash from several camps at a cost of \$4,000.



Before

Debris and trash left behind on Dry Gulch



After



Trees, branches and other debris can clog the drainageways. Each year the Utility inspects the gulches and removes debris. In 2018, over 350 cubic yards of debris and tree limbs were removed by Utility crews and contractors at a cost of over \$10,000.

Some of the underground storm sewer system has reached the end of its useful life and the Stormwater Management Utility replaces pipes and culverts as they fail or collapse. The two projects shown on this page are examples of the pipe replacements the Utility installed in 2018.



Utility crews replaced this 42-inch corroded metal pipe with a high density plastic pipe at West 10th Avenue and Teller Street. Materials for this project cost approximately \$5,400.



This metal pipe at Hoyt Street north of Colfax was close to the surface and was replaced with a new metal pipe. The cost for the 36-inch pipe and the other materials needed to complete the project was approximately \$5,700.

Robotic Video Equipment

A large part of the stormwater management system is in pipes buried underground. The pipes are difficult to inspect routinely and are often left alone until a pipe failure occurs as shown on the previous pages. The answer to this dilemma is a robotic camera that can be lowered into underground pipes to capture a video of the condition of the pipe. The camera can detect pipe damage or corrosion, debris and clogs, misaligned connections and other problems. A routine inspection cycle will help guide future replacement schedules, and catastrophic failures can be minimized. The cost of the van and video system was shared with the Lakewood Sanitary Sewer Utility, with a cost to the Stormwater Management Utility of \$90,000.



Notes of the condition of the pipe on the date of the inspection can be added to the video.



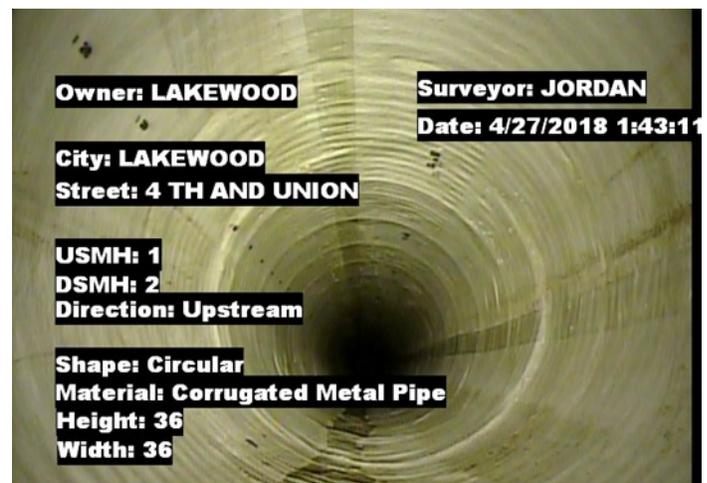
The small camera is on a wheeled robot that can travel through the pipe.

A sink hole developed in the Jose O'Shea's restaurant parking lot within a public drainage easement. The storm sewer in the easement was completely corroded, which allowed the soil around the pipe to erode, creating the sink hole. Approximately 200 feet of 42-inch pipe had to be replaced. A trenchless repair process was chosen to avoid having to shut down the parking lot to excavate the pipe. A plastic liner was inserted in the pipe and then the liner was expanded and cured with steam to create a new plastic pipe within the existing metal pipe. The cost of this repair project was approximately \$108,000. This same process was used to repair 200 feet of 36-inch pipe at West Jewell Avenue and South Oak Street and 80 feet of 18-inch pipe in Beech Park, for a combined cost of approximately \$97,000.

The robotic camera was used to view the inside of the pipe. The invert of the pipe was completely corroded and storm flows were eroding the soil below the pipe.



The contractor prepares the liner before it is inserted in the pipe.



The inside of the newly lined pipe was video-inspected with the robotic camera after the curing process was complete.

Construction Projects

The Stormwater Management Utility undertakes construction of several drainage projects each year. Before construction can begin, the Utility activities include:

- Obtaining input from affected property owners during the design process
- Designing the improvements and preparing plans
- Acquiring necessary easements for the proposed work
- Identifying funding from the Utility's revenue and the Urban Drainage and Flood Control District
- Receiving bids from contractors
- Notifying adjacent property owners of the construction activities

The Utility often partners with the Urban Drainage and Flood Control District to improve major drainageways and for maintenance projects along major drainageways. The District provides technical expertise and funds for many of the Utility's projects. The District's funds are derived from a property tax collected throughout the metropolitan region. Obtaining District funds for major improvement projects requires city matching funds. For years prior to the creation of the Utility, Lakewood was not able to match the District's funds and the District spent funds available to Lakewood in other jurisdictions. The Stormwater Management Utility now provides the required matching funds. The Utility prioritizes the District's maintenance projects and routine maintenance activities, which do not require matching funds.

Urban Drainage and Flood Control District funds budgeted for use in Lakewood during the year included:

- Capital projects: \$540,000
- Master planning projects : \$160,000
- Maintenance/restoration projects: \$313,000
- Routine maintenance activities: \$39,000

The following pages highlight some of the construction activities during the year.

Weir Gulch at 8835 West Mississippi Avenue — Construction to correct severe bank erosion on this property was completed in January 2018. Total cost was \$43,000 and was funded entirely by the Urban Drainage and Flood Control District's maintenance program.



Before

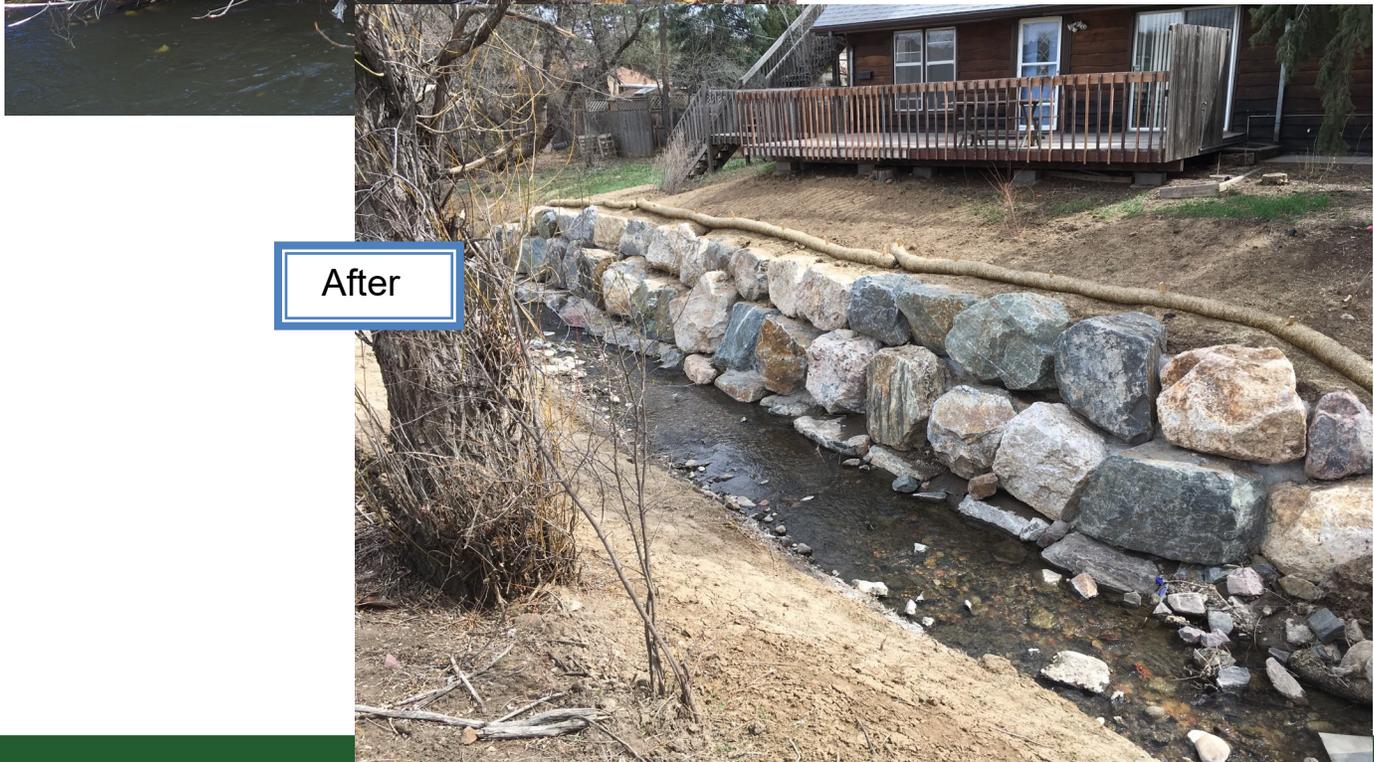


After

Weir Gulch at South Fenton Street — Design work for bank stabilization was finished in mid-2018 and construction was completed in December 2018. A grouted boulder wall was used to stabilize the stream bank and soil was added behind the wall to restore the slope near the deck. Design and construction costs were \$175,000 and were funded entirely by the Urban Drainage and Flood Control District's maintenance program.



Before



After

Lakewood Gulch between Depew Street and Fenton Street — Design work to alleviate severe bank erosion on five properties was completed in 2018. Construction began in late 2018 and is anticipated to be completed early 2019. The design and construction is estimated to cost \$750,000 and funding is being provided by the Urban Drainage and Flood Control District's maintenance program.



Before



Grouted boulders are being installed at the bottom of the vertical bank. Soil will be placed above the boulders and sloped up to the top of the bank.

Drainage Master Planning and Updated Floodplain Studies

Major drainageways often cross jurisdictional boundaries and the Stormwater Management Utility partners with the Urban Drainage and Flood Control District and other jurisdictions to coordinate master planning efforts. This results in cost-effective and cohesive planning among jurisdictions.

Floodplain mapping is updated to reflect current conditions in the watershed and to accurately show the limits of the floodplain. Flood Hazard Area Delineation studies are sponsored by the Urban Drainage and Flood Control District with participation from the Stormwater Management Utility and other affected jurisdictions.

The Stormwater Management Utility took part in the following drainage master plan and floodplain updates in 2018:

North Dry Gulch – from Harlan Street at 13th Avenue to Dover Street at Colfax Avenue - Work continued to update the master plan for drainage improvements along North Dry Gulch. The estimated total cost of the master plan is \$200,000. The Stormwater Management Utility and the Urban Drainage and Flood Control District each contributed \$100,000.

Weaver Creek – from the confluence with Bear Creek just west of Kipling Parkway to three miles west of Bowles Avenue and C-470 in Jefferson County - The Utility, Jefferson County and the Urban Drainage and Flood Control District partnered to update the drainage master plan and the Flood Hazard Area Delineation Map. The total cost of the study was \$250,000, with the Utility contributing \$7,000.

Sloan's Lake Drainageway — from the South Platte River to Crown Hill Park — The Utility, City and County of Denver, City of Edgewater, City of Wheat Ridge and the Urban Drainage and Flood Control District partnered to update the drainage master plan and the Flood Hazard Area Delineation Map. The new study area was expanded west of Wadsworth to accurately show the floodplain through the western part of the watershed, and documented the floodplain changes due to the regional detention pond at Wadsworth Boulevard and 26th Avenue and the channelization through Walker Branch Park. The total cost was \$250,000, with the Utility contributing \$25,000.

Sanderson Gulch - from the South Platte River to Kipling Street — The Utility partnered with the City and County of Denver and the Urban Drainage and Flood Control District to update the Flood Hazard Area Delineation study in 2018. The updated study incorporated revised rainfall and runoff data and reduced the width of the 100-year floodplain. The Urban Drainage and Flood Control District paid the total cost for the update.

Lakewood Gulch - from the South Platte River to Red Rocks Community College - Urban Drainage and Flood Control District, the City and County of Denver, and the Utility are partnering to update the drainage master plan and the Flood Hazard Area Delineation study in 2019. The total cost is \$260,000, with the Utility contributing \$80,000.

Projects in the Design Stage

Several projects are in the pre-construction stages. Pre-construction activities include:

- Obtaining input from affected property owners
- Designing the improvements
- Acquiring necessary property rights
- Identifying funding from the Utility's revenue and the Urban Drainage and Flood Control District
- Receiving bids from contractors

The following projects are examples of the projects in the pre-construction stages:

McIntyre Gulch at Holland Street - between West 2nd Avenue and West 4th Avenue — Final design for increasing the capacity of the existing culverts carrying flows for McIntyre Gulch under Holland Street was completed in 2018. The new culvert will be capable of carrying 100-year storm flows without overtopping Holland Street. The floodplain will be removed from two structures, one of which experienced flooding in a 2013 storm event. Design costs were \$100,000, with \$50,000 contributed by the Stormwater Management Utility and \$50,000 contributed by the Urban Drainage and Flood Control District. Construction of the improvements is estimated to cost \$1,300,000 and will be funded by the Stormwater Management Utility. Construction is anticipated to be completed in 2019.



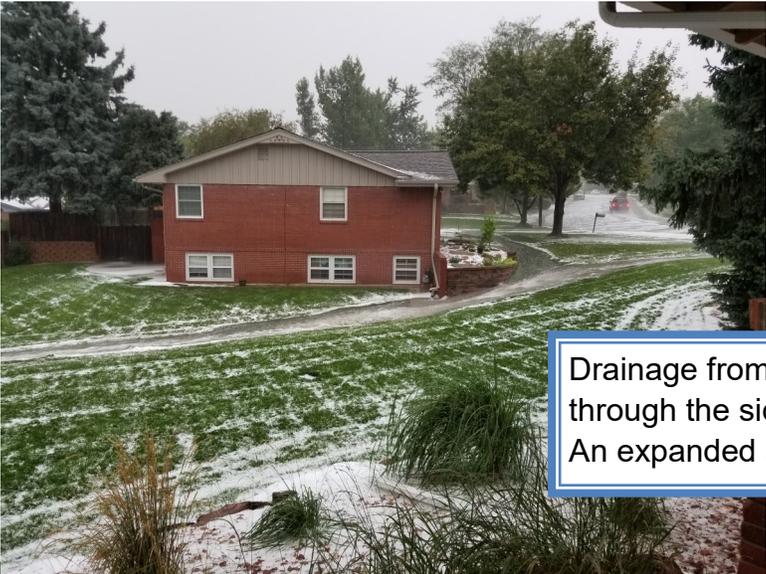
These small culverts will be replaced with a larger culvert under Holland Street.

Independence Street — South of 8th Avenue — Design work to reduce localized flooding in Lakewood Acres east of Independence Street was completed in 2018. Construction of these improvements is anticipated in 2019. The design and construction is currently estimated to cost \$700,000 and funding is being provided by the Stormwater Management Utility.

The roadway routinely floods with small storms. A new storm sewer system will help control the flooding.



20th Avenue and Union Area Drainage Improvements - Design work to reduce localized flooding north of 20th Ave on Urban Drive and Union Drive is underway and construction is anticipated in 2020. The design and construction is currently estimated to cost approximately \$500,000 and is being provided by the Stormwater Management Utility.



Drainage from the street overtops the curb and flows through the side and back yards of several homes. An expanded storm sewer system is planned.

Stormwater Quality

The discharge of natural precipitation through Lakewood's storm sewer system affects the health of aquatic life in Lakewood and downstream in the South Platte River. The city is required by the State of Colorado Department of Public Health and Environment (CDPHE) to provide a water quality program designed to:

- Monitor the stormwater quality in Lakewood's waterways
- Respond to all reports of water pollution and eliminate any pollutant sources
- Educate our residents about water quality and their actions that can harm or improve water quality

Monitoring is conducted at suspect locations within the city to identify and eliminate pollutant sources. Additional monitoring is also conducted in cooperation with other entities. The Utility's cooperative approach results in significant cost efficiencies and logical solutions to stormwater issues that cross jurisdictional boundaries. Some of the joint project efforts include:

- Sharing technical data and costs among Denver, Aurora, Urban Drainage and Flood Control District and Lakewood for implementation of State-required permit provisions.
- Participating as a member of the Bear Creek Watershed Association with Denver, Sheridan, CDOT and non-governmental groups to address E.coli in Lower Bear Creek.
- Monitoring stormwater quality at five sites in Bear Creek Lake Park, seven locations on Turkey and Bear creeks upstream of the park and six locations along the South Platte River, in partnership with Denver, Aurora, the Urban Drainage and Flood Control District, Jefferson and Clear Creek Counties and the United States Geological Survey.
- Monitoring and posting advisories for toxic blue-green algae blooms in Bear Creek Lake and the Bear Creek Greenbelt with Lakewood Community Resources staff and the City and County of Denver.

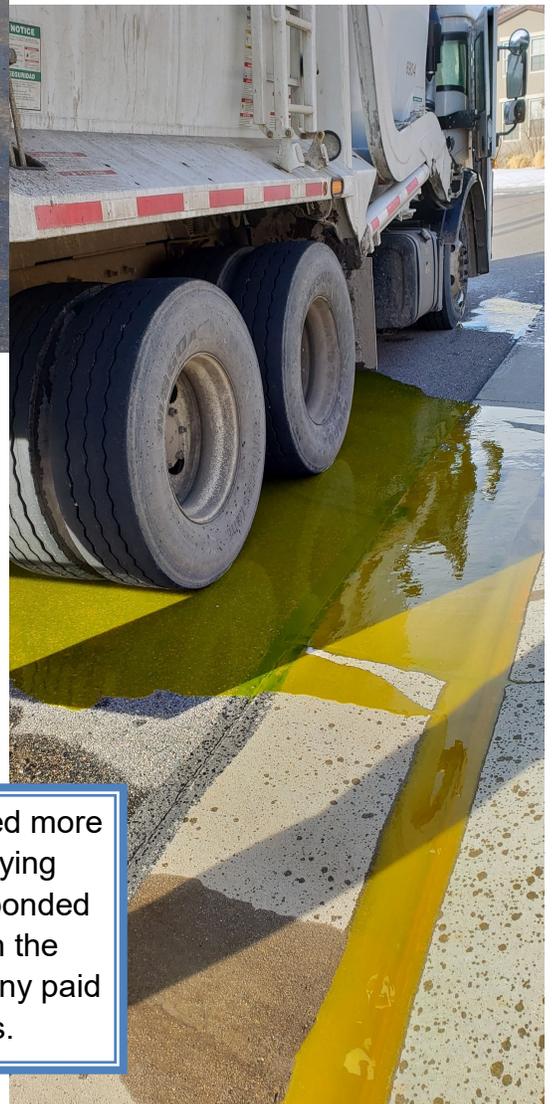
The Utility worked with Community Resources to post notices for park users when blue green algae was detected in Bear Creek Lake in 2018. Algae can be harmful to people and pets if ingested.



Numerous pollution problems were identified and resolved. More than 30 illicit discharges of gasoline, motor oil, antifreeze, hydraulic fluid, concrete washout water, restaurant grease, raw sewage and sediment were remediated.



Most restaurants have grease interceptors as part of the sanitary sewer system. Without regular maintenance, these interceptors can get clogged, resulting in an overflow. This overflow was detected before reaching the storm sewer system. The owner cleaned up the overflow and had the interceptor serviced to bring it back to working condition.



The hydraulic system in this truck failed and released more than five gallons of hydraulic fluid to the street, spraying some parked cars and two houses. Utility staff responded to calls from the neighbors and contained the spill in the gutter with absorbent material. The trucking company paid to clean the street and the affected cars and houses.

Educational efforts are designed to reach as many groups as possible that may affect municipal stormwater quality. Educational programs during the year included:

- Airing YouTube videos about proper disposal of used cooking oil and “No Leaf Left Behind,” a video to encourage bagging or composting yard waste.
- Continuing to air “Protecting Our Waterways Through BMPs” and other water quality public service announcements on Lakewood8.
- Installing “Dump No Waste - Drains to Stream” medallions on storm sewer inlets.
- Distributing a brochure titled “Managing Your Household Wastes” to residents, and distributing pollution prevention booklets to industrial and commercial businesses.
- Electronically distributing brochures encouraging contractors to participate in the Red Rocks Community College courses on erosion, sediment control and construction site management.

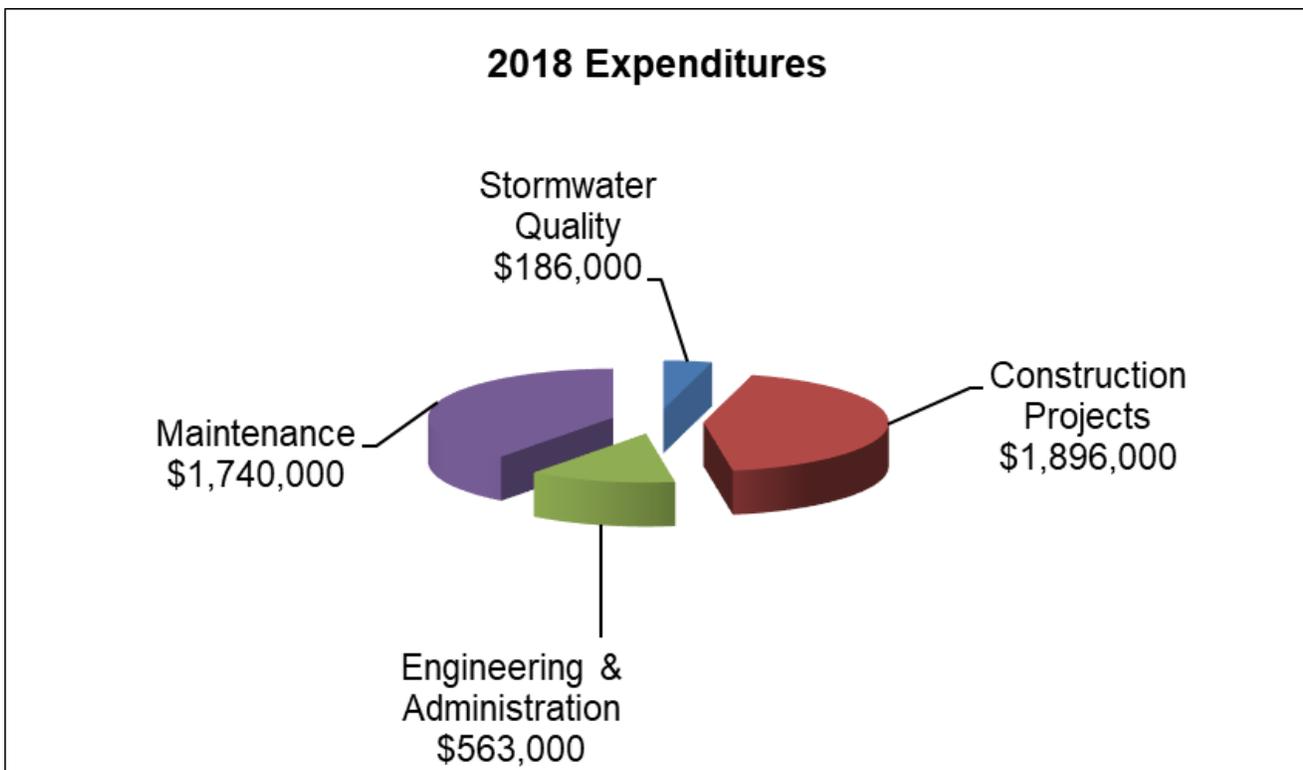


As part of the education program, the Utility engages with students and teachers in area schools to teach stormwater quality stewardship. In 2018, more than 80 Jefferson County teachers were trained to conduct monitoring of waterways to be used as part of the STEM curriculum. The teachers tested stormwater for nitrate, phosphate and biochemical oxygen demand and learned how these components affect stormwater quality.

Financial Summary

The Utility was established in 1998 and at that time, the city's capital need for drainage improvement was estimated to be \$60 million. Since then, the construction cost inflation and identification of additional needs have pushed the estimated cost to between \$125 and \$155 million.

Total Stormwater Management Utility revenue in 2018 was approximately \$5 million dollars. The Utility's expenditures do not equal revenue every year. During some years, revenues will exceed expenses as funds are set aside for larger projects. Many projects will require several million dollars for completion. During years when larger projects are constructed, expenditures exceed revenue.



Beginning in 2000, property owners throughout Lakewood have received annual bills for stormwater management. Nearly 38,000 properties are billed each year. In 2019, single-family homeowners will pay a fee of \$47.64 per year. Other property owners pay a proportional amount based on the impervious area on each property.

In 1998 when the Lakewood fee was established, the average cost of Colorado stormwater utilities was \$3.11 per month. The average cost has since more than doubled to \$7.77 per month. The chart below compares monthly costs for stormwater utilities in Colorado.

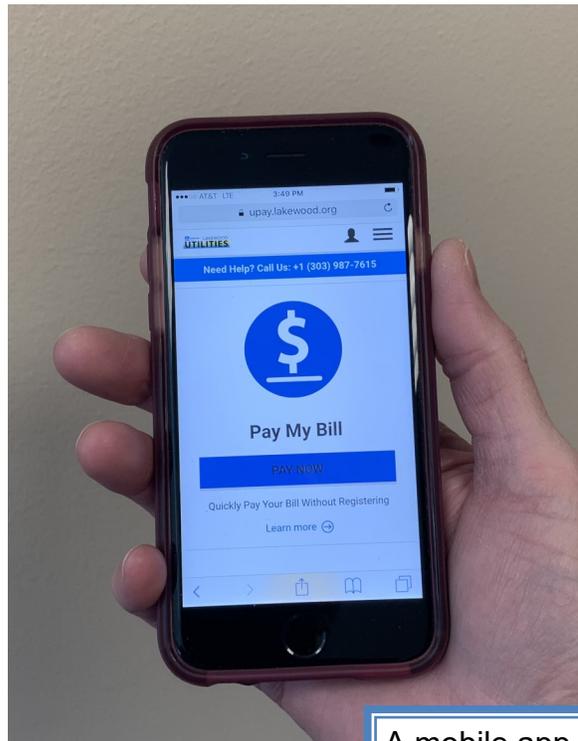
Community	Monthly cost for a Single-Family Home in dollars
Greeley	17.36
Boulder	16.39
Berthoud	16.00
Loveland	14.06
Longmont	13.05
Erie	11.98
Fort Collins	10.66
Aurora	10.46
Denver	9.56
Parker	7.26
Castle Rock	7.12
Southeast Metro Stormwater Authority	6.61
Westminster	6.00
Pueblo	5.36
Colorado Springs	5.00
Englewood	4.39
Golden	4.22
Lakewood	3.97
Windsor	3.52
Arvada	3.42
Federal Heights	3.15
Littleton	2.84
Woodland Park	2.00
Northglenn	2.00

Billing System Modernization

The utility billing system had been in place for many years and was shared between the Stormwater Management Utility, the Lakewood Water Utility and the Lakewood Sanitary Sewer Utility. The outdated software was difficult to maintain and did not accommodate modern payment methods, such as payment by credit or debit cards.

The billing system was replaced in 2018 and includes many customer-focused enhancements with an online customer portal, online payments through credit and debit cards or electronic funds transfers, and the ability to go paperless.

The 2019 stormwater bills will be processed using the new system. The new system was funded jointly by the three utilities, prorated based on the number of bills each utility generates annually. The total cost of the replacement system was \$270,000, with the Stormwater Management Utility contributing \$122,000.



A mobile app adds another online option to pay the annual Stormwater Management Utility fee.



Summary

For decades, the City of Lakewood was unable to adequately maintain its drainage facilities. The investment in pipes, inlets, ditches and gulches was substantial and the potential for property damage and personal injury was increasing because of inadequate maintenance. The Stormwater Management Utility is providing the resources to care for the existing drainage system with a minimal systematic maintenance program.

Many of the pipes and culverts in the stormwater system are nearing the end of the expected service life. In recent years more of the Utility's resources have been needed for repair and replacement, often in an emergency after a pipe failure. This is expected to continue and accelerate as the stormwater system ages.

The Stormwater Management Utility is providing revenue to match available funds from the Urban Drainage and Flood Control District. Improvements are being made and federally mandated water quality program requirements are being met.

Cover photo: a view across Kendrick Lake by Rick Kooker

All other photos courtesy of Stormwater Management Utility staff