City of Bozeman and Montana State University

Stormwater Management Plan

Graphic: Stormwater treatment unit installation

Graphic: Surcharging storm sewer manhole

2017 - 2021 MS4 General Permit Term

Updated on February 26, 2019

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Section 1.0

Program Administration

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1.1 Introduction

This Stormwater Management Plan (SWMP) describes the City of Bozeman (City) and Montana State University's (University), collectively known as the MS4, structural and administrative Best Management Practices (BMPs) engineered, implemented, maintained, and enforced to meet the following objectives:

- Protect public safety
- Improve water quality by mitigating stormwater pollutants
- Comply with environmental regulations
- Improve urban flood resiliency and climate change preparedness
- Guide policies at local, state, and federal levels

The MS4 also refers to this SWMP as the Stormwater Master Plan. This SWMP is an iterative and evolving document with updates occurring annually. SWMP Section 1.0 details the following components necessary to administer the MS4's Program, including:

- Background Information
- City Program Framework
- University Program Framework
- Stormwater Management Team
- MS4 Coordination
- Affiliations
- Additional Regulatory Responsibilities
- Annual Report
- Public Comment

1.2 Background Information

The MS4 is an incorporated town located in Gallatin County, Montana, and has a population of 61,953 as of 2016 (*City population 45,250, University population 16,703*). The MS4's primary land-use type is residential and commercial, with isolated industrial areas. Other notable geographical details include:

- Elevation: 4820 ft.
- Climate: Cold continental, with warm and dry summers, cold and dry winters
- Average Temperature: 44.6 ˚F
- Average Precipitation: 18.4 inches (*University rain gauge*)

The MS4 is located at the headwaters of the Upper Missouri Watershed and possesses relatively pristine surface water quality that supports several beneficial uses, including aquatic life, drinking water, agriculture, and recreation. Numerous waterways originate within and pass through the MS4.

The MS4's most notable waterway is Bozeman Creek (aka Sourdough Creek), which originates in the Gallatin Mountains south of its jurisdictional boundary. Flowing north, Bozeman Creek enters the MS4 at its southeastern border and continues until its confluence with the E. Gallatin River. The Montana Department of Environmental Quality (MDEQ) determined that Bozeman Creek has various impairments from natural and anthropogenic sources when developing its 2013 Lower Gallatin Planning Area Total Maximum Daily Load Report (TMDL).

The second most notable waterway is Mandeville Creek, which is a small spring feed watercourse that originates south of Bozeman. Flowing north, Mandeville Creek enters the MS4 at its southcentral boundary and continues until its confluence with the E. Gallatin River. The Montana DEQ determined

that Mandeville Creek also has various impairments from natural and anthropogenic sources when developing its TMDL.

Numerous other perennial and intermittent spring creeks flow through the MS4 in a web of channels, irrigation ditches, and underground pipes. The Montana DEQ has not completed an assessment of these waterways; however, it is likely they receive similar impacts as the other more notable waterways.

The MS4's water resources represent a significant community value and are the backbone of its tourism, recreation, and neighboring agricultural industries. A growing threat to these invaluable resources is stormwater runoff, which occurs when rainfall and snowmelt flow over developed surfaces, such as yards, roadways, parking lots, and rooftops. Stormwater picks up pollutants before entering storm sewers, such as drains, pipes, and ditches, and eventually discharges into the MS4's waterways. Stormwater runoff can result in property damage, public health threats, and environmental degradation if not proactively managed. Specific pollutants of concern include:

- Sediment: Sourced from barren ground, construction sites, road sand, unpaved roads and trails, windblown dust, and vehicle grime, resulting in suffocated aquatic habitat and changes to stream channel morphology
- Nitrogen and Phosphorous: Sourced from improper lawn fertilizer application, grass clippings, and yard debris, resulting in oxygen-depleting algae blooms
- E.coli: Sourced from substandard septic systems and pet waste, resulting in toxic conditions for the public and wildlife
- Floatables: Sourced from littering, overfilled garbage cans, and unsecured loads, resulting in clogged infrastructure, impaired aesthetic value, and endangered wildlife
- Oil, Grease, Metals, and Detergents: Sourced from improper vehicle maintenance, car spills, and car washing, resulting in toxic conditions for humans and wildlife
- Temperature: Sourced from extensive and continuous impervious areas, resulting in harmful impacts to cold-water fisheries

To counter stormwater runoff's impact, the United States Congress established the National Pollutant Discharge Elimination System (NPDES) as a part of the Clean Water Act (CWA) in 1972 to preserve and restore the health of the United States' Waters. The U.S. Environmental Protection Agency (EPA) is the lead organization tasked with implementing and oversight of the CWA. In Montana, the MDEQ has assumed authority, allowing for further state-scale interpretation, enactment, and enforcement.

The NDPES program regulates water pollution through a series of permits focused on point sources, such as industrial facilities, wastewater plants, and stormwater discharges. The driving permit behind the development and implementation of this SWMP is the MDEQ's Small Municipal Separate Storm Sewer Systems General Discharge Permit (MS4 Permit), which requires the City and University to implement a variety of subprograms with the goal of mitigating polluted discharges to waterways.

The MDEQ designates the City as a traditional permittee and the University as an non-traditional permittee. Both parties are co-permittees, because their storm sewers are connected and they work together on some administrative programs. The MDEQ requires the MS4 to complete the following:

- Prepare and submit individual Notices of Intent (NOI)
- Receive authorizations to discharge from MDEQ by January 1, 2017
- Prepare and submit individual Annual Reports
- Develop, implement, and update this SWMP throughout the MS4 Permit term
- Execute a Memorandum of Understanding (MOU)

Also, the MDEQ requires the MS4 to administer a program that works to accomplish the following:

- Educate the public (see SWMP Section 3.0)
- Engage citizens through involvement and participation (see SWMP Section 3.0)
- Detect and eliminate illicit discharges (see SWMP Section 4.0)
- Regulate construction sites (see SWMP Section 5.0)
- Regulate stormwater facilities constructed with new development (see SWMP Section 6.0)
- Prevent pollution stemming from internal facilities and operations (see SWMP Section 7.0)
- Collect and analyze water quality and stormwater runoff data (see SWMP Section 8.0)

The following sections of this SWMP outline the MS4's work within each of these subprograms.

1.3 City Program Framework

On June 25, 2012, the City adopted Ordinance 1831 creating a stormwater utility, providing for the collection of rates and charges that generate revenue for the operation and maintenance of the City's stormwater system. Funding was initially allocated to inventory, map, and assess the condition of the City's storm sewer. This effort was in response to findings identified during a 2011 MDEQ MS4 Permit audit, which included one violation, 16 program deficiencies, and 23 improvement recommendations.

On March 3, 2014, the City presented the results of their inventory, mapping, and assessment effort to City Commissioners. The City inventoried over ten thousand individual assets, many of which were found to be clogged, cracked, buried, or in disrepair. Also, a program administration review identified significant shortfalls. Commissioners directed the City to develop options for addressing known issues.

On April 21, 2014, the City presented three levels of service, differing primarily on the timeline required to address issues and the annual funding level. Commissioners decided to implement a program that included a funding level of $1.2 million annually for operations, treatment, and deferred maintenance.

On February 23, 2015, the City adopted a new level of service and a rate model to collect service fees based on individual property's impact on the stormwater system.

On December 1, 2015, the City implemented the final piece of the new rate model allowing the Stormwater Utility to be fully funded and functional for the first time in its history.

The City's utility rate model includes the following components and funding allocations:

- Approximately $450,000 annually for deferred maintenance, which includes costs associated with the replacement and cleaning of storm sewer componenrnts
- Approximately $550,000 annually for operations and maintenance, which includes expenses related to personnel, reoccurring system maintenance, supplies, and equipment
- Approximately $200,000 annually for system enhancements, which includes costs associated with projects that provide stormwater treatment to remove pollutants before discharging to waterways

The City's rate model has three distinct guiding principles:

- Flat Charge: Charged evenly across the service area. Properties with a water meter receive a flat monthly charge of $3.23 per meter. Properties that have impervious area, but do not have a water meter also receive a flat charge. The funding pays for deferred maintenance projects.
- Variable Charge: Charged proportional to the amount of impervious area individual properties have. Impervious area does not allow water to soak into the ground during rain events creating stormwater runoff. Larger areas result in more impact on public storm sewers and waterways.

- Utility Credit: Properties that have installed quantity and quality-based stormwater infrastructure controls receive a billing credit as these properties impact the stormwater system less than those without stormwater infrastructure.

The Stormwater, Building, Strategic Services, and Finance Divisions work collaboratively to update the stormwater utility rate model regularly as new development occurs. The workflow includes:

1. Site plans submitted to the Building Division through electronic permit review software
2. Staff reviews and uploads site plan to a shared group folder on the public drive
3. Strategic Services Staff checks the folder regularly, imports site plans into GIS, digitizes impervious area, and updates the polygon's ERU attribute
4. Finance Staff sends water meter notice to Staff when a project is nearing completion
5. Stormwater Staff reviews impervious area data based on the address information provided by Finance and calculates an ERU total, including percentage credit.
6. Stormwater Staff provides Finance Staff with an ERU value and credit value.
7. Finance Staff updates software and generates a bill for customers.

The MS4 tracks impervious area growth to gauge the workload associated with updating the rate model. The following data points display multi-family and commercial (does not include single-family residential properties and public right-of-way) impervious area added within their respective years, including:

- 2017: 75 acres
- 2018: 73 acres
- 2019: XX Acres
- 2020: XX Acres
- 2021: XX Acres

FY18 Approved Budget (July 1, 2017, through June 30, 2018)

- Source: Municipal Enterprise Fund
  - Rate Model Type: Impervious Area
  - Percent Allocation: 100%
  - Resource Justification: Budget approval process completed June 26, 2017
  - Program Effectiveness: See SWMP Sections 2.6, 3.4, 4.4, 5.4, 6.4, 7.2, 7.3, 7.4, 8.8, and 8.9
  - Resource Variation: Proposed addition of one FTE (Stormwater Specialist), approved
  - Success Determination: See SWMP Sections 2.6, 3.4, 4.4, 5.4, 6.4, 7.2, 7.3, 7.4, 8.8, and 8.9
- Staff: 6.5 FTEs
- Budget: $1,488,360
  - Salaries and Benefits: $451,548
  - Operating Budget: $161,466
  - Capital: $650,000
  - Debt Service: $225,346
  - Transfers: $0.00

FY19 Approved Budget (July 1, 2018, through June 30, 2019)

- Source: Municipal Enterprise Fund
  - Rate Model Type: Impervious Area
  - Percent Allocation: 100%
  - Resource Justification: Budget approval process completed June 25, 2018

- Program Effectiveness: See SWMP Sections 2.6, 3.4, 4.4, 5.4, 6.4, 7.2, 7.3, 7.4, 8.8, and 8.9
- Resource Variation: Proposed addition of one FTE (Project Manager), pending approval
- Success Determination: See SWMP Sections 2.6, 3.4, 4.4, 5.4, 6.4, 7.2, 7.3, 7.4, 8.8, and 8.9

- Staff: 6.5 FTEs
- Budget: $1,444,302
  - Salaries and Benefits: $408,583
  - Operating Budget: $240,373
  - Capital: $635,000
  - Debt Service: $160,346
  - Transfers: $0.00

1.4 University Program Framework

In the current permit cycle, the University has managed four projects of an acre or larger in size which have influenced stormwater quantity and quality. Those projects are:

- Rendezvous Dining Hall Construction
  - Complete
- Norm Asbjornson Hall Construction
  - Active, 2019 planned completion
- Lambert Field Renovations
  - Active, 2019 planned completion
- Dormitory Construction
  - Active, 2020 planned completion

Additionally, one project of under one acre is being managed; the Montana Hall Elevator and Renovation project. This project has no stormwater specific work but is being staged east of the building requiring management of materials, storage, toilet facilities and tracking.

Current funding is not a line item but included in the general campus maintenance operations budget for Facilities Services. As allowable and necessary funding from Facilities Services General Operating budget are allocated to specific stormwater improvement projects.

The University currently devotes approximately 740 hours annually to stormwater maintenance, management, and improvements and tracks work activities and labor using a work order system. Under the general guidance of the Engineering and Utilities Manager, the Environmental Service Manager coordinates and ensures MS4 Permit compliance.

1. Current Staff:
   - Engineering and Utility Manager: Directional and political support (*40 hours per year*)
   - Director - Facilities Services: Overall program coordination. Administers and supports environmental compliance programs; manages support personnel; identifies and advocates for infrastructure projects; conducts sampling, training, inspections, permit reviews, data collection, and reporting; manages reoccurring infrastructure maintenance, structural inspections, repairs, and replacements *(300 hours/year)*

- Support Staff and Contracted Services: Groundskeepers, laborers, plumbers, and street sweeping *(400 hours/year)*

The following representatives make up the University's stormwater management team. Regular communication occurs, allowing for the exchange of necessary information:

1. Megan Sterl, Engineering and Utility Manager
   - Program Administration
2. EJ Hook, Director – Facilities Services *(Primary SWMP Coordinator)*
   - Community Outreach and Education Program
   - Public Involvement and Participation Program
   - Construction-Site Management Program
   - Post-Construction Management Program
   - Illicit Discharge Detection and Elimination Program
   - Project Management
   - Good Housekeeping Program
   - Training

FY18 Approved Budget (July 1, 2017, through June 30, 2018)

- Source: Facility's Budget
  - Rate Model Type: Part of Facilities Services Major maintenance budget
  - Percent Allocation: 100%
  - Resource Justification: Budget approval process completed June 29, 2017
  - Program Effectiveness: See SWMP Sections 2.6, 3.4, 4.4, 5.4, 6.4, 7.2, 7.3, 7.4, 8.8, and 8.9
  - Resource Allocation Variation: Approx. $25,000 for College and 11th stormwater improvement project design
  - Success Determination: See SWMP Sections 2.6, 3.4, 4.4, 5.4, 6.4, 7.2, 7.3, 7.4, 8.8, and 8.9
- Staff: 0.3 FTEs
- Budget: $124,000
  - Salaries and Benefits: n/a
  - Operating Budget: $124,000
  - Capital: n/a
  - Debt Service: n/a
  - Transfers: n/a

FY19 Approved Budget (July 1, 2018, through June 30, 2019)

- Source: Facility's Budget
  - Rate Model Type: Part of Facilities Services Major maintenance budget
  - Percent Allocation: 100%
  - Resource Justification: Budget approval process completed June 29, 2018
  - Program Effectiveness: See SWMP Sections 2.6, 3.4, 4.4, 5.4, 6.4, 7.2, 7.3, 7.4, 8.8, and 8.9
  - Resource Allocation Variation: Approx. $150,000 for College and 11th stormwater improvement project installation
  - Success Determination: See SWMP Sections 2.6, 3.4, 4.4, 5.4, 6.4, 7.2, 7.3, 7.4, 8.8, and 8.9
- Staff: 0.3 FTEs
- Budget: $124,000

- Salaries and Benefits: n/a
- Operating Budget: $124,000
- Capital: Approx. $150,000
- Debt Service: n/a
- Transfers: n/a

1.5 Stormwater Management Team

The following positions make up the Stormwater Management Team (SWMT):

1. Stormwater Program Coordinator (Primary SWMP Coordinator): Develops and manages the implementation of SWMP and MS4 Permit compliance activities, administers environmental compliance programs, manages personnel, prepares budgets, develops policies, coordinates infrastructure projects, and maintains rate model databases. This position's primary permit responsibilities include:

   - Capital Project Management
   - Post-Construction Management Program
   - Illicit Discharge Detection and Elimination Program
   - Rate Model Update Program

2. Stormwater Program Specialist: Develops and implements best practice solutions related to water quality compliance monitoring, BMP effectiveness research, and data analysis. This position's primary permit responsibilities include:

   - Water Quality Sampling and Analysis Program
   - Industrial Stormwater Permits (Water Reclamation Facility and Landfill)
   - Community Outreach and Education Program
   - Public Involvement and Participation Program
   - Staff Training Program
   - Illicit Discharge Detection and Elimination Program

3. Stormwater Program Technician: Provides support for SWMP implementation and MS4 Permit compliance activities, environmental compliance programs, sampling, training, inspections, permit reviews, data collection, reporting, and equipment management. This position's primary permit responsibilities include:

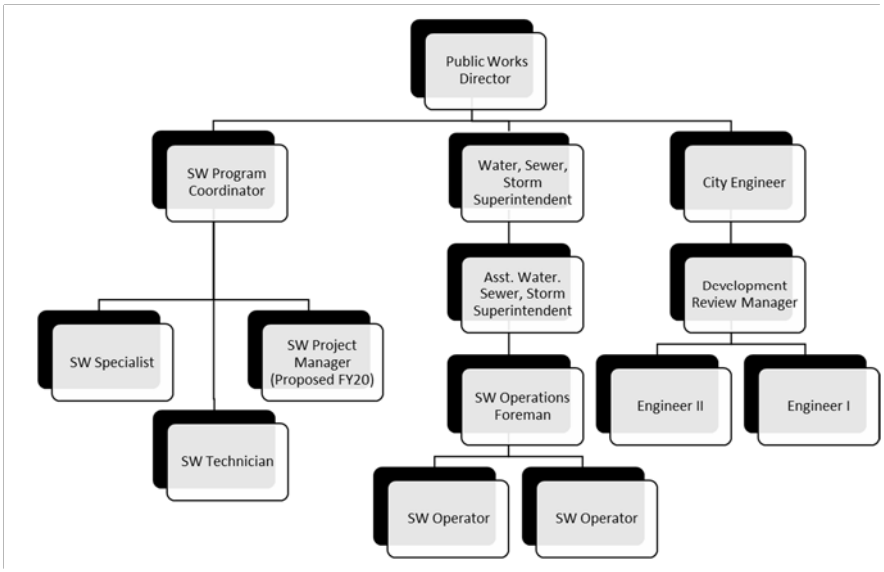
   - Construction-Site Management Program
   - Good Housekeeping Program
   - Illicit Discharge Detection and Elimination Program

4. Engineering Division: Team of four positions that provide the regulation of new and redevelopment projects and the oversight of engineering standards, including City Engineer, Development Review Manager, Engineer II, and Engineer I.

   - Post-Construction Program

5. Future Additions

   - Stormwater Project Manager: Post-Construction and Project Management Programs
   - Internship: Short-term projects



Graphic 1.5.1: Staff structure

The SWMT conducts reoccurring meetings where communication and coordination occur, allowing for the exchange of necessary information. The following is a list of current members:

- Kyle Mehrens, Stormwater Program Coordinator (*Primary SWMP Coordinator*)
- Frank Greenhill, Stormwater Program Specialist
- Cody Flammond, Stormwater Program Technician

The SWMT tracks and compiles all phone call and email questions, requests, and complaints received from the public to gauge programmatic needs and workloads. The following chart includes the totals:

Correspondence Type	Count				
	2018	2019	2020	2021	Total
Resident: Flooding Inquiry or Report	7				7
Resident: Construction Inquiry or Report	22				22
Resident: Water Quality Inquiry or Report	2				2
Resident: Pollution Inquiry or Report	14				14
Resident: Basin Inquiry or Report	14				14
Resident: Outreach Inquiry or Report	2				2
Resident: Rate Model Inquiry	4				4
Professional: Post-Const. Program	47				47
Professional: Pollution Program	4				4
Professional: Const. Program	112				112
Professional: Project Management	16				16
Professional: Education Program	14				14
Professional: Division Administration	9				9
Professional: Water Quality Program	11				11
Professional: Service or Product Solicitation	17				17
Referral to other division	5				5
Total:	**300**				**300**

Graphic 1.5.2: Correspondence-tracking

The following representatives are Subject Matter Experts (SME). SMEs provide guidance related to specific issues, projects, plans, and policy changes. The SWMT and SMEs meet monthly.

- Mike Dilbeck, Stormwater Operations Foreman, Good Housekeeping
- Shawn Kohtz P.E., City Engineer, Post-Construction Program
- Griffin Nielsen E.I., Development Review Engineer, Post-Construction Program
- Anna Russel P.E., Development Review Engineer, Post-Construction Program
- Kellen Gamradt P.E., Project Engineer, Project Management
- Chris Kangas, Strategic Services, Rate Model Updates
- John Alston, Water/Sewer/Storm Superintendent, Good Housekeeping Program
- Nick Pericich, Water/Sewer/Storm Assistant Superintendent, Good Housekeeping Program
- John Vandelinder, Streets Superintendent, Good Housekeeping Program
- Matt Workman, Streets Assistant Superintendent, Good Housekeeping Program

1.6 MS4 Coordination

The MS4s works collaboratively on various programs, including:

- Participation in monthly meetings
- University payment of City stormwater fees
- Performance tracking and reporting
- Project development and implementation
- Inspection forms, training, methodologies, and program documentation
- Pollution event response and resolution
- Storm sewer operation and maintenance
    - The City removes collected debris from select University stormwater treatment units and incorporates totals into SWMP Section 8.0 annually, including:
        - University Field House Downstream Defender Unit
- Water Sampling and Analysis Program
    - The City manages the University's portion of this program, including purchasing equipment, collecting samples/data, analyzing results, and updating SWMP Section 8.0 for the following:
        - Urban Runoff Monitoring
        - In-Stream Wet Weather Monitoring
        - Sediment Reduction Monitoring
        - Long-Term Trend Monitoring
- The City provides the University an updated SWMP by February 1 of each calendar year.

1.7 Affiliations

The MS4 utilizes and engages with a variety of groups through informal relationships, including:

- Montana Stormwater Committee (MSC): An organization formed in 2016 comprised of public and private stormwater industry representatives. The MSC provides a unified voice for state scale policy changes, rules, issues, and initiatives. The MSC meets monthly to discuss relevant topics. Their most recent accomplishment includes the development of Montana's first American Society of Civil Engineers Stormwater Report Card, resulting in a statewide score of D.

- National Municipal Stormwater Alliance (NMSA): An organization formed in 2015 comprised of stormwater industry professionals. The NMSA provides a unified voice for national scale policy changes, rules, issues, and initiatives.
- Montana Department of Environmental Quality (MDEQ): A state agency tasked with the administration and enforcement of the Montana Clean Water Act. MDEQ provides compliance training, conferences, and enforcement in cases where the MS4's resources become exhausted.
- Gallatin Local Water Quality District (GLWQD): A Gallatin County public agency that conducts water quality sampling and community education.
- Montana State Extension Water Quality: A University Extension agency that provides water quality sampling and community education.
- Montana Water Environment Association (MWEA): A Montana organization that represents water, wastewater, and stormwater professionals. MWEA is a member of the Water Environment Federation (WEF), which has over 34,000 members worldwide. WEF is working to raise knowledge regarding stormwater infrastructure, policy, and science at the national level.
- Greater Gallatin Watershed Council (GGWC): An education-based nonprofit organization working to improve waterway health by implementing the WRP.

1.8 Additional Regulatory Responsibilities

The following MPDES permits also fall under the purview of the MS4:

- General Permit for Stormwater Discharges Associated with Construction Activity (MTR100000): Construction projects that disturb one acre or more of land must obtain a stormwater discharge authorization from the MDEQ. The MS4 implements a Construction Management Program detailed in SWMP Section 5.0
- Multi-Sector General Permit for Discharges Associated with Industrial Activity (MTR000000): The MS4's Water Reclamation Facility (WRF) and Landfill obtain authorizations to discharge stormwater from their facilities. MS4 Staff assist WRF and Landfill personnel with required inspections, BMP development, training, reporting, and records keeping.
- General Permit for Construction Dewatering (MTG070000): The Water and Sewer Division completes main break repairs and preventative maintenance in high groundwater areas, both requiring dewatering activities. Pumped water is land applied whenever possible to avoid any potential impacts from this activity and the need for permit coverage.
- General Permit for Disinfected Water and Hydrostatic Testing (MTG770000): The Water and Sewer Division flow hydrants to flush the water distribution pipe network and test hydrants.

1.9 Annual Report

The MS4 submits an individual Annual Report Form, updated SWMP, and relevant documents to the MDEQ by March 1 each year.

1.10 Public Comments

The MS4 considers and responds to all public comment related to the SWMP. To facilitate, a public comment form exists on the MS4's website and is available year round. Also, the MS4 publically notices the SWMP after making annual updates in the Bozeman Daily Chronicle the second and third Sundays of March during each calendar year. Dates include:

- 2019: March 10th and 17th

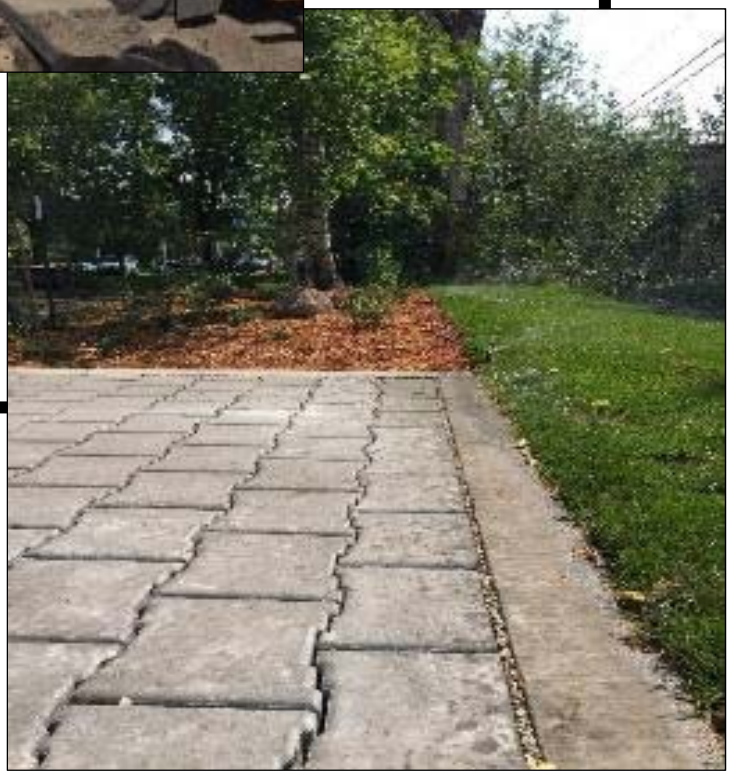
The MS4 received the following comments:

#	Date	Participant	Comment	MS4 Response
1	n/a			

Graphic 1.10.1: Public comments

Section 2.0
Capital Project Program

Graphic 2.0.1: Stormwater treatment unit installation



Graphic 2.0.2: Permeable pavers

2.1 Introduction

The MS4 strives to improve waterway health, protect public safety, and comply with its MS4 Permit through the completion of projects that:

- Replace aged storm sewer pipes
- Construct regional treatment projects
- Install localized green infrastructure
- Rehabilitate surface conveyances
- Acquire specialized inspection and maintenance equipment

SWMP Section 2.0 details the following components necessary to administer the MS4's Capital Project Program, including:

- Action Plan
- Future Projects
- Ongoing or Completed Projects
- Pollutant Reduction Totals
- Performance Measures

2.2 Total Maximum Daily Load (TMDL) Action Plan

The MS4 allocates $650,000 per year towards the design and construction of structural and treatment infrastructure projects to improve the integrity of the stormwater collection network, expand system conveyance, and meet water quality requirements.

From a structural standpoint, the MS4 replaces infrastructure with deficiencies, capacity limitations, and expired life cycles, focusing the majority of their work in the downtown core where over six miles of 100-year old vitrified clay pipes exist.

From a treatment standpoint, the MS4 implements specific projects to address 303(d) listed water quality impairments to the maximum extent practicable. For purposes of permit term, the MS4 prioritizes the following waterways:

1. Bozeman Creek is the highest priority because of its total stormwater discharge points, known impairments, degraded state, and, the fact that it is the only waterway with a non-zero MS4 Waste Load Allocation (WLA). According to the TMDL, Total Suspended Solids (TSS) contributions from the MS4 to Bozeman Creek require a 37% or 81 tons/year reduction.
2. Mandeville Creek is the second highest priority waterway because of its total stormwater discharge points, known impairments, shared responsibilities between co-permittees, and its degraded state. The MS4 has previously made investments to reduce loads to Mandeville Creek and plans to continue pollution reduction efforts as this MS4 General Permit term progresses.
3. Three other impaired waterways exist that receive benefits from the MS4's broad programmatic efforts, such as community education, pollution event response, and construction site management. These waterways include the East Gallatin River, Bridger Creek, and Rocky Creek.

The MS4 targets pollutants of concern for its impaired waterbodies by taking the following project identification and development strategy:

1. Mitigate significant impacts through industry standard structural treatment technologies, such as mechanical separation, confirmed to achieve 50% TSS removal through independent certification programs. This step allows the MS4 to triage the system, installing effective and

maintainable treatment systems near stormwater discharge points for the MS4's large urban drainage areas currently lacking treatment before discharge.

2. Develop, implement, and maintain sustainable operation and education-based programs and initiatives, such as street sweeping, infrastructure cleaning, and community outreach, that target pollutants of concern.
3. Collect and analyze stormwater runoff, in-stream water quality, BMP effectiveness, and long-term monitoring data using an array of industry-standard gages and equipment to plan future investments and initiatives. This step allows the MS4 to monitor its pollutant reductions, impaired waterbody improvement, and investment and conduct program self-evaluation.
4. Enhance pollutant reductions using targeted projects, such as boulevard infiltration galleries, verified to achieve 100% TSS removal by capturing and infiltrating the water quality event. This step allows the MS4 to fine-tune the stormwater system to optimize treatment in larger urban watersheds and treat stormwater in smaller urban watersheds not suitable for larger projects.

2.3 Future Projects

The MS4 prepares a five-year Capital Improvement Plan (CIP) that outlines future infrastructure projects annually. The CIP process is open for public comment, approved by the City Commission, and incorporated into the fiscal year's budget. The MS4 accounts for the following when preparing CIPs:

- Urban Waterway and Watershed Priority
- Development and Land Use
- Infrastructure Condition Analysis
- Programmatic Goals
- Available Budget
- Project Coordination

The MS4 maintains the following performance metrics that align with the programmatic goals to track TMDL Action Plan effectiveness and identify future needs:

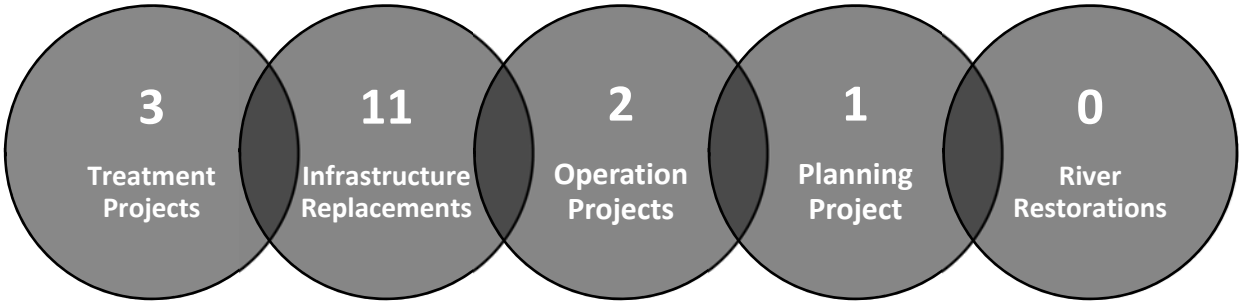
1. River Health Projects: Comply with the MS4's stormwater permit and improve water quality by preventing the discharge of 91 tons of pollutants into rivers annually (Bozeman Creek: 81 tons, Mandeville Creek: 10 tons).
    - Benefit: Reduced permit risk, improved public safety, and a healthier environment
    - Driving Policy: Bronze Level of Service, approx. $200,000 per year
    - Risk: Medium (adequate funding, permit requirements subject to change)
    - Five-Year Planned Investment (FY20-24): 4 Projects, $550,000
    - Percent Complete:
        - 2017: 25%
        - 2018: 56%
        - 2019: TBD
        - 2020: TBD
        - 2021: TBD
        - 2030 (estimated): 100%
2. Deferred Maintenance Projects: Replace six miles of structurally deficient and undersized historic storm sewer infrastructure throughout the downtown core.
    - Benefit: Reduced urban flooding and improved public safety
    - Driving Policy: Bronze Level of Service, approx. $450,000 per year

- Risk: Low (adequate funding)
- Five-Year Planned Investment (FY20-24): 10 Projects, $1.9 Million
- Percent Complete:
    - 2017: 3%
    - 2018: 4%
    - 2019: TBD
    - 2020: TBD
    - 2021: TBD
    - 2030 (estimated): 100%

3. Utility Operation Projects: Maintain 20% (+/-2.5%) of city-owned storm sewer annually.

- Benefit: Reduced urban flooding, longer infrastructure lifecycles, and improved public safety
- Driving Policy: Bronze Level of Service
- Risk: Low (adequate funding, rapid growth)
- Five-Year Planned Investment (FY20-24): 2 Projects, $200,000
- Percent Complete:
    - 2017: 18.1%
    - 2018: 21.6%
    - 2019: TBD
    - 2020: TBD
    - 2021: TBD
    - 2030 (estimated): 16%

MS4 plans to complete the following projects, including:



Graphic 2.3.1: Future projects

1. Utility Operation Project - Stormwater Facility Plan Update

- ID: STUO01
- Year: FY20
- Budget: $150,000
- Description: The project includes hiring a contractor to update the City's Stormwater Facility Plan last revised in 2007. The City has made significant programmatic, operational, and administrative changes over the past ten years in response to evolving environmental regulations, growth, and aging infrastructure. An updated Stormwater Facility Plan will assist Staff in identifying high-priority infrastructure deficiencies, future needs, and determine the City's regulatory standing with stormwater permit regulations.

- Alternatives Considered: Staff will continue implementing the recommendations provided in the 2007 Stormwater Facility Plan.
- Advantages of Approval: An updated Stormwater Facility Plan provides Staff a framework, action plan, and third party professional oversights helping the City achieve its programmatic goals, which include complying with environmental regulations, improving waterway health, protecting public safety, and managing infrastructure.
- Additional Operating Cost in the Future: None.

2. Deferred Maintenance Project – Downtown Trunk Line Rehabilitation (Phase 1)

   - ID: STDM01
   - Year: FY20
   - Budget: $400,000
   - Description: The project includes designing and rehabilitating 2,000 feet of storm sewer pipe beneath the alley located between Main Street and Mendenhall Street, and beneath North Rouse from Main Street to East Villard Street. The current pipe consists of historical materials throughout its length, including brick, vitrified clay, and concrete. The pipe is over 100 years old, is in poor structural condition (contains 42 identified deficiencies), and conveys significant stormwater flows generated from a 330-acre urban drainage basin, making it a high priority for rehabilitation.
   - Alternatives Considered: None. The pipe is a critical component of the City's public storm sewer network, and further deference will impact public safety and increase flood risk in the event of a failure. Further, internally managed spot repairs - which prolong a pipe's life – are unfeasible due to the pipe's location, depth, condition, and size.
   - Advantages of Approval: The project will ensure the pipe conveys stormwater as originally designed and intended. The project collaborates with the Montana Department of Transportation's (MDT) reconstruction of North Rouse Avenue. MDT will provide a cost-share commensurate with their contribution to the section of pipe within their right-of-way. Completion of FY20 conveyance projects will bring the City to 21% of its deferred maintenance goal set by the City Commission during the Stormwater Utility's development.
   - Additional Operating Cost in the Future: Stormwater Personnel will complete maintenance of the pipe on a five-year reoccurring schedule, including flushing, vacuuming, and inspection.

3. Deferred Maintenance Project – Manley Ditch Rehabilitation

   - ID: STDM02
   - Year: FY20
   - Budget: $100,000
   - Description: The project includes designing and rehabilitating 1,500 feet of Manley Ditch located east of Manley Road. Ther ditch conveys stormwater generated from a 58-acre urban drainage basin. The ditch includes a vegetated swale that has experienced significant degradation, resulting in a nonfunctional conveyance and obstructed railroad-owned culvert crossing. Specific issues include sediment deposition, overgrown vegetation, an illegal bulkhead, and bank erosion.
   - Alternatives Considered: None. The ditch is a critical component of the City's public storm sewer network, and further deference will impact public safety and further heighten ongoing flooding impacts. Also, the ditch's location, length, and tight grades make an internally managed repair unfeasible.

- Advantages of Approval: The project will ensure the ditch conveys stormwater as originally designed and intended. Completion of FY20 conveyance projects will bring the City to 21% of its deferred maintenance goal set by the City Commission during the Stormwater Utility's development.

4. Deferred Maintenance Project – Downtown Trunk Line Rehabilitation (Phase 2)

   - ID: STDM03
   - Year: FY21
   - Budget: $350,000
   - Description: The project includes designing and rehabilitating 1,419 feet of storm sewer pipe beneath the alley located between Main Street and Mendenhall Street, and is the second and final phase of the Downtown Trunk Line Rehabilitation Project. The current pipe consists of historical materials throughout its length, including brick, vitrified clay, and concrete. The pipe is over 100 years old, is in poor structural condition (contains 27 identified deficiencies), and conveys significant stormwater flows generated from a 273-acre urban drainage basin, making it a high priority for rehabilitation.
   - Alternatives Considered: None. The pipe is a critical component of the City's public storm sewer network, and further deference will impact public safety and increase flood risk in the event of a failure. Further, internally managed spot repairs - which prolong a pipe's life – are unfeasible due to the pipe's location, depth, condition, and size.
   - Advantages of Approval: The project will ensure the ditch conveys stormwater as originally designed and intended. Completion of FY21 conveyance projects brings the City to 27% of its deferred maintenance goal set by the City Commission during the Stormwater Utility's development.
   - Additional Operating Cost in the Future: Stormwater Personnel will complete maintenance of the pipe on a five-year reoccurring schedule, including flushing, vacuuming, and inspection.

5. River Health Project – Downtown Mechanical Stormwater Treatment (Phase 3)

   - ID: STRH01
   - Year: FY21
   - Budget: $300,000
   - Description: The project includes designing and installing two (2) stormwater mechanical separation units near the intersections of North Rouse Avenue and East Peach Street, and North Rouse Avenue and East Tamarack Street. Staff proposes to target these locations because the roads, parking lots, yards, driveways, and drainage systems contained within their urban watershed have a direct connection to Bozeman Creek, meaning no removal of stormwater pollutants occurs.
   - Alternatives Considered: None. City staff has not identified any alternative stormwater treatment approaches with comparable maintenance requirements, construction footprints, and pollutant removal efficiencies, especially considering the large size of the drainage basins targeted.
   - Advantages of Approval: The units will treat stormwater generated from 138-acres of urban development, and collect over 20-tons of sediment, litter, nutrients, oil, and metals annually. Pollutant removal will improve public safety, help restore Bozeman Creeks' aquatic habitat, and reduce stormwater permit violation risk. Completion of this project will bring the City to 81% of its water quality goal set by the City Commission during the Stormwater Utility's development.

- Additional Operating Cost in the Future: Stormwater Operations Personnel will complete maintenance semi-annually, including the removal of collected debris using existing vacuuming equipment. Staff will then store and dry debris at the City's Stormwater Waste Management Facility before hauling to the landfill for final disposal.

6. River Health Project – Downtown Mechanical Stormwater Treatment (Phase 4)

   - ID: STRH02
   - Year: FY22
   - Budget: $250,000
   - Description: The project includes designing and installing two (2) stormwater mechanical separation units near the intersections of South Black Avenue and East Cleveland Street, and South Bozeman Avenue and East Cleveland Street. Staff proposes to target these locations because the roads, parking lots, yards, driveways, and drainage systems contained within their urban watershed have a direct connection to Matthew Bird Creek (a tributary of Bozeman Creek), meaning no removal of stormwater pollutants occurs.
   - Alternatives Considered: None. City staff has not identified any alternative stormwater treatment approaches with comparable maintenance requirements, construction footprints, and pollutant removal efficiencies, especially considering the large size of the drainage basins targeted.
   - Advantages of Approval: The units will treat stormwater generated from 193-acres of urban development, and collect over 27-tons of sediment, litter, nutrients, oil, and metals annually. Pollutant removal will improve public safety, help restore Matthew Bird and Bozeman Creeks' aquatic habitat, and reduce stormwater permit violation risk. Completion FY22 treatment projects will bring the City to 100% of its water quality goal set by the City Commission during the Stormwater Utility's development.
   - Additional Operating Cost in the Future: Stormwater Operations Personnel will complete maintenance semi-annually, including the removal of collected debris using existing vacuuming equipment. Staff will then store and dry debris at the City's Stormwater Waste Management Facility before hauling to the landfill for final disposal.

7. River Health Project – Regional Stormwater Collection Facility (Beal Park)

   - ID: STRH03
   - Year: FY22
   - Budget: $200,000
   - Description: This project includes designing and constructing a regional stormwater collection and infiltration facility near the intersection of North Black Avenue and East Villard Street. Staff proposes to target this location because the roads, parking lots, yards, driveways, and drainage systems contained within its urban watershed have a direct connection to Bozeman Creek, meaning no removal of stormwater pollutants occurs.
   - Alternatives Considered: Construction of decentralized and smaller boulevard infiltration-based facilities spread throughout the targeted basin. This approach would result in eight to nine times the cost as a regional facility to achieve similar stormwater quality and quantity reduction goals.
   - Advantages of Approval: The facility will capture, store, and infiltrate stormwater generated from 52-acres of urban development, and collect over 14-tons of sediment, litter, nutrients, oil, and metals annually. Pollutant removal will improve public safety, help restore Bozeman Creeks' aquatic habitat, and reduce stormwater permit violation risk. Also, the facility will improve urban resiliency by capturing urban flood flows that would otherwise take up

valuable capacity in the downstream system. Completion of FY22 treatment projects will bring the City to 100% of its water quality goal set by the City Commission during the Stormwater Utility's development.

- Additional Operating Cost in the Future: Stormwater Operations Personnel will complete maintenance semi-annually, including the removal of collected debris using existing vacuuming and flushing equipment. Staff will then store and dry debris at the City's Stormwater Waste Management Facility before hauling to the landfill for final disposal.

8. Deferred Maintenance Project – Historic Pipe Replacement Program (FY22)

   - ID: STDM04
   - Year: FY22
   - Budget: $100,000
   - Description: The project includes designing and replacing 583 feet of storm sewer pipe beneath South Black Avenue from East Babcock Street to East Main Street. The current pipe consists of vitrified clay, which is historical material. The pipe is over 100 years old, is in poor structural condition (contains 31 identified deficiencies), and conveys stormwater flows generated from a 28-acre urban drainage basin, making it a high priority for replacement.
   - Alternatives Considered: None. The pipe is a critical component of the City's public storm sewer network, and further deference will impact public safety and increase flood risk in the event of a failure. Further, internally managed spot repairs - which prolong a pipe's life – are unfeasible due to the pipe's location, depth, condition, and size.
   - Advantages of Approval: The project ensures the pipe will effectively convey stormwater under design conditions. Completion of FY22 conveyance projects brings the City to 28% of its deferred maintenance goal set by the City Commission during the Stormwater Utility's development.
   - Additional Operating Cost in the Future: Stormwater Personnel will complete maintenance of the pipe on a five-year reoccurring schedule, including flushing, vacuuming, and inspection.

9. Operation Support Project – Sediment Disposal Facility Asphalt Repair

   - ID: STOS01
   - Year: FY22
   - Budget: $50,000
   - Description: The project includes the maintenance and repair of the asphalt surface located at the City's Stormwater Waste Disposal Facility. The facility is used daily to store, process, and dry waste generated from reoccurring stormwater operations.
   - Alternatives Considered: Prolong asphalt maintenance risking further degradation of drivable surfaces and increased deferred expense.
   - Advantages of Approval: The project ensures the facility remain functional, allowing staff to meet the City's level of service goals.
   - Additional Operating Cost in the Future: None

10. Deferred Maintenance – Annual Unplanned Pipe Rehabilitation and Drainage Projects

    - ID: STDM05
    - Year: FY22
    - Budget: $50,000
    - Description: An annual program that provides funding for the design and construction of various pipe rehabilitation, drainage, and treatment projects that improve the structural

integrity and conveyance capacity of the City's storm sewer system. Unplanned funds allow Staff to respond to infrastructure needs that arise from reoccurring system inspection and partner with other Public Works' projects, such as local SID street reconstructions if approved.

- Alternatives Considered: Staff assessed the potential of completing all pipe rehabilitation and drainage projects internally; however, determined this approach would significantly reduce resources applied towards critical reoccurring infrastructure maintenance.
- Advantages of Approval: The allocation of unplanned funds allows Staff to be proactive in the repair and replacement of stormwater infrastructure that has or is likely to fail, increasing system efficiency and reducing City liability.
- Additional Operating Cost in the Future: Stormwater Operations Personnel will complete the maintenance of projects as required.
- Additional Funding Sources: None

11. Deferred Maintenance Project – North 9th Avenue Ditch Rehabilitation

- ID: STDM06
- Year: FY23
- Budget: $150,000
- Description: The project includes designing and rehabilitating 900 feet of stormwater conveyance ditch located near North 9th Avenue from West Villard Street to West Peach Street. The ditch conveys stormwater generated from a 142-acre urban drainage basin and includes a vegetated swale that has experienced significant degradation. Specific issues include sediment deposition, overgrown vegetation, and bank erosion.
- Alternatives Considered: None. The ditch is a critical component of the City's public storm sewer network, and further deference will impact public safety and increase flood risk for adjacent properties. Also, the ditch's location, length, and tight grades make an internally managed repair unfeasible.
- Advantages of Approval: The project ensures the ditch will convey stormwater as designed for effective system operation. Completion of FY23 conveyance projects will bring the City to 40% of its deferred maintenance goal set by the City Commission during the Stormwater Utility's development.

12. Deferred Maintenance Project – Historic Pipe Replacement Program (FY23)

- ID: STDM07
- Year: FY23
- Budget: $475,000
- Description: The project includes designing and replacing 2,623 feet of storm sewer pipe located throughout the City's historic downtown core. The current pipes consist of vitrified clay, which is historical material. The pipes are over 100 years old, are in poor structural condition (contain 162 identified deficiencies), and convey stormwater flows generated from numerous large urban drainage basins, making them high priorities for replacement.
- Alternatives Considered: None. The pipes are a critical component of the City's public storm sewer network, and further deference will impact public safety and increase flood risk in the event of a failure. Further, internally managed spot repairs - which prolong a pipe's life – are unfeasible due to the pipes' locations, depths, conditions, and sizes.
- Advantages of Approval: The project ensures the pipes will effectively convey stormwater under design conditions. Completion of FY23 conveyance projects brings the City to 40% of

its deferred maintenance goal set by the City Commission during the Stormwater Utility's development.

- Additional Operating Cost in the Future: Stormwater Personnel will complete maintenance of the pipe on a five-year reoccurring schedule, including flushing, vacuuming, and inspection.

13. Deferred Maintenance – Annual Unplanned Pipe Rehabilitation and Drainage Projects

    - ID: STDM08
    - Year: FY23
    - Budget: $25,000
    - Description: An annual program that provides funding for the design and construction of various pipe rehabilitation, drainage, and treatment projects that improve the structural integrity and conveyance capacity of the City's storm sewer system. Unplanned funds allow Staff to respond to infrastructure needs that arise from reoccurring system inspection and partner with other Public Works' projects, such as local SID street reconstructions if approved.
    - Alternatives Considered: Staff assessed the potential of internal crews completing all pipe rehabilitation and drainage projects; however, determined this approach would significantly reduce resources applied towards critical reoccurring infrastructure maintenance.
    - Advantages of Approval: The allocation of unplanned funds allows Staff to be proactive in the repair and replacement of stormwater infrastructure that has or is likely to fail, increasing system efficiency and reducing City liability.
    - Additional Operating Cost in the Future: Stormwater Operations Personnel will complete the maintenance of projects as required.

14. Deferred Maintenance Project – Middle Creek Ditch Rehabilitation

    - ID: STDM09
    - Year: FY24
    - Budget: $300,000
    - Description: The project includes designing and rehabilitating 1,500 feet of stormwater conveyance ditch located near North 15th Avenue from West Main Street to West Beall Street. Ther ditch conveys stormwater generated from a 42-acre urban drainage basin. The ditch includes a vegetated swale that has experienced significant degradation. Specific issues include sediment deposition, overgrown vegetation, and bank erosion.
    - Alternatives Considered: None. The ditch is a critical component of the City's public storm sewer network, and further deference will impact public safety and increase flood risk for adjacent properties. Also, the ditch's location, length, and tight grades make an internally managed repair unfeasible.
    - Advantages of Approval: The project ensures the ditch will convey stormwater as designed for effective system operation. Completion of FY24 conveyance projects will bring the City to 51% of its deferred maintenance goal set by the City Commission during the Stormwater Utility's development.

15. Deferred Maintenance Project – Historic Pipe Replacement Program (FY24)

    - ID: STDM10
    - Year: FY24
    - Budget: $275,000

- Description: The project includes designing and replacing 1,400 feet of storm sewer pipe located through the City's historic downtown core. The current pipes consist of vitrified clay, which is historical material. The pipes are over 100 years old, are in poor structural condition (contain 54 identified deficiencies), and convey stormwater flows generated from numerous large urban drainage basins, making them high priorities for replacement.
- Alternatives Considered: None. The pipes are a critical component of the City's public storm sewer network, and further deference will impact public safety and increase flood risk in the event of a failure. Further, internally managed spot repairs - which prolong a pipe's life – are unfeasible due to the pipes' locations, depths, conditions, and sizes.
- Advantages of Approval: The project ensures the pipe convey stormwater as designed for effective system operation. Completion of FY24 conveyance projects brings the City to 51% of its deferred maintenance goal set by the City Commission during the Stormwater Utility's development.
- Additional Operating Cost in the Future: Stormwater Personnel will complete maintenance of the pipe on a five-year reoccurring schedule, including flushing, vacuuming, and inspection.

16. Deferred Maintenance – Annual Unplanned Pipe Rehabilitation and Drainage Projects

- ID: STDM11
- Year: FY24
- Budget: $75,000
- Description: An annual program that provides funding for the design and construction of various pipe rehabilitation, drainage, and treatment projects that improve the structural integrity and conveyance capacity of the City's storm sewer system. Unplanned funds allow Staff to respond to infrastructure needs that arise from reoccurring system inspection and partner with other Public Works' projects, such as local SID street reconstructions if approved.
- Alternatives Considered: Staff assessed the potential of completing all pipe rehabilitation and drainage projects internally; however, determined this approach would significantly reduce resources applied towards critical reoccurring infrastructure maintenance.
- Advantages of Approval: The allocation of unplanned funds allows Staff to be proactive in the repair and replacement of stormwater infrastructure that has or is likely to fail, increasing system efficiency and reducing City liability.
- Additional Operating Cost in the Future: Stormwater Operations Personnel will complete the maintenance of projects as required.

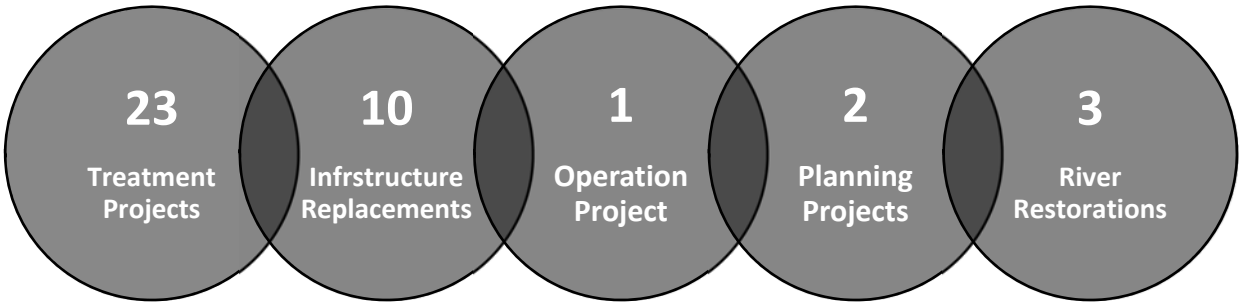
17. Operation Support Project - Stormwater TV Van Refurbishment

- ID: STRM26
- Year: Unscheduled
- Budget: $125,000
- Description: Refurbishment of existing Stormwater TV van routinely completed every five years to replace worn parts and remain consistent with new technology. This equipment is critical in assessing structural failures in the City's underground stormwater system and allows the City to identify troubled areas and allocate resources to fix. This process significantly improves operation efficiency, budget allocation, and project planning. Deferring this purchase would result in existing equipment to exceed their effective lifespans, resulting in unexpected breakdowns and inefficiencies
- Alternatives Considered: Purchase a new TV Van at an estimated cost of $250,000

- Advantages of Approval: Provides for the replacement of critical maintenance equipment
- Additional Operating Cost in the Future: Reoccurring vehicle and equipment maintenance

2.4 Ongoing or Completed Projects

The MS4 has or is in the process of completing the following projects:



Graphic 2.4.1: Ongoing or completed projects

1. Treatment Project: Mechanical Separation Unit Installation – N. Black and W. Main
   - Purpose: Reduce sediment loads
   - Type: TBD
   - Expected Treatment Efficiency: 50% TSS Reduction
   - Treatment Area: ≈28 Acres
   - Discharge Location: Bozeman Creek
   - Date of Completion: Planned completion is spring 2019
   - Co-Benefits: Progress towards WLA
2. Treatment Project: Mechanical Separation Unit Installation – N. Bozeman and W. Main
   - Purpose: Reduce sediment loads
   - Type: TBD
   - Expected Treatment Efficiency: 50% TSS Reduction
   - Treatment Area: ≈29 Acres
   - Discharge Location: Bozeman Creek
   - Date of Completion: Planned completion is spring 2019
   - Co-Benefits: Progress towards WLA
3. Infrastructure Replacement: N. Rouse Avenue Stormwater Upgrades (Phase 2)
   - Purpose: Improve drainage for N. Rouse Avenue
   - Type: Inlets, manholes, and mains
   - Expected Treatment Efficiency: n/a
   - Treatment Area: n/a
   - Discharge Location: Bozeman Creek
   - Date of Completion: Planned completion is summer 2019
   - Co-Benefits: Flood control and water quality
4. Treatment Project: Mechanical Separation Units 1-5: Rouse Reconstruction Phase 2
   - Purpose: Reduce sediment loads
   - Type: TBD

- Expected Treatment Efficiency: 50% TSS Reduction
- Treatment Area: ≈94 Acres
- Discharge Location: Bozeman Creek
- Date of Completion: Planned completion is summer 2019
- Co-Benefits: Progress towards WLA

5. Treatment Project: Boulevard Infiltration Structure – Mason and Tracy

   - Purpose: Reduce sediment loads
   - Type: Ultra Rain Garden
   - Expected Treatment Efficiency: 100% TSS Reduction
   - Treatment Area: ≈2 Acres
   - Discharge Location: Matthew Bird Creek (a tributary of Bozeman Creek)
   - Date of Completion: Planned completion is spring 2019
   - Co-Benefits: Progress towards WLA and peak flow reduction

6. Planning Project: Bozeman Creek Culvert Assessment (Mendenhall to Babcock)

   - Purpose: Determine structural integrity of critical culver/bridge under Main Street
   - Type: Analysis
   - Expected Treatment Efficiency: n/a
   - Treatment Area: n/a
   - Discharge Location: Planned completion is spring 2019
   - Co-Benefits: Public safety

7. Treatment Project: Mechanical Separation Unit Installation – 11th and College (MSU Project)

   - Purpose: Reduce sediment loads
   - Type: TBD
   - Expected Treatment Efficiency: 50% TSS Reduction
   - Treatment Area: ≈60 Acres
   - Discharge Location: Mandeville Creek
   - Date of Completion: Planned completion is August 1, 2019
   - Co-Benefits: n/a

8. Infrastructure Replacement: S. Tracy Reconstruction Stormwater Upgrades

   - Purpose: Improve drainage for S. Tracy Ave.
   - Type: Inlets, manholes, and 2,850 ft. of mains
   - Expected Treatment Efficiency: n/a
   - Treatment Area: n/a
   - Discharge Location: Bozeman Creek
   - Date of Completion: Summer 2018 and 2019
   - Co-Benefits: Flood control and water quality

9. Treatment Project: Mechanical Separation Unit Installation – N. 3rd and W. Main

   - Purpose: Reduce sediment load to Bozeman Creek
   - Type: Contech CDS (6*′ Diameter*)
   - Expected Treatment Efficiency: 50% TSS Reduction
   - Treatment Area: ≈94 Acres
   - Discharge Location: Bozeman Creek
   - Date of Completion: Spring 2018

- Co-Benefits: Progress towards WLA

10. Treatment Project: Mechanical Separation Unit Installation – N. Grand and W. Main
    - Purpose: Reduce sediment load to Bozeman Creek
    - Type: Contech CDS (6′ *Diameter*)
    - Expected Treatment Efficiency: 50% TSS Reduction
    - Treatment Area: ≈58 Acres
    - Discharge Location: Bozeman Creek
    - Date of Completion: Spring 2018
    - Co-Benefits: Progress towards WLA
11. Treatment Project: Mechanical Separation Unit Installation – N. Tracy and W. Main
    - Purpose: Reduce sediment load to Bozeman Creek
    - Type: Contech CDS (6′ *Diameter*)
    - Expected Treatment Efficiency: 50% TSS Reduction
    - Treatment Area: ≈32 Acres
    - Discharge Location: Bozeman Creek
    - Date of Completion: Spring 2018
    - Co-Benefits: Progress towards WLA
12. Infrastructure Replacement: N. Rouse Avenue Stormwater Upgrades (Phase 1)
    - Purpose: Improve drainage for N. Rouse Avenue
    - Type: Inlets, manholes, and mains
    - Expected Treatment Efficiency: n/a
    - Treatment Area: n/a
    - Discharge Location: East Gallatin
    - Date of Completion: Summer 2018
    - Co-Benefits: Flood control and water quality
13. Treatment Project: N. 7th and W. Peach Permeable Pavers Streetscape Project
    - Purpose: Pilot permeable paver use
    - Type: Basalite Pavers
    - Expected Treatment Efficiency: 100% TSS Reduction
    - Treatment Area: .1 Acres
    - Discharge Location: East Gallatin
    - Date of Completion: Spring 2018
    - Co-Benefits: Flood control and water quality
14. Infrastructure Replacement: Baxter Lane Stormwater Upgrades
    - Purpose: Improve drainage for 7th and Baxter
    - Type: Inlets, manholes, and mains
    - Expected Treatment Efficiency: n/a
    - Treatment Area: n/a
    - Discharge Location: Mandeville Creek
    - Date of Completion: Summer 2018
    - Co-Benefits: Flood control and water quality
15. Planning Project: Bozeman Creek Stream Gauge Installation

- Purpose: Data collection
- Type: DNRC Stream Gauge
- Expected Treatment Efficiency: n/a
- Treatment Area: n/a
- Discharge Location: n/a
- Date of Completion: Summer 2018
- Co-Benefits: Includes port for sediment monitoring device

16. Infrastructure Replacement: East Olive Street Stormwater Upgrades

- Purpose: Improve drainage for East Olive Street
- Type: Inlets, manholes, and mains
- Expected Treatment Efficiency: n/a
- Treatment Area: n/a
- Discharge Location: Bozeman Creek
- Date of Completion: Fall 2017
- Co-Benefits: Flood control and water quality

17. Treatment Project: City Hall Patio Permeable Paver Project

- Purpose: LID/Green infrastructure pilot project and community education
- Type: Pave Drain Permeable Pavers
- Expected Treatment Efficiency: 100% TSS Reduction
- Treatment Area: ≈1,000 square feet
- Discharge Location: Bozeman Creek
- Date of Completion: Summer 2017
- Co-Benefits: Progress towards WLA

18. Infrastructure Replacement: Inlet Replacements

- Purpose: Reduce sediment to Bozeman Creek and flood control
- Type: Standard inlet with 9" sump
- Expected Treatment Efficiency: Unknown
- Treatment Area: 23 inlets
- Discharge Location: Bozeman Creek
- Date of Completion: Fall 2017
- Co-Benefits: Progress towards WLA

19. Infrastructure Replacement: Pipe Replacements (S. Black and S. Bozeman)

- Purpose: Flood control
- Type: 15" SDR
- Expected Treatment Efficiency: n/a
- Treatment Area: 600'
- Discharge Location: Bozeman Creek
- Date of Completion: Fall 2017
- Co-Benefits: n/a

20. Treatment Project: Mechanical Separation Unit Installation – N. Rouse and E. Griffin

- Purpose: Reduce sediment load to Bozeman Creek
- Type: Contech CDS (*6' Diameter*)
- Expected Treatment Efficiency: 80% TSS Reduction

- Treatment Area: ≈ 14 Acres
- Discharge Location: Bozeman Creek
- Date of Completion: Fall 2017
- Co-Benefits: Progress towards WLA

21. Treatment Project: Mechanical Separation Unit Installation - N. Rouse and Bridger Center

- Purpose: Reduce sediment load to Bozeman Creek
- Type: Contech CDS (*5' Diameter*)
- Expected Treatment Efficiency: 80% TSS Reduction
- Treatment Area: ≈12 Acres
- Discharge Location: Bozeman Creek
- Date of Completion: Fall 2017
- Co-Benefits: Progress towards WLA

22. Treatment Project: Mechanical Separation Unit Installation - S. Rouse and E. Olive

- Purpose: Reduce sediment load to Bozeman Creek
- Type: Contech CDS (*5' Diameter*)
- Expected Treatment Efficiency: 80% TSS Reduction
- Treatment Area: ≈9 Acres
- Discharge Location: Bozeman Creek
- Date of Completion: Fall 2017
- Co-Benefits: Progress towards WLA

23. Treatment Project: Mechanical Separation Unit Installation – Perkins and E. Peach

- Purpose: Reduce sediment load to Bozeman Creek
- Type: Contech CDS (*4' Diameter*)
- Expected Treatment Efficiency: 80% TSS Reduction
- Treatment Area: ≈ 22 Acres
- Discharge Location: Bozeman Creek
- Date of Completion: Fall 2017
- Co-Benefits: Progress towards WLA

24. Operations Project: Stormwater Operations Disposal Facility

- Purpose: Sediment dewatering and storage
- Type: Asphalt pad with ecology block bays
- Expected Treatment Efficiency: n/a
- Treatment Area: n/a
- Discharge Location: Lined wastewater pond
- Date of Completion: Fall 2017
- Co-Benefits: Facilitates pollutant reduction totals

25. Treatment Project: Mechanical Separation Unit Installation - S. Rouse and E. Lincoln

- Purpose: Reduce sediment load to Bozeman Creek
- Type: Contech CDS (*5' Diameter*)
- Expected Treatment Efficiency: 80% TSS Reduction
- Treatment Area: ≈32 Acres
- Discharge Location: Bozeman Creek
- Date of Completion: Fall 2016

- Co-Benefits: Progress towards WLA

26. Treatment Project: Mechanical Separation Unit Installation - N. 11th and W. Lamme

    - Purpose: Reduce sediment load to Mandeville Creek
    - Type: Contech CDS (*4' Diameter*)
    - Expected Treatment Efficiency: 80% TSS Reduction
    - Treatment Area: ≈7 Acres
    - Discharge Location: Mandeville Creek
    - Date of Completion: Fall 2016
    - Co-Benefits: Located adjacent to High School and includes educational signage

27. Treatment Project: Mechanical Separation Unit, Underground Infiltration Basin, Wash Pad, and Paving Project – Shops Complex

    - Purpose: Reduce sediment load to Bozeman Creek
    - Type: Contech CDS (*4' Diameter*), ADS StormTech, and Inlet Sumps
    - Expected Treatment Efficiency: 80% TSS Reduction for Mechanical Separation Unit and 100% for Underground Infiltration Basin
    - Treatment Area: ≈2 Acres
    - Discharge Location: Bozeman Creek
    - Date of Completion: Fall 2016
    - Co-Benefits: Progress towards WLA

28. Treatment Project: Mechanical Separation Unit Installation – N. Wallace and E. Tamarack

    - Purpose: Reduce sediment load to Bozeman Creek
    - Type: Contech CDS (8' *Diameter*)
    - Expected Treatment Efficiency: 80% TSS
    - Treatment Area: ≈100 Acres
    - Discharge Location: Bozeman Creek
    - Date of Completion: November 2016
    - Co-Benefits: Progress towards WLA

29. Treatment Project: Underground Infiltration Basin – N. 7th and Baxter

    - Purpose: Reduce localized flooding; reduce sediment load to Mandeville Creek
    - Type: Perforated gravity main embedded in aggregate for storage
    - Expected Treatment Efficiency: 100% TSS
    - Treatment Area: ≈9 Acres
    - Discharge Location: Mandeville Creek
    - Date of Completion: Summer 2016
    - Co-Benefits: Joint water conservation and stormwater LID pilot project

30. Treatment Project: Underground Infiltration Basin – Plum and Avocado

    - Purpose: Reduce localized flooding; reduce sediment load to East Gallatin;
    - Type: ADS StormTech
    - Expected Treatment Efficiency: 100% TSS
    - Treatment Area: ≈14 Acres
    - Discharge Location: Subsurface
    - Date of Completion: Fall 2016
    - Co-Benefits: Resolved localized flooding issue

31. River Restoration: Backwater Slough – Story Mill Park

- Purpose: Reduce sediment load in Bozeman Creek
- Type: Constructed wetland
- Expected Treatment Efficiency: 100% TSS
- Treatment Area: Entire Bozeman Creek Watershed
- Discharge Location: Bozeman Creek
- Date of Completion: Summer 2015
- Co-Benefits: Nutrient uptake, flood mitigation, and wetland restoration

32. River Restoration: Bozeman Creek Meander Construction – Bogert Park

- Purpose: Stream restoration; improve streamside vegetative cover; reduce sediment load due to streambank erosion; flood control
- Type: Excavated meander and pool addition; inset floodplain construction
- Expected Treatment Efficiency: Unknown
- Treatment Area: Entire Bozeman Creek Watershed
- Discharge Location: Bozeman Creek
- Date of Completion: Spring 2017
- Co-Benefits: Education, fish habitat, stream bank stabilization, and flood control

33. River Restoration: Meander the Mandeville Construction Phase 1 – Bozeman High School

- Purpose: Stream restoration; improve streamside vegetative cover; flood control
- Type: Construction of meanders, riffles, and pools
- Expected Treatment Efficiency: Unknown
- Treatment Area: Entire Mandeville Creek Watershed
- Discharge Location: Mandeville Creek
- Date of Completion: 2016
- Co-Benefits: Education, fish habitat, stream bank stabilization, and flood control

34. Treatment Project: LID Infiltration Galleries – University Field House

- Purpose: Reduce sediment load to Mandeville Creek
- Type: LID Infiltration Galleries
- Expected Treatment Efficiency: 100% TSS Reduction
- Treatment Area: 2.4 Acres
- Discharge Location: Mandeville Creek
- Date of Completion: 2016

35. Treatment Project: Mechanical Separation Unit Installation – University Field House

- Purpose: Reduce sediment load to Mandeville Creek
- Type: Hydro International Downstream Defender and Sediment Separator
- Expected Treatment Efficiency: 80% TSS removal
- Treatment Area: 3 Acres
- Discharge Location: Mandeville Creek
- Date of Completion: Fall 2015

36. Treatment Project: Underground Infiltration – Jabs and Wilson Halls

- Purpose: Reduce sediment load to Mandeville Creek
- Type: Underground Infiltration Gallery
- Expected Treatment Efficiency: 100% TSS Reduction

- Treatment Area: 3.9 Acres
- Discharge Location: Subsurface
- Date of Completion: 2016

37. Infrastructure Replacement: Gravity Main Install – 15th and Babcock

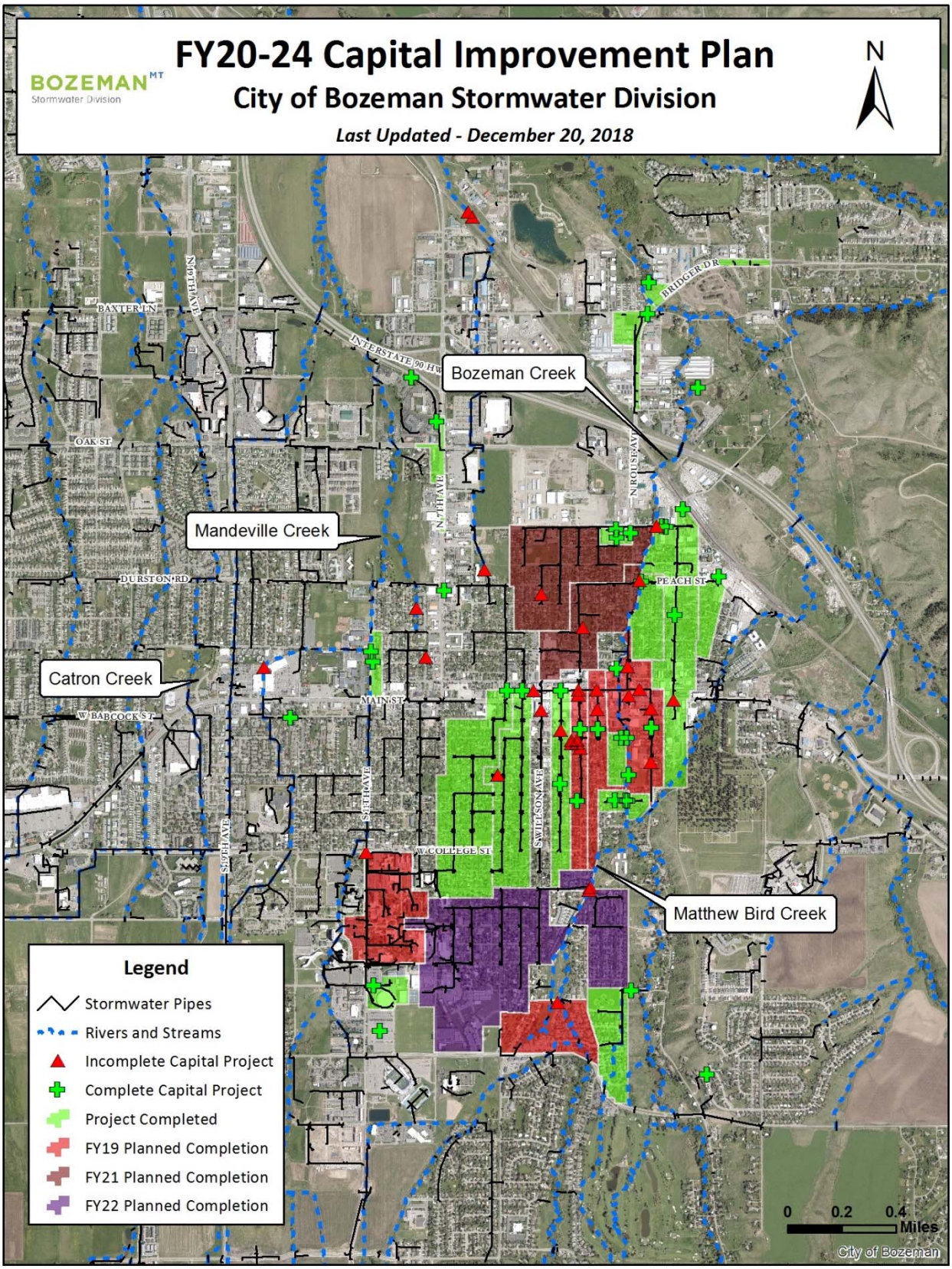
    - Purpose: Eliminate localized flooding issue
    - Type: Construction of underground stormwater main
    - Expected Treatment Efficiency: None
    - Treatment Area: None
    - Discharge Location: Mandeville Creek
    - Date of Completion: Fall 2015

38. Infrastructure Replacement: Wallace Street Reconstruction and Stormwater System Improvements

    - Purpose: Eliminate localized flooding issue and provide treatment
    - Type: Construction of 3,000 feet of underground stormwater mains and new inlets
    - Expected Treatment Efficiency: None
    - Treatment Area: None
    - Discharge Location: Bozeman Creek
    - Date of Completion: 2016

39. Infrastructure Replacement: Story Street Reconstruction and Stormwater System Improvements

    - Purpose: Eliminate localized flooding issue and provide treatment
    - Type: Construction of underground stormwater mains, new inlets, and oil/sand separators
    - Expected Treatment Efficiency: Unknown
    - Treatment Area: 10 Acres
    - Discharge Location: Bozeman Creek
    - Date of Completion: 2015

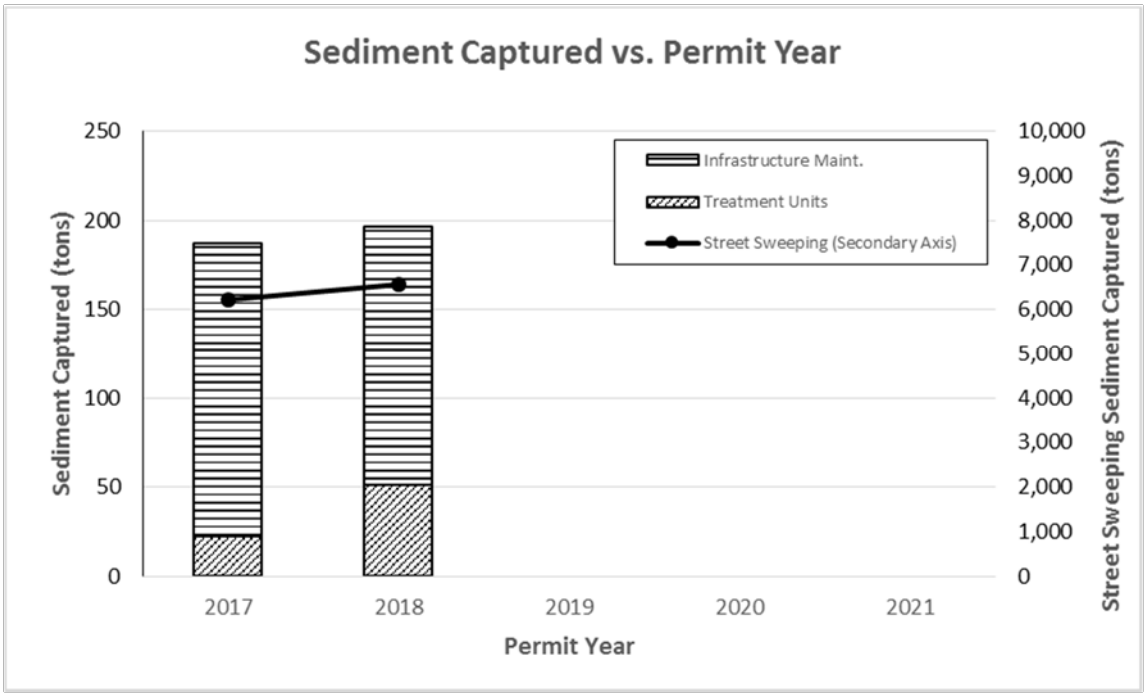


Graphic 2.4.2: Planned and complete stormwater projects

2.5 Pollutant Reduction Totals

The MS4 tracks pollutant reduction totals using a variety of data tracking mechanisms, including:

- Total Suspended Solids (Sediment)
  - Treatment Unit Maintenance: The MS4 calculates tonnage totals by measuring the depth of sediment within each unit before cleaning. The MS4 subtracts a top of sediment depth measurement from a total depth measurement, calculates a volume of sediment (cubic feet) using dimension information for each unit, and converts the volume to tons by using an assumed sand weight ratio of .056 Tons = 1 Cubic Foot of Sand.
    - 2017: 22.6 Tons
      - Bozeman Creek Watershed: 16.3 Tons
      - Mandeville Creek Watershed: 5.0 Tons
      - East Gallatin: 1.3 Tons
    - 2018: 51.0 Tons
      - Bozeman Creek Watershed: 45.7 Tons
      - Mandeville Creek Watershed: 1.0 Tons
      - East Gallatin: 4.3 Tons
  - Infrastructure Maintenance: The MS4 calculates tonnage totals by calculating the depth of sediment vacuumed out of manholes and inlets before cleaning. The MS4 multiplies the area of each assets sump by an assumed 1/2 full depth measurement, multiplies the volume by the total assets maintained for that year, and converts the volume to tons by using an assumed sand weight ratio of .056 Tons = 1 Cubic Foot.
    - 2017: 164.7 Tons
      - City: 117.7 Tons
      - MSU Campus: 46.9 Tons
    - 2018: 145.6 Tons
      - City: 99.3 Tons
      - MSU Campus: 46.3 Tons
  - Street Sweeping: The MS4 calculates tonnage totals for reoccurring, spring, and fall street sweeping operations. The Streets Division tracks cubic yard totals for each of the activities, which is then stored in Cityworks and reported. The MS4 converts yards to tons using an assumed weight ratio of 1.5 Tons = 1 Cubic Yard of Sand for reoccurring and spring street sweeping and converts yards to tons using an assumed weight ratio of .18 Tons = 1 Cubic Yard of Leaves for fall street sweeping.
    - 2017: 6,232 Tons
      - City Citywide: 6,108 Tons
      - MSU Campus: 124 Tons
    - 2018: 6,577 Tons
      - City Citywide: 6,353 Tons
      - MSU Campus: 224 Tons



Graphic 2.5.1: Sediment capture chart

2.6 Performance Measures

The MS4 utilizes performance measures to evaluate programmatic strategies with the goal of optimizing limited resources, increasing efficiencies, and balancing annual workloads.

1. Stream Health Improvement: Final Grade generated by the MS4 that provides a consistent and communicable method for tracking stream health improvement and permit compliance risk. The MS4s target level of service is to facilitate an upward trend annually, which is calculated using the methods described in SWMP Section 8.0. Results include:

   - 2017: n/a
   - 2018: D Grade (60.5%)
   - 2019: TBD
   - 2020: TBD
   - 2021: TBD

2. Community Safety and Urban Flood Risk: Tracking mechanism utilized by the MS4 that provides a consistent and communicable method for tracking community safety and urban flood risk. The MS4 target level of service is to have zero insurance claims filed annually as a result of public storm sewer deficiencies.

   - 2017: 0 claims filed
   - 2018: 0 claims filed
   - 2019: TBD
   - 2020: TBD
   - 2021: TBD

Section 3.0

Public Education Program

Graphic 3.0.1: Construction field academy

Graphic 3.0.2: Dog waste station with educational signage

3.1 Introduction

The MS4 strives to improve waterway health, protect public safety, and comply with its MS4 Permit through the education and involvement of the public by:

- Passively engaging residents through the consistent supply of educational information
- Actively engaging residents, allowing them to take direct action

SWMP Section 3.0 details the following components necessary to administer the MS4's Public Education Program, including:

- Protocol
- Key Audiences
- Ongoing Initiatives
- Future Opportunities

3.2 Protocol

The MS4 educates audiences on stormwater-related issues to reduce the public's contribution of pollutants to waterbodies using the following strategies:

1. Passive Engagement (Education): Involves creating and distributing educational messages targeting pollutant-generating activities. Strategies include:
    - Website
    - Utility bill inserts
    - Internet and radio advertisements
    - Brochures
    - Magazine articles
    - Educational signage
    - Vehicle wraps
2. Active Engagement (Involvement and Enforcement): Includes holding customized interpersonal interactions with various audiences targeting pollutant-generating activities and issuance of violations for repeat offenses. Strategies include:
    - Presentations
    - Meetings
    - Trainings
    - Tours
    - Activities
    - Events
    - Penalties

3.3 Key Audiences

The MS4 targets the following audiences because they complete activities that do not conform to best practice procedures, such as proper erosion control, landscape maintenance, and stormwater basin maintenance.

1. Residents
    - Pollutant(s): Nutrients, floatables, and Total Suspended Solids (TSS)
    - Activity: Yard maintenance

- Rationale: See SWMP Section 8.9
- Outreach Strategy: Passive Engagement and Active Engagement
- Initiatives: See SWMP Section 3.4

2. Construction Industry

   - Target Pollutant(s): TSS, floatables, oil, grease, and concrete waste
   - Targeted Activity: Construction
   - Rationale: See SWMP Section 5.4
   - Outreach Strategy: Passive and Active Engagement
   - Initiatives: See SWMP Section 3.4

3. Youth

   - Pollutant(s): E.coli, nutrients, and TSS
   - Activity: Early education
   - Rationale: Initiation of a paradigm shift and trickle up impact
   - Outreach Strategy: Active Engagement
   - Initiatives: SWMP Section 3.4

4. Home Owner Associations (HOAs) and Property Management Companies

   - Pollutant(s): Nutrients, TSS, E. coli, and flood control
   - Activity: Stormwater basin maintenance
   - Rationale: SWMP Section 6.4
   - Outreach Strategy: Passive and Active Engagement
   - Initiatives: See SWMP Section 3.4

5. Carpet Cleaning and Restoration Companies

   - Pollutant(s): Wash waters
   - Activity: Illegal dumping
   - Rationale: See SWMP Section 4.4
   - Outreach Strategy: Active Engagement
   - Initiatives: See SWMP Section 3.4

6. Pet Owners

   - Pollutant(s): E.coli
   - Activity: Dog waste pickup
   - Rationale: See SWMP Section 8.2
   - Outreach Strategy: Passive Engagement
   - Initiatives: See SWMP Section 3.4

3.4 Ongoing Initiatives

The MS4 completes initiatives to engage, educate, and promote sustainable behavior of its key target audiences. Ongoing initiatives include:

1. Adopt a Storm Drain: A program that actively engages watershed champions, and supplies them with a tool to make a measurable difference in their neighborhoods by periodically cleaning and disposing debris from adopted stormwater inlets. The program also passively engages residents by creating an environment where stormwater-related issues can be discussed and acted upon at a neighborhood level, rather than the City acting as the sole information provider.

A participant in the program is subject to the following: (1) recruitment through meetings, mailers, social media, or informative videos, (2) selection of inlet through online web map application, (3) receipt of a welcome packet, including tools, educational information, and instructions, (4) engagement and troubleshooting with City Staff through email or phone, (5) incentivization through receipt of a yard sign, and other rewards based on seniority, (6) completion of inlet cleaning and debris collection during the spring, summer, and fall, (7) annual reporting of debris collected to City, (8) survey allowing for a feedback mechanism, and (9) receipt of annual thank you and report

- Key Audience: Residents
- Targeted Pollutant(s): E.coli, nutrients, floatables, and TSS
- Strategy: Active and Passive Engagement
- Treatment Area: Citywide
- Distribution Channels: Recruitment, training, troubleshooting, and engagement
- Performance: Total weight of debris collected annually
    - 2017: n/a
    - 2018: n/a
- 2019 Schedule: Pilot program
- 2019 Goal: 250 lbs. of debris

2. Educational Stormwater Video: Seven-minute video that describes the MS4's Program, the context for why stormwater is important, and ways residents/property owners can make a difference. Residents view the video on the City's website or YouTube.

    - Key Audience: Residents
    - Targeted Pollutant(s): E.coli, nutrients, oil, grease, floatables, and TSS
    - Strategy: Passive Engagement
    - Treatment Area: Citywide
    - Distribution Channels: MS4 website and email signature attachment
    - Performance: Total views, watch time, and average view duration tracked annually
        - 2017: 179 views, 722 minutes watch time, and 4:02 average view duration
        - 2018: 493 views, 1,800 minutes watch time, and 3:41 average view duration
    - 2019 Schedule: Maintain video, add to City Public Broadcasting Channel
    - 2019 Goal: Repeat 2018 view count +/-5%

3. Dog-Waste Campaign: Campaign devoted to educating residents about the importance of dog waste collection and disposal.

    - Key Audience: Residents
    - Targeted Pollutant(s): E.coli
    - Strategy: Passive Engagement
    - Treatment Area: Citywide
    - Distribution Channels: Strategic signage placed in high pedestrian and dog use areas.
    - Performance: Tonnage tracked annually by calculating the total amount of dog waste collected by the Parks Division at all MS4 maintained stations.
        - 2017: 19.5 Tons
        - 2018: 20.6 Tons
    - 2019 Schedule: Maintain dog waste signs, add urban specific signs in four locations

- 2019 Goal: Repeat 2018 collection total +/-5%

4. Vehicle Decal Wraps: Educational signage installed on the MS4's vacuum truck and street sweeper that visually displays the connection between the urban areas and waterways.

   - Key Audience: Residents
   - Targeted Pollutant(s): E.coli, nutrients, oil, grease, floatables, and TSS
   - Strategy: Passive Engagement
   - Treatment Area: Citywide
   - Distribution Channel: Vehicle use
   - Performance: Stormwater operator hours
     - 2017: 4,300 hours
     - 2018: 5,400 hours
   - 2019 Schedule: Maintain decals
   - 2019 Goal: Repeat operator hours +/-5%

5. Website: Publically accessible site that includes a variety of information, spanning from what stormwater is, how to report a pollution event, rate model information, post-construction design standards, and more. Address: www.bozeman.net/government/stormwater.

   - Key Audience: Residents, Home Owner Associations, and Contractors
   - Targeted Pollutant(s): E.coli, nutrients, oil, grease, floatables, and TSS
   - Strategy: Passive Engagement
   - Treatment Area: Citywide
   - Distribution Channels: Available to the public via the internet
   - Performance: Total unique page views tracked by Google Analytics
     - 2017: 677 Views
     - 2018: 1,225 Views
   - 2019 Schedule: Maintain website
   - 2019 Goal: Repeat total unique page views +/-5%

6. General Outreach: Information developed by the MS4 and applied in various settings focused on providing general stormwater information and soliciting public participation.

   - Key Audience: Residents
   - Targeted Pollutant(s): E.coli, nutrients, oil, grease, floatables, and TSS
   - Strategy: Active Engagement
   - Treatment Area: Entire MS4
   - Distribution Channels: Presentations, conferences, community events, and advertisements
   - Performance: Total events
     - 2017: 10 (Green Drinks Event, MSU Class Presentations, GLWQD Board Presentation, (2) MSAWWA Conference Presentation, SWMBIA Home Show Booth, Environment Summit Community Event, Water Works Art Initiative, Gallatin Watershed Sourcebook, Breaking Ground Advertisement)
     - 2018: 15 (Montana DNRC Water Summit Presentation, MDEQ Stormwater Conference Presentation, MDEQ Stormwater Conference Tour, Parade of Homes Garden Tour, Gallatin College Presentation, MSU Landscape School Presentation, Stream Team Training, City Commission Emergency Ordinance Presentation, City Commission Capital and Budget Presentation, Gallatin Watershed Sourcebook Creation and Distribution,

Water and Society Class Presentation, Horticulture 201 Stormwater Design Project, (2) Student Led Campus Cleanup Events: Loose Litter and Cigarettes, Campus Cleanup Event)

- 2019 Schedule: Identify and pursue public education opportunities
- 2019 Goal: Complete ten events

7. Construction Training: Training designed to educate contractors on proper selection and use of best management practices (BMPs). The MS4 holds training tailored to various education levels, construction activities, and inspection procedures. Further, the MS4 maintains a Construction Program that includes permits, processes, and materials tailored to this group also described in SWMP Section 5.0.

   - Key Audience: Contractors and Engineers
   - Targeted Pollutant(s): TSS, floatables, oil, grease, and concrete waste
   - Strategy: Active and Passive Engagement
   - Treatment Area: Citywide
   - Distribution Channels: Best Management Practices Manual and conducting annual training
   - Performance: Annual construction-site audit earned score (see SWMP Section 5.4)
     - 2017: n/a
     - 2018: 33%
   - 2019 Schedule: See SWMP Section 5.0
   - 2019 Goal: Improve the audit score by 10%

8. Project WET Curriculum: Class exercises administered by 4th, 5th, and 6th-grade teachers in local schools educating students on stormwater-related issues, utilizing customized, and location-specific lesson plans and activities.

   - Key Audience: Residents
   - Targeted Pollutant(s): E.coli, nutrients, floatables, and TSS
   - Strategy: Active Engagement
   - Treatment Area: Entire MS4
   - Distribution Channels: The MS4 contracts with Project Wet to train teachers who then administer lesson plans.
   - Performance: Total student participants
     - 2017: 492 students
     - 2018: 526 students
   - 2019 Schedule: Coordinate use in classrooms and through Recreation Division
   - 2019 Goal: Repeat student totals +/-5%

9. Post-Construction Stormwater Control Training: Tailored outreach that educates HOA Boards and management representatives on the proper function and maintenance of stormwater basins. The MS4 maintains a Post-Construction Program that includes processes and materials tailored to this group further described in SWMP Section 6.0.

   - Key Audience: Home Owner Associations and Property Management Companies
   - Targeted Pollutant(s): Nutrients, TSS, flood control (downstream erosion)
   - Strategy: Active and Passive Engagement
   - Treatment Area: Citywide

- Distribution Channels: Participation in site tours, board meetings, annual assemblies, and development of educational information
- Performance: Annual post-construction audit earned score (see SWMP Section 6.4)
    - 2017: n/a
    - 2018: 25%
- 2019 Schedule: See SWMP Section 6.0
- 2019 Goal: Improve the audit score by 10%

10. Targeted Outreach: Educate local carpet cleaning and restoration companies on proper disposal methods and potential enforcement penalties for illicit discharges to the storm sewer system.

- Key Audience: Carpet Cleaning and Restoration Companies
- Targeted Pollutant(s): Wash waters
- Strategy: Active Engagement
- Treatment Area: Entire MS4
- Distribution Channels: Written and verbal correspondence
- Performance: Illicit discharge reports related to targeted activities
    - 2017: 0
    - 2018: 1
- 2019 Schedule: Distribute a letter to owners
- 2019 Goal: No illicit discharges

3.5 Future Opportunities

The MS4's Public Education Program requires the following to meet established goals:

1. Education Video Series: Development of a multifaceted video library that would bring to life many of the concepts presented in the MS4's static educational materials, such as how to properly fertilize, pick up dog waste, and install rain barrels.
2. Adopt a Rain Garden: Program similar to Adopt a Storm Drain Program where residents or businesses adopt MS4 constructed rain gardens/boulevard infiltration galleries.

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Section 4.0

Illicit Discharge Detection and Elimination Program

Graphic 4.0.1: Bentonite slurry spill

Graphic 4.0.2: Illicit connection confirmation

4.1 Introduction

The MS4 strives to improve waterway health, protect public safety, and comply with its MS4 Permit through the identification and elimination of pollutant sources by:

- Completing dry weather screening of outfalls
- Inspecting the storm sewer for illegal connections (see SWMP Section 7.2)
- Responding and resolving pollution events
- Enforcing municipal standards

SWMP Section 4.0 details the following components necessary to administer the MS4's Illicit Discharge Detection and Elimination Program, including:

- Regulatory Framework
- Response Protocol
- Event Tracking
- Non-Stormwater Discharge Evaluation
- Outfall Reconnaissance Inventory
- Storm Sewer Infrastructure Totals

4.2 Regulatory Framework

The MS4 utilizes Bozeman Municipal Code (BMC) Section 40.04.200 as its regulatory foundation, which states:

"It shall be unlawful to discharge or cause to be discharged into the MS4 any materials, including, but not limited to, pollutants or waters containing any pollutants that cause or contribute to a violation of applicable water quality standards or that could cause the city to be in violation of its MPDES. It shall be unlawful to store, handle, or apply any pollutant in a manner that will cause exposure to rainfall or runoff and discharge to the MS4 and to state waters or waters of the United States."

4.3 Response Protocol

The MS4 uses the following Emergency Response Plan (ERP) to assess event priority, formulate a response, and, if necessary, pursue enforcement in cases where a party completes a repeat, blatant, or knowing violation of BMC:

1. Assign event coordinator
2. Investigate complaint to determine pollutant type and severity (site visit and correspondence)
3. Implement one of the following responses:
    - Tier 1 Event
        - Threat: Minimal impact on public safety, infrastructure and environment
        - Priority: High
        - Team: MS4 staff
        - Timeline: Initiate response within 5-days
        - Resolution: MS4 operations staff and/or contracted restoration firm
        - Pollutant Disposal: Public - Disposal Facility, private - varies
        - Reporting: Internal report
        - Examples: Leaking vehicles, dripping dumpster, and minor construction violations

- Tier 2 Event
    - Threat: Moderate impact on public safety, infrastructure, and environment
    - Priority: High
    - Team: MS4 Staff
    - Timeline: Initiate response within 24-hours
    - Resolution: MS4 operations staff and/or contracted restoration firm
    - Pollutant Disposal: Public - Disposal Facility, private - varies
    - Reporting: Internal report
    - Examples: Carpet cleaning process water discharge, sanitary overflow, camper waste disposal, homeless camp cleanup, floor drain, and illicit sanitary connections, non-hazardous chemical spills, and moderate to severe construction violations
- Tier 3 Event
    - Threat: Immediate threat to human health. Infrastructure, and environment
    - Priority: High
    - Team: MS4 operations staff and emergency services
    - Timeline: Immediate response
    - Resolution: Fire, MS4 operations, and/or restoration firm
    - Pollutant Disposal: Public - Disposal Facility, private - varies
    - Reporting: Internal report and DEQ Notification
    - Example: Hazardous chemical spills

4. Eliminate discharge by whatever means necessary
5. If applicable, notify appropriate state and federal agencies
6. Prepare and file an event report
7. If applicable, assess one or more of the following penalties to the responsible party:
    - Informal Response: Warning using correspondence, email notification, or verbal notice
    - Formal Response: Notice of Violation and Cease and Desist Order using compliance timeline and monetary penalties based on staff time accrued and remediation costs.
    - Judicial Response: Civil penalties, injunctive relief, or criminal penalties using court systems

4.4 Event Tracking

1. 2017 Events: 5
    - Tier 1 Event: Ellis Apartments - Leaking vehicle
        - Event ID: 201701
        - Pollutant: Oil
        - Local Control: Bozeman Municipal Code *(report available upon request)*
        - Resolved: Yes, owner cleaned up oil
        - Significant: No, less than 5-gallons, no confirmed discharge to the storm sewer
    - Tier 1 Event: Crystal Bar - Illicit roof drain
        - Event ID: 201702
        - Pollutant: Wash water
        - Local Control: Bozeman Municipal Code *(report available upon request)*
        - Resolved: Yes, owner disconnected sink from the roof drain
        - Significant: Yes, over 5-gallons, confirmed discharge to the storm sewer

- Tier 2 Event: Lindley Park - Homeless camp clean up
    - Event ID: 201703
    - Pollutant: Trash, human waste, and drug paraphernalia
    - Local Control: Bozeman Municipal Code *(report available upon request)*
    - Resolved: Yes, restoration firm cleaned up debris
    - Significant: No, less than 5-gallons, no confirmed discharge to the storm sewer
- Tier 1 Event: NAC Construction Site Fueling Spill
    - Event ID: 201704
    - Pollutant: Diesel Fuel
    - Local Control: MSU Safety and Risk Management
    - Resolved: Yes, MSU Facility Services clean up
    - Significant: Yes, over 5-gallons
- Tier 1 Event: Stadium Tractor Hydraulic Oil Spill
    - Event ID: 201705
    - Pollutant: Hydraulic Oil (<25 gallons)
    - Local Control: MSU Safety and Risk Management
    - Resolved: Yes, MSU Facility Services clean up
    - Significant: Yes, over 5-gallons, no confirmed discharge to the storm sewer

2. 2018 Events: 7

- Tier 1 Event: 15th & Patrick Oil Dumping
    - Event ID: 201801
    - Location: See map 4.2.1
    - Pollutant: Used motor oil
    - Local Control: BMC Section 40.04.200 and system cleaning
    - Significant: No, less than 5-gallons, confirmed discharge to the storm sewer
- Tier 1 Event: Solid Waste Hydraulic Hose
    - Event ID: 201802
    - Location: See map 4.2.1
    - Pollutant: Hydraulic fluid
    - Local Control: Solid Waste and Streets spill response
    - Significant: No, over 5-gallons, no confirmed discharge to the storm sewer
- Tier 1 Event: Prue Clean Technologies Carpet Cleaners
    - Event ID: 201803
    - Location: See map 4.2.1
    - Pollutant: Soaps and cleaning chemicals
    - Local Control: BMC Section 40.04.200
    - Significant: Yes, over 5-gallons, confirmed discharge to the storm sewer
- Tier 1 Event: Northwestern Energy Frac-Out
    - Event ID: 201804
    - Location: See map 4.2.1
    - Pollutant: Bentonite slurry
    - Local Control: BMC Section 40.04.200

- Significant: No, over 5-gallons, no confirmed discharge to the storm sewer

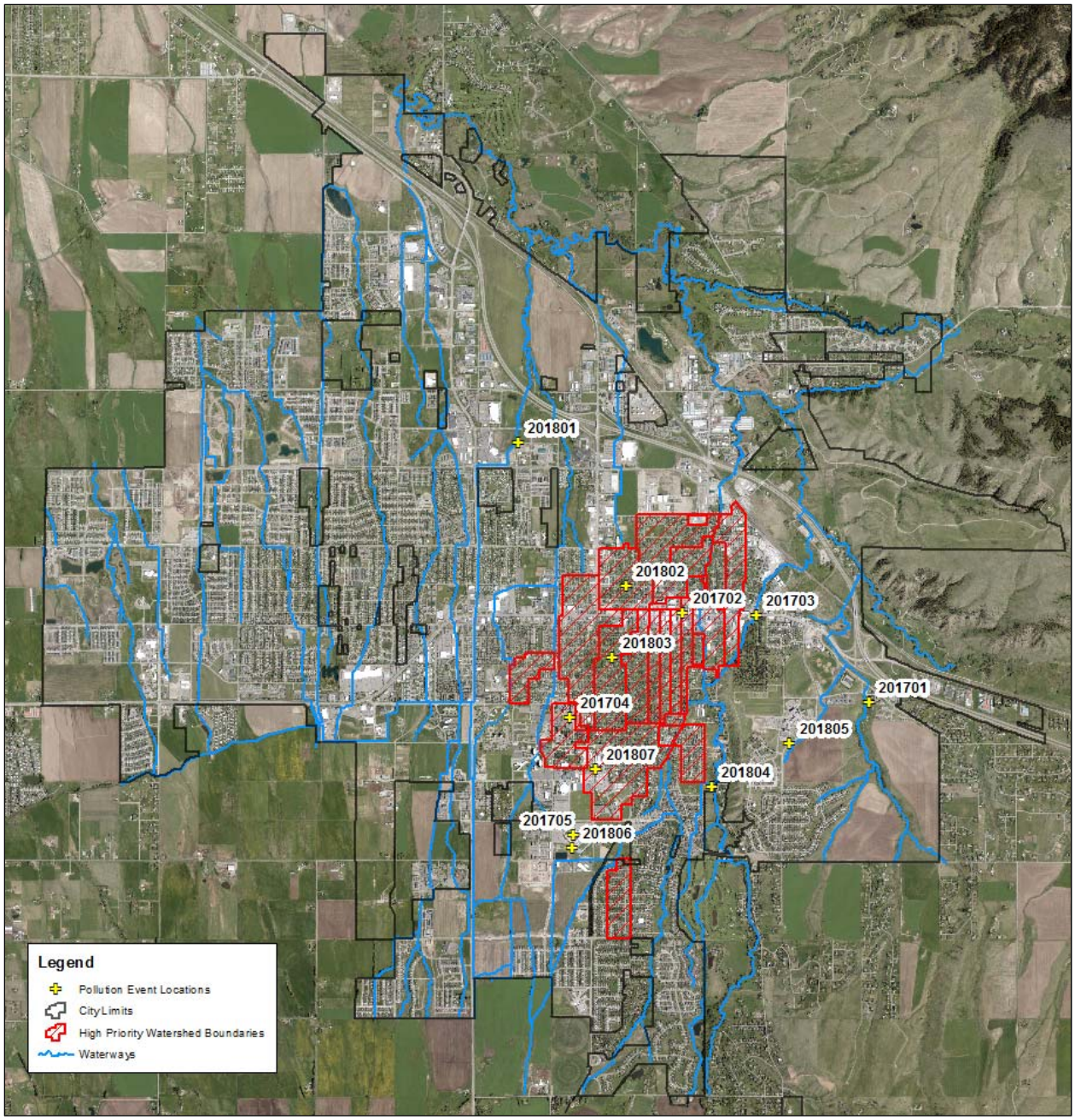
- Tier 2 Event: Sanitary Sewer Overflow
  - Event ID: 201805
  - Location: See map 4.2.1
  - Pollutant: Sediment and pathogens
  - Local Control: Sewer Department sanitary sewer overflow response and system cleanout
  - Significant: Yes, over 5-gallons, confirmed discharge to the storm sewer

- Tier 1 Event: John Deer Contractor Hydraulic Hose Failure
  - Event ID: 201806
  - Location: See map 4.2.1
  - Pollutant: Hydraulic Fluid
  - Local Control: MSU Safety and Risk Spill Response (sorbent material, 55-gallon drum, disposal)
  - Significant: No, under 5-gallons, no confirmed discharge to the storm sewer

- Tier 1 Event: Barnard Holder Snow Machine Hydraulic Hose Failure
  - Event ID: 201807
  - Location: See map 4.2.1
  - Pollutant: Hydraulic Fluid
  - Local Control: MSU Safety and Risk Spill Response (sorbent material, 5-gallon buckets, disposal)
  - Significant: No, under 5-gallons, no confirmed discharge to the storm sewer

Illicit Discharge Events Resolved					
	2017	**2018**	**2019**	**2020**	**2021**
Tier 1 Events	4	6			
Tier 2 Events	1	1			
Tier 3 Events	0	0			
Total	5	7			

Graphic 4.4.1: Illicit discharge events



Graphic 4.4.2: Illicit discharge locations (last updated 2/6/2019)

4.5 Non-Stormwater Discharge Evaluation

The MS4 evaluates the following non-stormwater discharges to identify if they pose a waterway threat:

1. Water Line Flushing
    - Description: Chlorinated water resulting from Bac-T testing and cleaning of new water lines
    - Associated Pollutant(s): Chlorine
    - Local Control(s): Construction specifications requiring contractors to contain flush water
    - Risk: Medium, managed as Tier 2 illicit discharge
    - Illicit Discharges Reported: 0

2. Landscape Irrigation, Irrigation, Lawn Watering, and Potable Water

   - Description: Intermittent over-watering or faulty sprinklers
   - Associated Pollutant(s): Varied depending on the source (well or potable supply)
   - Local Control(s): Water Conservation landscaping audits and outreach initiatives
   - Risk: Low, not managed as an illicit discharge
   - Illicit Discharges Reported: 0

3. Rising Groundwater, Springs, and Flows from Riparian Habitats

   - Description: Flows that enters the storm sewer system when ground and surface water levels rise above the bottom elevation of the storm drain
   - Associated Pollutant(s): None
   - Local Control(s): Prohibition of sump drains that discharge to a street or other public right-of-way, a sanitary sewer line, or onto neighboring properties
   - Risk: Low, not managed as an illicit discharge
   - Illicit Discharges Reported: 0

4. Uncontaminated Groundwater Infiltration

   - Description: Water other than wastewater that enters a storm sewer system from the ground through such means as defective pipes, pipe joints, connections, or utility holes
   - Associated Pollutant(s): None
   - Local Control(s): Inspection of storm sewer pipe annually, and defective pipe repair
   - Risk: Low, not managed as an illicit discharge
   - Illicit Discharges Reported: 0

5. Uncontaminated Pumped Groundwater

   - Description: Groundwater pumped into the storm sewer system for lowering subsurface levels, particularly for construction
   - Associated Pollutant(s): None
   - Local Control(s): Discharge must originate from a well located in an undisturbed area, initial turbid first flush contained on site
   - Risk: Low, not managed as an illicit discharge
   - Illicit Discharges Reported: 0

6. Foundation Drains, Crawl Space Pumps, and Footing Drains

   - Description: Groundwater pumped or diverted from building foundations to the MS4.
   - Associated Pollutant(s): None
   - Local Control(s): Prohibition of sump drains that discharge to a street or other public right-of-way, a sanitary sewer line, or onto neighboring properties
   - Risk: Low, not managed as an illicit discharge
   - Illicit Discharges Reported: 0

7. Air Conditioning Condensation

   - Description: HVAC and refrigeration condensation discharged to the MS4
   - Associated Pollutant(s): None
   - Local Control(s): Allowed
   - Risk: Low, not managed as an illicit discharge
   - Illicit Discharges Reported: 0

8. Swimming Pool and Hot Tub Drain Water

   - Description: Dumping of swimming pool and hot tub drain water into the MS4
   - Associated Pollutant(s): Chlorine
   - Local Control(s): Required dechlorinating of swimming pool and hot tub discharge water
   - Risk: Medium, managed as Tier 2 illicit discharge
   - Illicit Discharges Reported: 0

9. Fire Hydrant Flushing

   - Description: Discharges resulting from regular fire hydrant flushing by MS4 operators
   - Associated Pollutant(s): Chlorine
   - Local Control(s): Water and Sewer Division fire hydrant flushing process
   - Risk: Low, not managed as an illicit discharge
   - Illicit Discharges Reported: 0

10. Non-Commercial, Individual Residential, and Charity Carwashes

    - Description: Wash-waters resulting from vehicle washing
    - Associated Pollutant(s): Soaps, oils, greases, metals, and sediment
    - Local Control(s): The City requires a public assembly permit for non-commercial and charity car washes on public property. If deemed appropriate, the MS4 can utilize this process to require specific controls.
    - Risk: Low, not managed as an illicit discharge
    - Illicit Discharges Reported: 0

11. Street Wash Waters

    - Description: Water used to wash sidewalks, streets, parking lots, and buildings
    - Associated Pollutant(s): Sediment, oils, greases, and metals
    - Local Control(s): Allowed
    - Risk: Low, not managed as an illicit discharge
    - Illicit Discharges Reported: 0

12. Construction Dewatering

    - Description: Water discharged from the excavated trench, deep well point, or cofferdam
    - Associated Pollutant(s): Sediment
    - Local Control(s): MDEQ General Permit for Construction Dewatering for excavated trench and cofferdam dewatering, well points are required to be in undisturbed areas with the first turbid first-flush contained on site, Article 4 Ch. 40 Bozeman Municipal Code, and protocols described in SWMP Section 5.0.
    - Risk: Medium, managed using protocols described in SWMP Section 5.0
    - Illicit Discharges Reported: 1

4.6 Outfall Reconnaissance Inventory (ORI)

The MS4 has hundreds of storm sewer outfalls that discharge into numerous waterways and irrigation ditches within its boundary. Staff used the Draft 2016 Integrated Report available at the MDEQ's Clean Water Act Information Center, TMDL, and City GIS databases (2018 data intersect using 150' buffer) to compile the following information:

1. Baxter Creek

   - Total Outfalls: 14

- Approved TMDL: No
- Impairments: None
- MS4 Waste Load Allocation: None

2. Bozeman (aka Sourdough) Creek

   - Total Outfalls: 60
   - Approved TMDL: Yes
   - Impairments: E. Coli, Total Nitrogen, Sediment, Chlorophyll-a, and Alteration in streamside cover
   - MS4 Waste Load Allocation: TN = 0 lb/day; E. Coli = 0 cfu/day; sediment = 81 tons/year

3. Bridger Creek

   - Total Outfalls: 1
   - Approved TMDL: Yes
   - Impairments: Chlorophyll-a and Nitrate/Nitrite (Nitrite + Nitrate as N)
   - MS4 Waste Load Allocation: N/N = 0 lbs./day

4. East, West and Main Forks of Catron Creek

   - Total Outfalls: 82
   - Approved TMDL: No
   - Impairments: None
   - MS4 Waste Load Allocation: None

5. Cattail Creek

   - Total Outfalls: 42
   - Approved TMDL: No
   - Impairments: None
   - MS4 Waste Load Allocation: None

6. East Gallatin River

   - Total Outfalls: 13
   - Approved TMDL: Yes
   - Impairments: Total Nitrogen and Total Phosphorous
   - MS4 Waste Load Allocation: TN = 0 lbs./day; TP = 0 lbs./day

7. Farmers Canal

   - Total Outfalls: 46
   - Approved TMDL: No
   - Impairments: None
   - MS4 Waste Load Allocation: N/A

8. Figgins Creek

   - Total Outfalls: 23
   - Approved TMDL: No
   - Impairments: None
   - MS4 Waste Load Allocation: N/A

9. Flat Creek

   - Total Outfalls: 11

- Approved TMDL: No
- Impairments: None
- MS4 Waste Load Allocation: N/A

10. Mandeville Creek

    - Total Outfalls: 48
    - Approved TMDL: Yes
    - Impairments: Total Nitrogen and Total Phosphorous
    - MS4 Waste Load Allocation: TN = 0 lbs./day; TP = 0 lbs./day; sediment = 10 tons/year (self-imposed)

11. Matthew Bird Creek

    - Total Outfalls: 29
    - Approved TMDL: No
    - Impairments: None
    - MS4 Waste Load Allocation: N/A

12. Maynard Border Ditch

    - Total Outfalls: 16
    - Approved TMDL: No
    - Impairments: None
    - MS4 Waste Load Allocation: N/A

13. Middle Creek Ditch

    - Total Outfalls: 26
    - Approved TMDL: No
    - Impairments: None
    - MS4 Waste Load Allocation: N/A

14. Mill Ditch

    - Total Outfalls: 0
    - Approved TMDL: No
    - Impairments: None
    - MS4 Waste Load Allocation: N/A

15. Nash Spring Creek

    - Total Outfalls: 0
    - Approved TMDL: No
    - Impairments: None
    - MS4 Waste Load Allocation: N/A

16. Rocky Creek

    - Total Outfalls: 1
    - Approved TMDL: Yes
    - Impairments: Alteration in Streamside Vegetative Cover, Other Anthropogenic Substrate Alterations, Physical Substrate Habitat Alterations, and Sedimentation/Siltation
    - MS4 Waste Load Allocation: N/A

17. Story Ditch

- Total Outfalls: 10
- Approved TMDL: No
- Impairments: None
- MS4 Waste Load Allocation: N/A

18. West Gallatin Canal

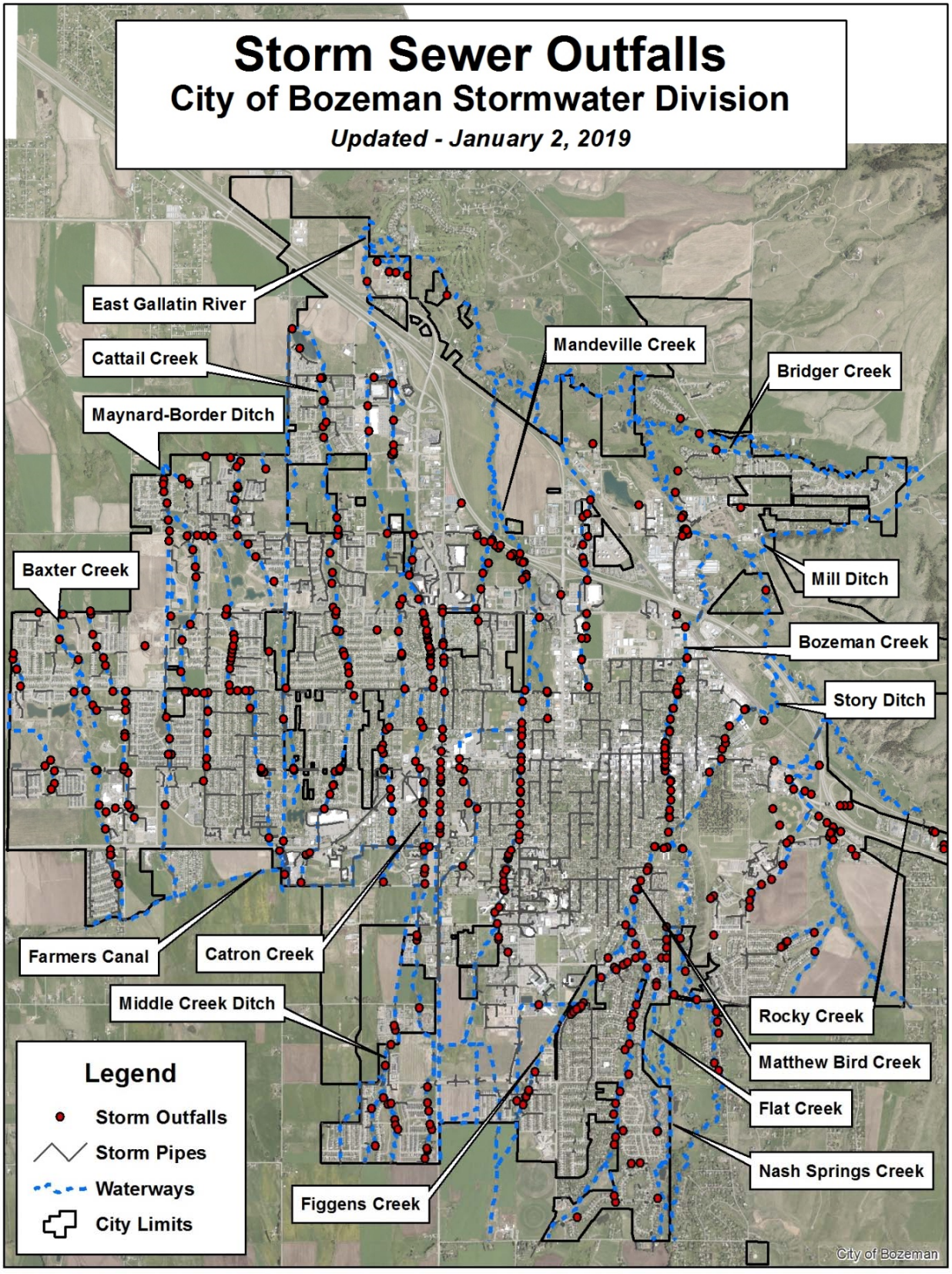
- Total Outfalls: 31
- Approved TMDL: No
- Impairments: None
- MS4 Waste Load Allocation: N/A

19. Unnamed Irrigation Canals

- Total Outfalls: 6
- Approved TMDL: No
- Impairments: None
- MS4 Waste Load Allocation: N/A

20. Unnamed Tributaries or Outside Buffer

- Total Outfalls: 161
- Approved TMDL: No
- Impairments: None
- MS4 Waste Load Allocation: N/A



Graphic 4.6.1: Storm sewer outfalls and receiving waterways

The MS4 prioritizes and inspect outfalls once during each MS4 Permit term. Further, the MS4 inspects outfalls deemed a high-priority annually. The MS4 considers an outfall to be high-priority if it meets the following criteria:

- 18" or more in diameter
- Drains an urban watershed area of 25 acres or more
- Dumps stormwater directly into an impaired receiving water (i.e., no stormwater basin)

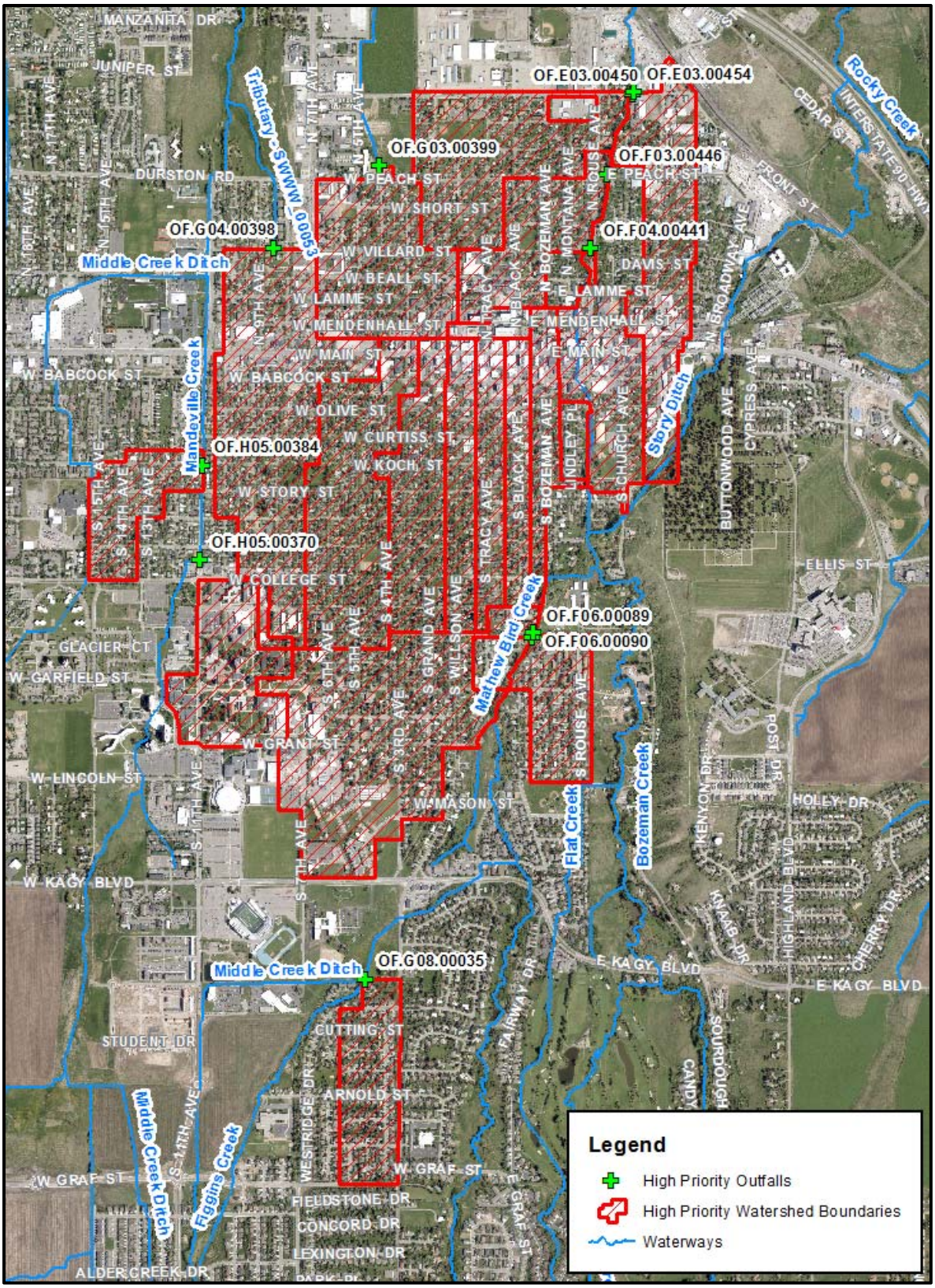
High-priority outfalls include:

1. Outfall ID: OF.G08.00035
   - Discharge Location: Overbrook Dr. and Langhor Ave.
   - Receiving Waterway: Figgins Creek
2. Outfall ID: OF.F06.00090
   - Discharge Location: S. Bozeman Ave. and E. Cleveland St.
   - Receiving Waterway: Matthew Bird Creek
3. Outfall ID: OF.F06.00089
   - Discharge Location: S. Black Ave. and W. Cleveland St.
   - Receiving Waterway: Matthew Bird Creek
4. Outfall ID: OF.H05.00370
   - Discharge Location: N. 11th Ave. and W. College St.
   - Receiving Waterway: Mandeville Creek
5. Outfall ID: OF.H05.00384
   - Discharge Location: N. 11th Ave. and W. Koch St.
   - Receiving Waterway: Mandeville Creek
6. Outfall ID: OF.F04.00441
   - Discharge Location: N. Rouse Ave. and E. Villard St.
   - Receiving Waterway: Bozeman Creek
7. Outfall ID: OF.G04.00398
   - Discharge Location: N. 9th Ave. and W. Villard St.
   - Receiving Waterway: Tributary SWWW_00053
8. Outfall ID: OF.F03.00446
   - Discharge Location: N. Rouse Ave. and E. Peach St.
   - Receiving Waterway: Bozeman Creek
9. Outfall ID: OF.G03.00399
   - Discharge Location: N. 4th Ave. and W. Peach St.
   - Receiving Waterway: Tributary SWWW_00034
10. Outfall ID: OF.E03.00450
    - Discharge Location: N. Rouse Ave. and E. Tamarack St.
    - Receiving Waterway: Bozeman Creek

11. Outfall ID: OF.E03.00454
    - Discharge Location: N. Rouse Ave. and E. Tamarack St.
    - Receiving Waterway: Bozeman Creek

The MS4 completed the following:

1. 2017 ORI Inspection Totals
    - Priority Outfalls: 594
    - Priority Outfalls Inspected: 0 (0%)
    - High-Priority Outfalls: n/a
    - High-Priority Outfalls Inspected: n/a
2. 2018 ORI Inspection Totals
    - Priority Outfalls: 622
    - Priority Outfalls Inspected: 0 (0%)
    - High-Priority Outfalls: 11
    - High-Priority Outfalls Inspected: 0 (0%)
3. 2019 ORI Inspection Totals
    - Priority Outfalls: TBD
    - Priority Outfalls Inspected: TBD (0%)
    - High-Priority Outfalls: TBD
    - High-Priority Outfalls Inspected: TBD (0%)
4. 2020 ORI Inspection Totals
    - Priority Outfalls: TBD
    - Priority Outfalls Inspected: TBD (0%)
    - High-Priority Outfalls: TBD
    - High-Priority Outfalls Inspected: TBD (0%)
5. 2021 ORI Inspection Totals
    - Priority Outfalls: TBD
    - Priority Outfalls Inspected: TBD (0%)
    - High-Priority Outfalls: TBD
    - High-Priority Outfalls Inspected: TBD (0%)



Graphic 4.6.2: High-priority watersheds and outfalls (last updated 11/15/2018)

4.7 Storm Sewer Infrastructure Totals

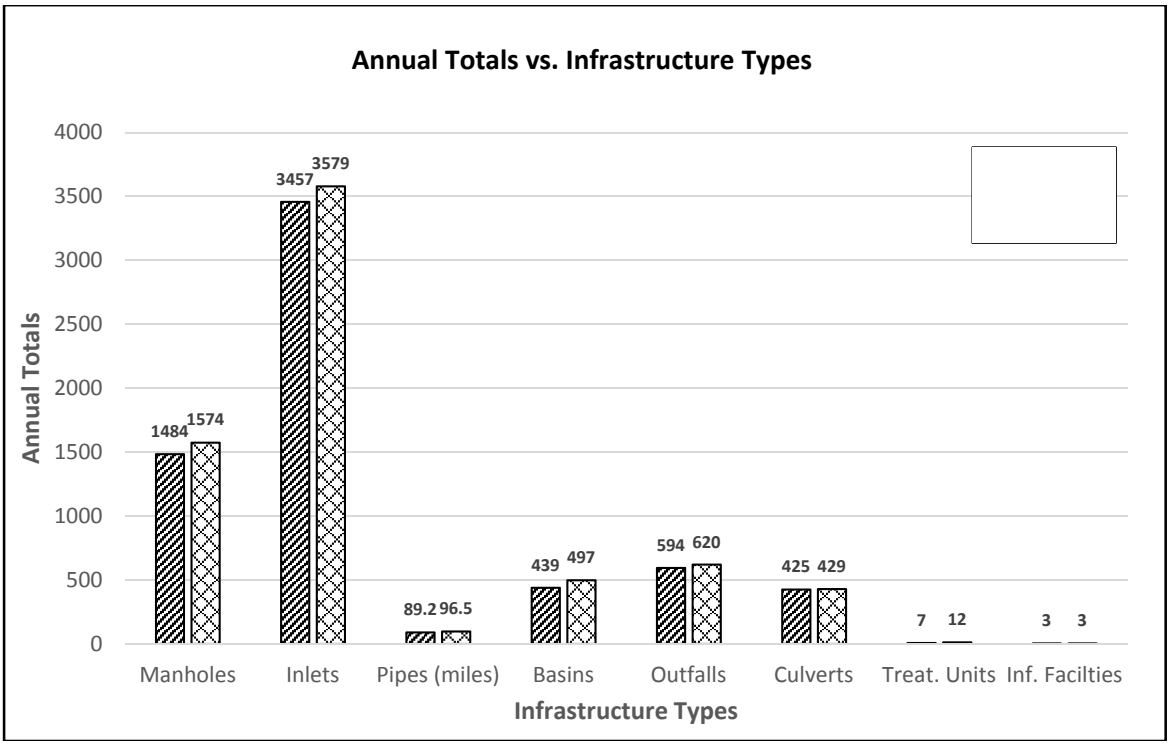
The MS4 collects and updates storm sewer data annually using GPS and GIS technology. The public can access an interactive map by visiting: https://gisweb.bozeman.net/Html5Viewer/?viewer=infrastructure

1. 2017 Infrastructure Totals *(includes public, private, MDT, and MSU assets)*

   - Manholes: 1,484
   - Inlets: 3,457
   - Gravity Mains: 89.2 miles
   - Stormwater Basins: 435
   - Outfalls: 594
   - Culverts and Bridges (Gravity mains 'Others' ownership): 425
   - Public Mechanical Separation Treatment Units: 7
   - Public Infiltration Facilities: 3

2. 2018 Infrastructure Totals:

   - Manholes: 1,574
     - City of Bozeman: 999
     - Montana State University: 155
     - Private: 352
     - Montana Dept. of Transportation: 68
   - Inlets: 3,579
     - City of Bozeman: 2,524
     - Montana State University: 207
     - Private: 661
     - Montana Dept. of Transportation: 187
   - Gravity Mains: 96.5 miles
     - City of Bozeman: 66.9 miles
     - Montana State University: 8.3 miles
     - Private: 17.8 miles
     - Montana Dept. of Transportation: 3.5 miles
   - Stormwater Basins: 497 (57.6 acres)
   - Outfalls: 622
   - Culverts and Bridges (gravity mains 'Others' ownership): 429 (12.6 miles)
   - Public Mechanical Separation Treatment Units: 12
     - City of Bozeman: 9
     - Montana State University: 1
     - MDT: 2
   - Public Infiltration Facilities: 3
     - City of Bozeman: 2
     - Montana State University: 1
     - MDT: 0



Graphic 4.7.1: Storm sewer infrastructure totals

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Section 5.0

Construction Site Management Program

Graphic 5.0.1: Compliant single-family residential property

Graphic 5.0.2: Inlet sump clogged with construction debris

5.1 Introduction

The MS4 strives to improve waterway health, protect public safety, and comply with its MS4 Permit through the regulation of construction sites by:

1. Providing educational opportunities
2. Administering a permitting program
3. Enforcing municipal and state standards

SWMP Section 5.0 details the following components necessary to administer the MS4's Construction Site Management Program, including:

- Regulatory Framework
- Oversight Protocol
- Performance Tracking
- Future Opportunities
- Applicable Documents

5.2 Regulatory Framework

The MS4 requires the construction industry to comply with the following regulations:

1. Article 4 Ch. 40 of the Bozeman Municipal Code
2. Montana Clean Water Act's Montana Pollution Discharge Elimination System
3. U.S. Clean Water Act National Pollution Discharge Elimination System

5.3 Oversight Protocol

The MS4 implements the following protocol to manage construction activities within its jurisdiction:

1. Hold Training *(optional)*: Classes held regularly for construction industry professionals, including Introduction to Stormwater Management, Construction Site BMP Field Academy, Stormwater Pollution Prevention Plan (SWPPP) Administrator, SWPPP Administrator Re-Certification, SWPPP Preparer, Construction Dewatering, and Compliance Evaluation Inspector. See SWMP Sec. 3.2.
2. Conduct Pre-submittal Meeting *(optional)*: Initial meeting where parties discuss minimum expectations, project details, and specific concerns.
3. Complete Permit Review: Adequacy reviews for all permits, tracking steps using Cityworks permit software. Stage repeats until the applicant submits an adequate permit. Permits include:
    - MDEQ Construction Stormwater Pollution Prevention Plan (SWPPP)
    - Construction Stormwater Permit: Sites Less than One (1) Acre
    - Construction Stormwater Permit: Single-Family Residential Projects
4. Inspect Site: Inspections based on the following prioritization:
    - Priority Site: Goal is to inspect one per week or 20% of total per year.
        - Complaint-driven (internal or external); or
        - Field observation; or
        - Compliance history
    - High-Priority Site: Goal is to inspect per frequency outlined in the MS4 Permit.
        - Greater than One (1) Acre; and
        - Direct Discharge to Bozeman Creek

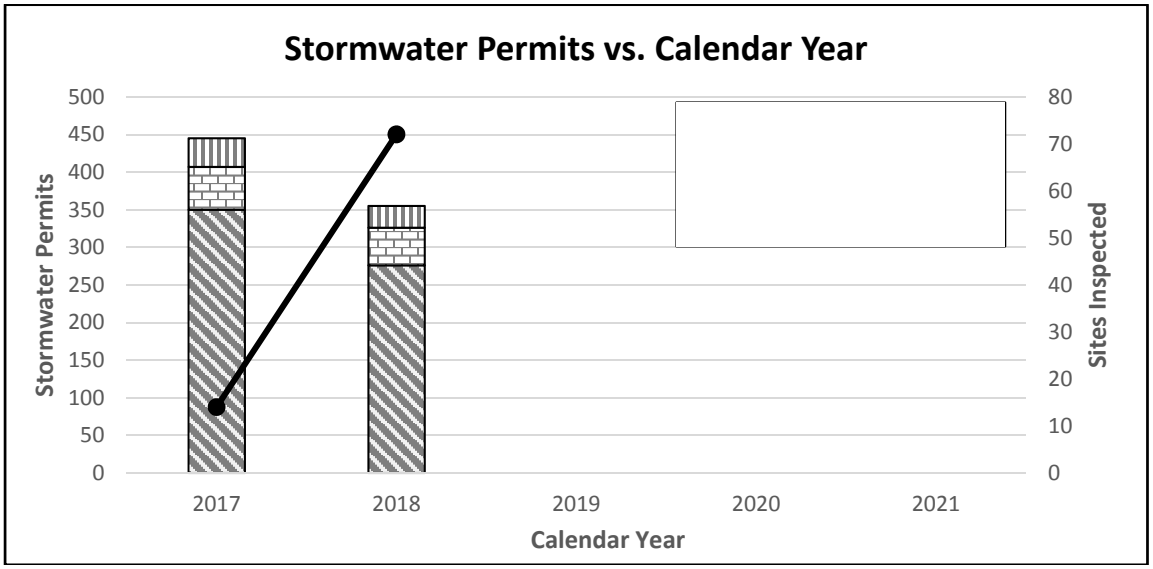
- Rain Gauge: Bozeman International Airport NOAA Station

5. Compile and Send Construction Stormwater Site Inspection Form: Document includes general information, weather, prohibited discharges, and findings related to the implementation and maintenance of Best Management Practices (BMPs) and applicable permits.
6. Issue Notice of Violations, Cease and Desist & Abatement Order, Notice to File Abatement Lien: Documents Bozeman Municipal Code violations, required corrective actions, schedule to remedy, and potential penalties if not resolved.
7. Issue Stop Work Order: Issued if the contractor does not implement corrective actions within required timeframes, ceasing all work until the violator brings the site into compliance.
8. File Civil Action: Monetary relief sought from the violator for the cost of the investigation, inspection, remediation, and bringing legal action
9. Pursue Criminal Charges: Pursued when a contractor completes repeat or knowing violations.
10. Issue Notice of Penalty: Document describing assessed penalties.
11. Refuse Occupancy and Infrastructure: Denial of occupancy or infrastructure approval until the project achieves compliance.

The MS4 tracks the following annual totals:

1. 2017 Totals:
   - Construction Projects: 445
     - Single-Family Residential: 350
     - Less than One (1) Acre: 57
     - Greater than One (1) Acre: 38
   - Plan Reviews: 445
     - Single-Family Residential: 350
     - Less than One (1) Acre: 57
     - Greater than One (1) Acre: 38
   - Site Inspections: 14 (3.1%)
     - Single-Family Residential: 8
     - Less than One (1) Acre: 0
     - Greater than One (1) Acre: 11
   - Training Classes: 11
     - Attendees: 268
2. 2018 Totals:
   - Construction Projects: 355
     - Single-Family Residential: 276
     - Less than One (1) Acre: 50
     - Greater than One (1) Acre: 29
   - Plan Reviews: 355
     - Single-Family Residential: 276
     - Less than One (1) Acre: 50
     - Greater than One (1) Acre: 29

- Site Inspections: 72
    - Single-Family Residential: 32
    - Less than One (1) Acre: 17
    - Greater than One (1) Acre: 23
- High-Priority Sites: 2
    - East Tamarack Reconstruction Project (Knife River)
    - South Tracy Reconstruction Project (Omdahl Construction)
- Requests for Occupancy: 28
    - Less than One (1) Acre: 20
    - Greater than One (1) Acre: 8
- Training Classes: 4
    - Attendees: 84



Graphic 5.3.1: Stormwater permit and inspection

5.4 Performance Tracking

The MS4 tracks construction site compliance inspections completed across all permit types annually to gauge its workload. The MS4's goal is to inspect 20% of construction sites per year, which does not include return site visits or final occupancy inspections.

1. 2017: 4.2% (19 inspections/450 projects)
    - City: 2.4% (14 inspections/445 projects)
    - MSU: 100% (5 inspections/5 projects)
2. 2018: 21.6% (78 inspections/361 projects)
    - City: 20.3% (72 inspections/355 projects)
    - MSU: 100.0% (6 inspections/6 projects)

The MS4 completes a Construction Site Compliance Audit in the fall, evaluating 50 random construction sites to determine their compliance with local, state, and federal stormwater regulations. The MS4 evaluates each construction site using the following criteria:

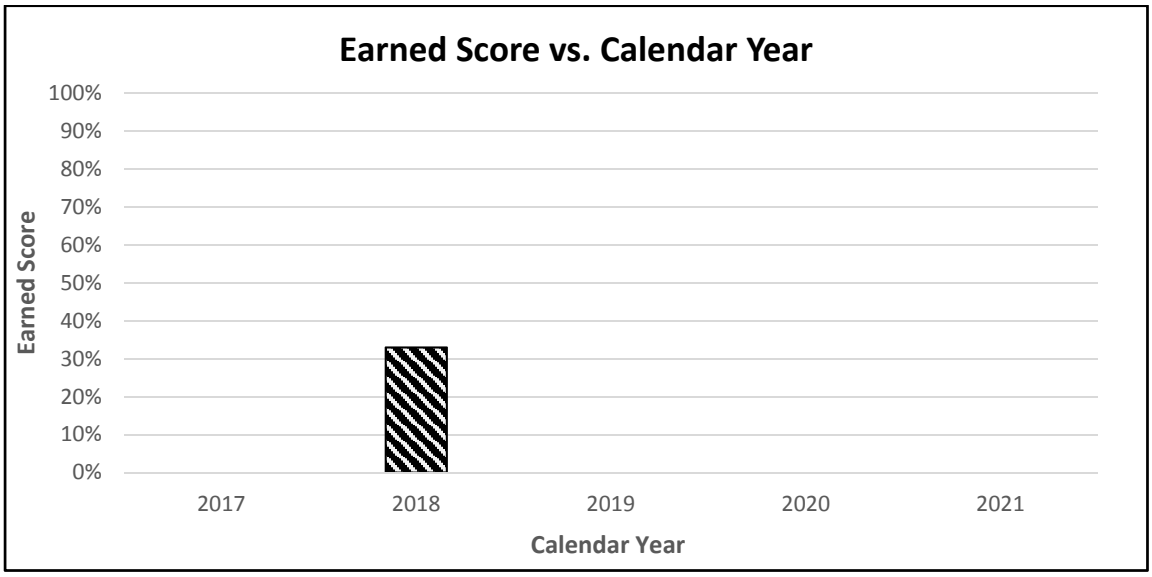
1. Implementation: BMPs present or absent
2. Adequacy: Appropriate type and scale of BMPs for site conditions
3. Installation: Adequate BMP installation per industry standard specifications
4. Maintenance: Sufficient maintenance so that BMPs are in good working order

After evaluation, the MS4 grades each construction site using one of the following categories:

1. 0-Points: Not compliant with permit, high risk to infrastructure, public, and environment
2. 1-Point: Partially compliant with permit, moderate risk to infrastructure, public, and environment
3. 2-Points: Compliant with permit, low risk to infrastructure, public, and environment

The MS4 compiles the collected data and updates the following:

1. 2018 Audit Results:
   - Date(s): October 24 - 26
   - Earned Points/Total Points: 33/100
   - Earned Score: 33% or F
   - Trend: n/a
   - Discussion:
     - Increased BMP use but many were not adequately maintained
     - Noncompliance was mostly contained within private sites
     - Increased inspection frequency is effective at increasing compliance rates



Graphic 5.4.1: Construction site audit score

5.5 Future Opportunities

The MS4's Construction Site Management Program requires the following to meet established goals:

1. Inspection Optimization Software: The MS4 plans to develop a web-based and field freindly inspection platform that will expedite documentation and communication. (Fall 2019)

5.6 Documents

The MS4 utilizes the following documents, which are available upon request:

1. Universal Documents:
   - Bozeman Municipal Code: Article 4 Ch. 40
   - City of Bozeman Best Management Practice (BMP) Manual for Construction Sites
2. Single-Family Residential Construction:
   - Construction Stormwater Permit: Single-Family Residential Projects
   - Construction Stormwater Permit Review Checklist: Single Family Residential Projects
   - Construction Stormwater Permit Approval
   - Construction Stormwater Site Inspection Form: Sites Less than One (1) Acre
3. Multi-Family and Commercial Projects Less than One (1) Acre:
   - Construction Stormwater Permit: Sites Less than One (1) Acre
   - Construction Stormwater Permit Review Checklist: Sites Less than One (1) Acre
   - Construction Stormwater Permit Approval
   - Construction Stormwater Site Inspection Form: Sites Less than One (1) Acre
   - Request for Final Occupancy (RFO) Form
4. Projects Greater than One Acre:
   - MDEQ Construction General Permit
   - MDEQ Construction General Permit Notice of Intent (NOI)
   - MDEQ Construction Stormwater Pollution Prevention Plan (SWPPP)
   - MDEQ Construction Stormwater Permit Notice of Termination
   - MDEQ Construction Stormwater Permit Transfer Notification
   - Construction Stormwater Permit Review Checklist: Sites Greater than One (1) Acre
   - Construction Stormwater Site Inspection Form: Sites Greater than One (1) Acre
   - Request for Final Occupancy (RFO) Form

Section 6.0

Post-Construction Program

Graphic 6.0.1: Overgrown stormwater basin

Graphic 6.0.2: Dredged stormwater basin

6.1 Introduction

The MS4 strives to improve waterway health, protect public safety, and comply with its MS4 Permit through the regulation and oversight of existing and new stormwater facilities by:

1. Inspecting, educating, and providing maintenance solutions
2. Enforcing development regulations

SWMP Section 6.0 details the following components necessary to administer the MS4's Post-Construction Management Program, including:

- Regulatory Framework
- Oversight Protocol
- Performance Tracking
- Future Opportunities
- Applicable Documents

6.2 Regulatory Framework

The MS4's requires new and redevelopment projects to infiltrate the first ½ inch of rainfall and meet volume control requirements, maintaining pre-development conditions post project completion. Project owners use an array of stormwater facilities to meet MS4 standards, including stormwater basins, permeable pavers, and bioretention systems. The documents regulating development include:

1. City of Bozeman Design Standards and Specification Policy
2. City of Bozeman Modifications to Montana Public Works Standard Specifications, 6th Edition
3. Montana Public Works Standard Specifications, 6th Edition
4. Montana Post-Construction Storm Water BMP Design Guidance Manual

Once constructed, the MS4 requires project owners or Home Owner Associations (HOAs) to maintain facilities in perpetuity per their Maintenance Plans submitted at the time of project approval.

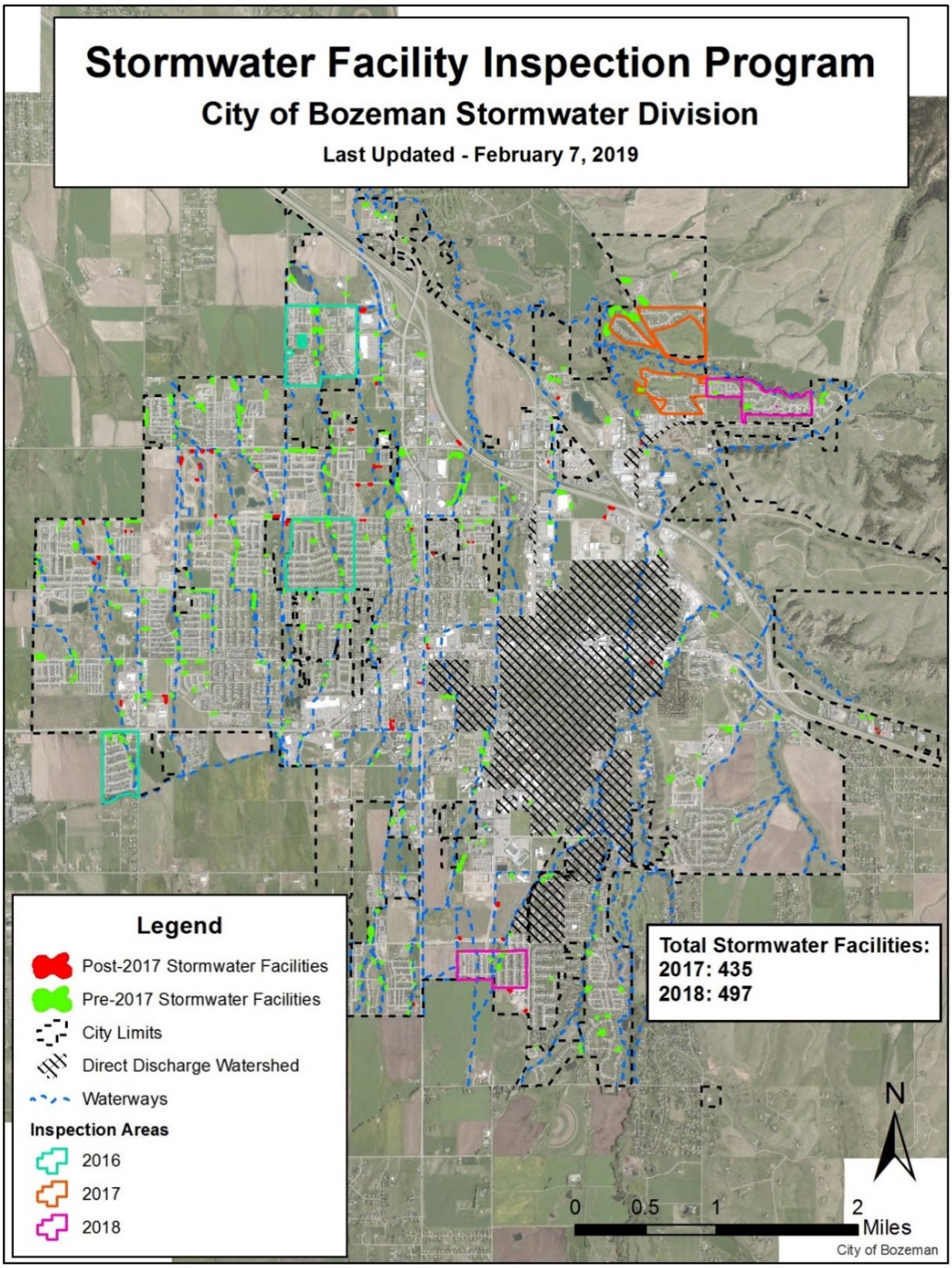
6.3 Oversight Protocol

The MS4 oversees maintenance efforts by implementing the following protocol:

1. Application Review: Engineering staff review submitted plan sets, design reports, maintenance agreements, and other applicable information to ensure the project complies with the MS4's water quantity and quality requirements using standard processes and documents.
2. Occupancy and Infrastructure Approvals: Engineering staff requires that a certified professional guarantees that the contractor installed the stormwater facilities per the approved plans.
3. Inspection: The MS4 completes investigations at the following frequencies:
    - Inspect 20% of stormwater facilities annually (once every five years), ordering based on:
        - Complaints or by request
        - Field observations
        - Compliance history
        - Property ownership and access
    - Inspect all high priority stormwater facilities annually with priority based on:
        - Those that drain into an impaired waterbody
        - Contain an area larger than 1,076 square feet

- Property ownership and access

4. Inspection Report: The MS4, or their consulting representative, documents the condition of stormwater facilities, identifies deficiencies, and provides the following information:
   - Drainage system map
   - Self-inspection recommendations
   - Maintenance strategies
   - Budgeting guidance
5. Training *(optional)*: Meetings, site tours, and presentations held for owners, HOAs, and property managers after the MS4 has concluded its inspection and provided an inspection report.



Map 6.3.1: Stormwater facilities

The following details the MS4's high-priority stormwater facilities:

#	Facility ID	Owner	Area (ft^2)	Location	Receiving Waterbody	2019		2020		2022	
						Insp.	Comp.	Insp.	Comp.	Insp.	Comp.
1	DP.H06.00023	MSU	4,667	GIS Data	Mandeville Creek						
2	DP.H06.00024	MSU	11,829	GIS Data	Mandeville Creek						
3	DP.H06.00028	MSU	1,294	GIS Data	Mandeville Creek						
4	DP.H06.00025	MSU	7,231	GIS Data	Mandeville Creek						
5	DP.H06.00026	MSU	3,185	GIS Data	Mandeville Creek						
6	DP.B05.00001	Private	3,967	GIS Data	Rocky Creek						
7	DP.H04.00006	Private	7,188	GIS Data	Mandeville Creek						
8	DP.E02.00006	Private	5,577	GIS Data	East Gallatin River						
9	DP.G02.00017	Private	2,245	GIS Data	Mandeville Creek						
10	DP.G02.00048	Private	3,464	GIS Data	Mandeville Creek						
11	DP.H02.00001	Private	5,450	GIS Data	Mandeville Creek						
12	DP.F01.00026	Private	7,354	GIS Data	East Gallatin River						
13	DP.I51.00073	Private	10,744	GIS Data	East Gallatin River						
14	DP.I51.00074	Private	10,314	GIS Data	East Gallatin River						
15	DP.I51.00075	Private	1,355	GIS Data	East Gallatin River						
16	DP.E01.00007	Private	22,765	GIS Data	East Gallatin River						
17	DP.H06.00400	MSU	7,591	GIS Data	Mandeville Creek						
18	DP.H07.00022	Private	14,775	GIS Data	Mandeville Creek						
19	DP.H07.00023	Private	26,987	GIS Data	Mandeville Creek						
20	DP.F00.00004	Private	21,961	GIS Data	East Gallatin River						

Graphic 6.3.2: High-priority stormwater facilities

6.4 Performance Tracking

The MS4 tracks stormwater facility inspections annually to gauge its workload, with a goal of reviewing 20% per year, which does not include return visits or final occupancy inspections. Totals include:

1. 2017: 8.7% (38 inspected/439 total)
   - City: 2.0% (8 inspected/409 total)
   - MSU: 100% (30 inspected/30 total)
2. 2018: 9.1% (45 inspected/497 total)
   - City: 3.2% (15 inspected/467 total)
   - MSU: 100.0% (30 inspected/30 total)

The MS4 completes a Stormwater Facility Compliance Audit annually, evaluating 50 random stormwater facilities to determine their condition based on the following criteria:

1. Vegetation Management: Evidence of reoccurring cattail, grass, and woody shrub removal
2. Clogged Entry or Exit Points: Pipe openings and outlet structures clear of accumulated debris
3. Sediment Deposition: Facility storage capacities minimally impacted by accumulated debris
4. Ability to Drain: No stagnant water present beyond the 48-hour infiltration period

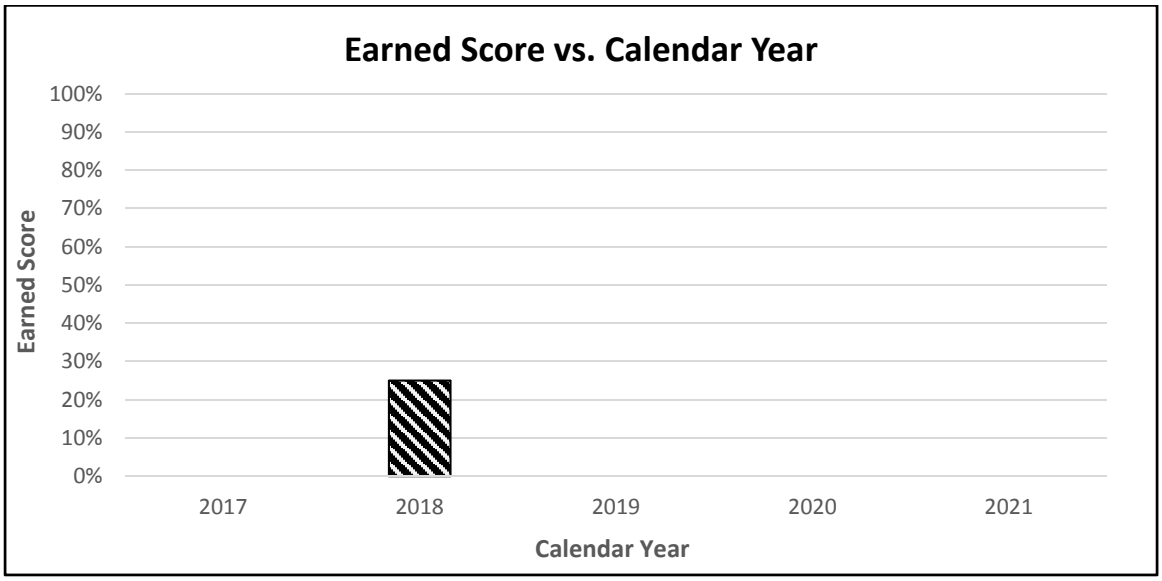
After evaluation, the MS4 grades each stormwater facility using one of the following categories:

1. 0-Points: Facility is not maintained, high risk to infrastructure, public, and environment

2. 1-Point: Facility is partially maintained, moderate risk to infrastructure, public, and environment
3. 2-Points: Facility is maintained, low risk to the infrastructure, public, and environment

The MS4 compiles the collected data and updates the following:

1. 2018 Audit Results:
   - Date(s): October 17 and 26
   - Earned Points/Total Points: 25/100
   - Earned Score: 25%
   - Discussion:
     - Wal-Mart, Safeway, and other private entities maintain their facilities more frequently, yielding an average score six times greater than HOAs.
     - Facilities integrated into landscapes are in better condition than those hidden.
     - The overwhelming majority of HOAs are ignorant of their responsibilities and do not complete maintenance regardless of previous engagement by the City.
     - Current design standards allow for the construction of inadequate systems.



Graph 6.4.1: Stormwater facility audit scores

6.5 Future Opportunities

The MS4's Post-Construction Program requires the following to meet established goals:

1. Increase Inspection Rate: The MS4 is in the process of aquiring a new position and/or increasing its contracted services budget in 2019 to improve compliance with its set goal.
2. New Drainage Design Standards: In 2008, the MS4 completed a Facility Plan, which evaluated requirements, identified shortfalls, and provided recommendations for improvement. The MS4 is working to implement the changes proposed in 2008, bringing standards in line with the Facility Plan's recommendations. Most notable changes include:
   - Increasing design storm from 10-year to 25, 50, or 100-year
   - Requiring detention downtown for redevelopment projects that do not exceed one acre
   - Aligning language to work jointly with the content of the Montana Post-Construction Stormwater BMP Guidance Manual

- Redeveloping rainfall curves to represent modern rainfall intensity and duration
- Requiring in-depth geotechnical, groundwater, and infiltration testing
- Categorizing development types and specific standards as applicable
- Improving maintenance plan development and documentation submittals

3. Enforcement of Stormwater Facility Maintenace and Repair: The MS4 needs an improved policy that results in the consistent operation and maintenance of private stormwater facilities. Specific items include:

   - Development of an enforcement process, including the ability to establish timelines, issue penalties, and complete work at the owner's expense.
   - Solution for defunct HOAs that lack maintenance funding

6.6 Documents

The MS4 utilizes the following materials, which are available upon request*:*

1. Stormwater Facility Maintenance:

   - Maintenance Guide
   - Inspection Form

2. Stormwater Facility Design and Construction:

   - City of Bozeman Design Standards and Specification Policy
   - City of Bozeman Modifications to Montana Public Works Standard Specifications, 6th Edition
   - Montana Public Works Standard Specifications, 6th Edition
   - Montana Post-Construction Storm Water BMP Design Guidance Manual
   - Development Review Documents (Plan Review Checklist): Planning Division Staff Report, Engineering Review Letter, and DRC Memo

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Section 7.0

Good Housekeeping Program

Graphic 7.0.1: Street sweeping debris pile

Graphic 7.0.2: Sediment management facility

7.1 Introduction

The MS4 strives to improve waterway health, protect public safety, and comply with its MS4 Permit through the responsible management of its storm sewer system, facilities, and daily work activities by:

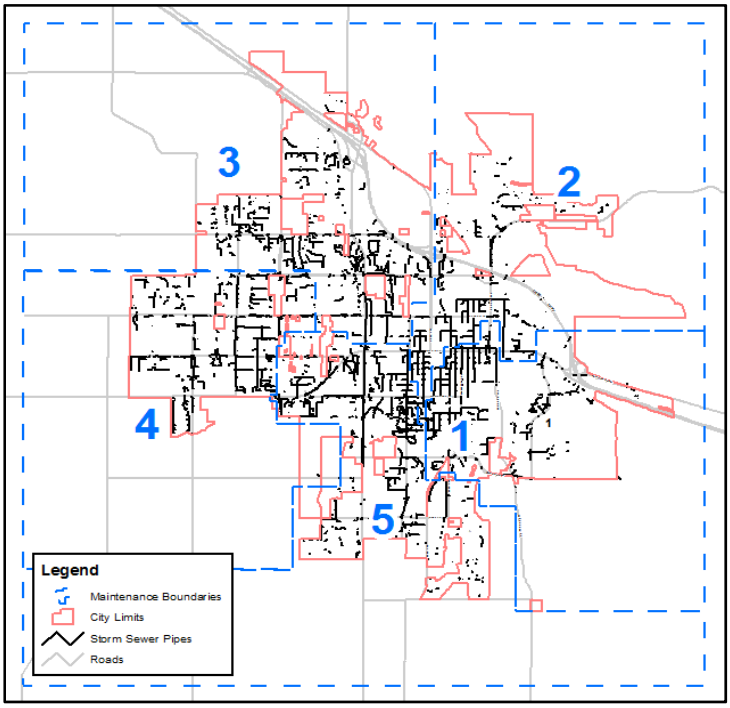
1. Inspecting, maintaining, and repairing public assets
2. Eliminating or mitigating stormwater pollutants
3. Maintaining an environmentally conscious workforce through training

SWMP Section 7.0 details the following components necessary to administer the MS4's Good Housekeeping Program, including:

- Infrastructure Operation
- Facility Stormwater Pollution Prevention Program
- Activity Stormwater Pollution Prevention Program
- Training

7.2 Infrastructure Operation

The MS4 inspects, maintains, and repairs its storm sewer system on an annual basis. Four parties complete activities, including the City of Bozeman (City), Montana State University (University), Montana Department of Transportation (MDT), and private owners. SWMP Section 4.0 includes quantity and asset type information broken down for each party. The University maintains infrastructure within its boundary. The City maintains City and MDT-owned infrastructure, completing work on a five-year cycle. To guide the work, the City uses Maintenance Boundaries (MB) that each contains 20% of the storm sewer system and completes work within per the following schedule: MB 1: 2019, MB 2: 2020, MB 3: 2021, MB 4: 2022, and MB 5: 2023.



Graphic 7.2.1: Maintenance boundaries

The following items specify the type of activity completed:

1. Stormwater Operations
   - Pipe inspection
     - Objective: 20% of the system per year
     - Active Season(s): Winter, Spring, Summer, and Fall
     - Operational Area: Citywide
   - Pipe, inlet, and manhole cleaning
     - Objective: 20% of the system per year
     - Active Season(s): Winter, Spring, Summer, and Fall
     - Operational Area: Citywide
   - Treatment unit maintenance
     - Objective: Clean semi-annually
     - Active Season(s): Spring and Fall
     - Operational Area: As required
   - Infiltration facility maintenance
     - Objective: Clean semi-annually
     - Active Season(s): Spring and Fall
     - Operational Area: As required
   - Pipe, inlet, manhole repair
     - Objective: As need basis
     - Active Season(s): Spring, Summer, and Fall
     - Operational Area: Citywide
2. Street Operations
   - Spring debris pickup
     - Objective: Annually
     - Active Season(s): Spring
     - Operational Area: Citywide
   - Fall leaf pickup
     - Objective: Annually
     - Active Season(s): Fall
     - Operational Area: Citywide
   - Street sweeping
     - Objective: Annually
     - Active Season(s): Winter, Spring, Summer, and Fall
     - Operational Area: Citywide
3. Strategic Services Division
   - New or improved private and public infrastructure mapping and attribution
     - Objective: Annually

- Active Season(s): Winter, Spring, Summer, and Fall
- Operational Area: Citywide

- Ownership, life-cycle, and maintainability GIS attribution coordination
  - Objective: Annually
  - Active Season(s): Winter, Spring, Summer, and Fall
  - Operational Area: Citywide
- Development and redevelopment impervious area digitization for rate model
  - Objective: Annually
  - Active Season(s): Winter, Spring, Summer, and Fall
  - Operational Area: Citywide
- Cityworks software management, including event layers, reports, and databases
  - Objective: Annually
  - Active Season(s): Winter, Spring, Summer, and Fall
  - Operational Area: Citywide
- Division performance optimization and database administration
  - Objective: Annually
  - Active Season(s): Winter, Spring, Summer, and Fall
  - Operational Area: Citywide

4. Operation Facilities
   - Storm Sewer Debris Collection and Dewatering Facility
     - Goal: Clean and haul waste to landfill annually
     - Operating Seasons: Winter, Spring, Summer, and Fall
   - East Gallatin Street Sweepings Collection Facility
     - Goal: Clean and haul waste to landfill annually
     - Operating Seasons: Winter, Spring, Summer, and Fall

The MS4 uses the following workload metrics to track its performance:

1. Inlets and Manholes Cleaned: Stormwater inlets and manholes serve two purposes: (1) mitigate flood risk by collecting runoff from streets, parking lots, alleyways, and other hard surfaces, and (2) treat stormwater by capturing sediment, trash, and other pollutants in their sumps.
   - Performance Measure: Clean 20% of public inlets and manholes annually
   - Calculation Type: Total assets (includes duplicate effort)
   - Data Source: Stormwater Operations Dashboard
     - 2017: 25.5% (1,051 maintained/4,117 total)
       - City: 20.8% (776 maintained/3,725 total)
       - MSU: 70.2% (275 maintained/392 total)
     - 2018: 24.1% (998 maintained/4,140 total)
       - City: 19.6% (742 maintained/3,778 total)
       - MSU: 70.7% (256 maintained/362 total)

2. Pipes Cleaned: Stormwater pipes serve two purposes: (1) convey stormwater collected by inlets to their point of discharge, and (2) capture sediment, trash, and other pollutants that fall out of suspension, requiring reoccurring maintenance to remain functional.

   - Performance Measure: Clean 20% of pipes annually
   - Calculation Type: Total assets (mains and laterals, includes duplicate effort)
   - Data Source: Stormwater Operations Dashboard
     - 2017: 18.0% (17.0 maintained miles/94.3 total miles)
       - City: 21.6% (16.7 maintained miles/77.4 total miles)
       - MSU: 1.8% (.3 maintained miles/16.9 total miles)
     - 2018: 21.3% (16.8 maintained miles/78.7 total miles)
       - City: 23.7% (16.7 maintained miles/70.4 total miles)
       - MSU: 1.2% (.1 maintained miles/8.3 total miles)

3. Infrastructure Repairs: Infrastructure repairs or "spot repairs" serve two purposes: (1) fix known pipe failures and restrictions to ensure the adequate flow of stormwater, and (2) repair open sections of pipe where scouring of subgrade soils occur, mitigating the chance of a road failure and sediment load contribution.

   - Performance Measure: Indicator
   - Calculation Type: Total repairs
   - Data Source: Stormwater Operations Dashboard
     - 2017: 23 Repairs
       - City: 18 Repairs
       - MSU: 5 Repairs
     - 2018: 18 Repairs
       - City: 16 Repairs
       - MSU: 2 Repairs

4. Stormwater Pipes Inspected: Pipe inspections serve two purposes: (1) allows staff to identify structural and maintenance needs for underground infrastructure and (2) ensure no cross connections or illegal pipe connections exist.

   - Performance Measure: Inspect 20% of stormwater mains annually
   - Calculation Type: Total assets (mains and laterals, includes duplicate effort)
   - Data Source: Infrastructure Maintenance Performance Measure
     - 2017: 10.4% (9.8 inspected miles/94.3 total miles)
       - City: 12.0% (9.3 inspected miles/77.4 total miles)
       - MSU: 3.0% (.5 inspected miles/16.9 total miles)
     - 2018: 19.8% (15.6 inspected miles/78.7 total miles)
       - City: 21.6% (15.2 inspected miles/70.4 total miles)
       - MSU: 4.8% (.4 inspected miles/8.3 total miles)

7.3 Facility Stormwater Pollution Prevention Program

The purpose of the MS4's Facility Stormwater Pollution Prevention Program (FSWPPP) is to mitigate stormwater pollutants generated on public facilities. To complete, the MS4 works to ensure all public facilities meet or exceed the following Facility Minimum Standards (FMS):

- Wash bays and interior floor drains must be connected to the sanitary sewer with pretreatment
- Chemicals must be stored under cover and within secondary containment
- Tracking must be controlled at entries, exits, and within parking areas
- Spill kits must be stocked with instructions, disposable bags, PPE, and absorbent products
- Preventative maintenance must be performed on vehicles and equipment
- Vehicles and equipment must be washed in designated locations
- Fuel tanks must be protected by secondary containment, inspected semi-annually
- BMPs must be implemented for pollutants identified to exceed applicable median concentrations detailed in SWMP Section 8.2
- Stormwater facilities must be maintained per the following frequencies:
  - Stormwater basins, annual vegetation and debris clearing, 10-15 year dredging
  - Mechanical separators, semi-annual vacuuming
  - Infiltration facilities, semi-annual flushing
  - Permeable surfaces, as required
  - Inlets, manholes, and pipes, five-year flushing, vacuuming, and inspection cycle
- Disturbed areas must be stabilized within 14-days
- FSWPPP must be onsite and updated to show current conditions

The MS4 uses the following FSWPPP inspection protocol:

1. Sample a minimum of two discharges and analyze the pollutants detailed in SWMP Section 8.3
2. Inspect site and establish baseline compliance with FMSs
3. Review existing documents, including existing Standard Operating Guides (SOGs), safety data sheets, spill documentation, and stormwater facility record drawings
4. Generate inspection report that documents the sampling results, including the comparison to median concentrations detailed in SWMP Section 8.2, site map, and inspection notes
5. Meet with applicable leadership to review the inspection report
6. Develop FSWPPP that includes:
   - Overview
   - Leadership
   - Site Description
   - Monitoring Strategy and Results
   - FMS and Pollution Assessment
   - Deployed BMPs and SOGs
   - Spill Response Plan
   - Training Program
   - Impaired Waterbody Discharge (if applicable)
   - Inspection Frequency
   - Record Keeping and Reporting
   - Site Map
   - Spill Tracking Sheet
   - Corrective Action Tracking Sheet

7. Implement FSWPPP
8. Re-inspect and compare compliance with FMSs and update FSWPPP one-year after implementation and on a three-year interval moving forward

The MS4 will subject the following facilities to the FSWPPP inspection protocol:

1. Operations Staging and Storage Areas
    - 1.1: University Shops Facility
        - Use: Staging, storage, and office property supporting numerous MSU divisions
        - Pollutants of Concern: TBD
        - Responsible Department: MSU Facilities Services
        - Responsible Position: MSU Director of Facilities Services
        - Control Measures: TBD
        - Workflow:
            - Sample: 2019
            - Inspect: 2019
            - Generate Inspection Report: 2019
            - Meet with Facility Leadership: 2019
            - Develop and Implement FSWPPP: 2019
            - Train: 2019
            - Confirm: 2020
    - 1.2: City Shops Complex
        - Use: Staging, storage, and office property supporting City Public Works divisions
        - Pollutants of Concern: TBD
        - Responsible Department: Public Works
        - Responsible Position: Public Works Director
        - Control Measures: Hydrodynamic separator, wash bay, underground infiltration gallery, double-walled fuel tank
        - Workflow:
            - Sample: 2019
            - Inspect: 2019
            - Generate Inspection Report: 2019
            - Meet with Facility Leadership: 2019
            - Develop and implement FSWPPP: 2019
            - Train: 2019
            - Confirm: 2020
    - 1.3: Vehicle Maintenance Facility
        - Use: Facility that supports the storage and maintenance of equipment for all municipal operations
        - Pollutants of Concern: TBD
        - Responsible Department: Public Works
        - Responsible Position: Public Works Director
        - Control Measures: Detention basin, sand-oil separator
        - Workflow:
            - Sample: 2019

- Inspect: 2019
- Generate Inspection Report: 2019
- Meet with Facility Leadership: 2019
- Develop and implement FSWPPP: 2019
- Train: 2019
- Confirm: 2020

- 1.4: Laurel Glen Operations Facility
  - Use: Facility that supports the storage and maintenance of equipment for Water and Sewer municipal operations
  - Pollutants of Concern: TBD
  - Responsible Department: Public Works
  - Responsible Position: Public Works Director
  - Control Measures: TBD
  - Workflow:
    - Sample: 2019
    - Inspect: 2019
    - Generate Inspection Report: 2019
    - Meet with Facility Leadership: 2019
    - Develop and implement FSWPPP: 2019
    - Train: 2019
    - Confirm: 2020
- 1.5: Bozeman Public Safety Facility
  - Use: Future location of the City's Police, Fire, and Legal Divisions
  - Pollutants of Concern: TBD
  - Responsible Department: City Management
  - Responsible Position: Assistant City Manager
  - Control Measures: TBD
  - Workflow:
    - Sample: 2019
    - Inspect: 2019
    - Generate Inspection Report: 2019
    - Meet with Facility Leadership: 2019
    - Develop and implement FSWPPP: 2019
    - Train: 2019
    - Confirm: 2020

2. Material Storage Yards

- 2.1: East Gallatin Storage Area
  - Use: Storage area for sediment, millings, street sweepings, and other materials used during the daily operation of numerous MS4 divisions
  - Pollutants of Concern: TBD
  - Responsible Department: Public Works and Parks
  - Responsible Position: Public Works and Parks Directors
  - Control Measures: TBD
  - Workflow:

        - ❖ Sample: 2020
        - ❖ Inspect: 2020
        - ❖ Generate Inspection Report: 2020
        - ❖ Meet with Facility Leadership: 2020
        - ❖ Develop and implement FSWPPP: 2020
        - ❖ Train: 2020
        - ❖ Confirm: 2021

- 2.2: Solid Waste Operations and Closed Landfill
    - Use: Minor Class IV Landfill Facility housing the Solid Waste Division and is permitted under the MDEQ's Stormwater Industrial Permit.
    - Pollutants of Concern: TBD
    - Responsible Department: Public Works
    - Responsible Position: Public Works Director
    - Control Measures: Detention basins, double walled fuel tank, rock rundown
    - Workflow:
        - ❖ Sample: 2020
        - ❖ Inspect: 2020
        - ❖ Generate Inspection Report: 2020
        - ❖ Meet with Facility Leadership: 2020
        - ❖ Develop and implement FSWPPP: 2020
        - ❖ Train: 2020
        - ❖ Confirm: 2021

- 2.3: Snow Storage Area
    - Use: Location that houses snow throughout winter
    - Pollutants of Concern: TBD
    - Responsible Department: Public Works
    - Responsible Position: Public Works Director
    - Control Measures: TBD
    - Workflow:
        - ❖ Sample: 2020
        - ❖ Inspect: 2020
        - ❖ Generate Inspection Report: 2020
        - ❖ Meet with Facility Leadership: 2020
        - ❖ Develop and implement FSWPPP: 2020
        - ❖ Train: 2020
        - ❖ Confirm: 2021

- 2.4: University Material Storage Area
    - Use: Location that houses arena dirt
    - Pollutants of Concern: TBD
    - Responsible Department: MSU Facilities Services
    - Responsible Position: MSU Director of Facilities Services
    - Control Measures: TBD
    - Workflow:
        - ❖ Sample: 2020

- ❖ Inspect: 2020
- ❖ Generate Inspection Report: 2020
- ❖ Meet with Facility Leadership: 2020
- ❖ Develop and implement FSWPPP: 2020
- ❖ Train: 2020
- ❖ Confirm: 2021

3. Treatment Works

- 3.1: Water Treatment Plant
  - Use: Potable water treatment plant
  - Pollutants of Concern: TBD
  - Responsible Department: Public Works
  - Responsible Position: Public Works Director
  - Control Measures: TBD
  - Workflow:
    - ❖ Sample: 2020
    - ❖ Inspect: 2020
    - ❖ Generate Inspection Report: 2020
    - ❖ Meet with Facility Leadership: 2020
    - ❖ Develop and implement FSWPPP: 2020
    - ❖ Train: 2020
    - ❖ Confirm: 2021
- 3.2: Water Reclamation Facility
  - Use: Treatment plant regulated under the MDEQ's Stormwater Industrial Permit
  - Pollutants of Concern: TBD
  - Responsible Department: Public Works
  - Responsible Position: Public Works Director
  - Control Measures: TBD
  - Workflow:
    - ❖ Sample: 2020
    - ❖ Inspect: 2020
    - ❖ Generate Inspection Report: 2020
    - ❖ Meet with Facility Leadership: 2020
    - ❖ Develop and implement FSWPPP: 2020
    - ❖ Train: 2020
    - ❖ Confirm: 2021

4. Parking Facilities

- 4.1: Public Parking Garage
  - Use: Vehicle parking
  - Pollutants of Concern: TBD
  - Responsible Department: Parking Division
  - Responsible Position: Parking Manager
  - Control Measures: TBD
  - Workflow:

        - ❖ Sample: 2021
        - ❖ Inspect: 2021
        - ❖ Generate Inspection Report: 2021
        - ❖ Meet with Facility Leadership: 2021
        - ❖ Develop and implement FSWPPP: 2021
        - ❖ Train: Fall/Winter 2021
        - ❖ Confirm: Spring 2022

- 4.2: University Parking Garage
    - Use: Vehicle parking
    - Pollutants of Concern: TBD
    - Responsible Department: University Facilities
    - Responsible Position: University Facilities Director
    - Control Measures: TBD
    - Workflow:
        - ❖ Sample: 2021
        - ❖ Inspect: 2021
        - ❖ Generate Inspection Report: 2021
        - ❖ Meet with Facility Leadership: 2021
        - ❖ Develop and implement FSWPPP: 2021
        - ❖ Train: Fall/Winter 2021
        - ❖ Confirm: Spring 2022

- 4.3: Public Parking Lots (4)
    - Use: Vehicle parking
    - Pollutants of Concern: TBD
    - Responsible Department: Parking Division
    - Responsible Position: Parking Manager
    - Control Measures: TBD
    - Workflow:
        - ❖ Sample: 2021
        - ❖ Inspect: 2021
        - ❖ Generate Inspection Report: 2021
        - ❖ Meet with Facility Leadership: 2021
        - ❖ Develop and implement FSWPPP: 2021
        - ❖ Train: Fall/Winter 2021
        - ❖ Confirm: Spring 2022

- 4.4: University Parking Lots (17)
    - Use: Vehicle parking
    - Pollutants of Concern: TBD
    - Responsible Department: University Facilities
    - Responsible Position: University Facilities Director
    - Control Measures: TBD
    - Workflow:
        - ❖ Sample: 2021
        - ❖ Inspect: 2021

- Generate Inspection Report: 2021
- Meet with Facility Leadership: 2021
- Develop and implement FSWPPP: 2021
- Train: Fall/Winter 2021
- Confirm: Spring 2022

5. 5.1: Public Safety Facilities

- Fire Station #1 (34 N Rouse Ave)
  - Use: Emergency services
  - Pollutants of Concern: TBD
  - Responsible Department: Fire Department
  - Responsible Position: Fire Chief
  - Control Measures: TBD
  - Workflow:
    - Sample: 2022
    - Inspect: 2022
    - Generate Inspection Report: 2022
    - Meet with Facility Leadership: 2022
    - Develop and implement FSWPPP: 2022
    - Train: Fall/Winter 2022
    - Confirm: Spring 2023
- 5.2: Fire Station #2 (410 S 19th Ave)
  - Use: Emergency services
  - Pollutants of Concern: TBD
  - Responsible Department: Fire Department
  - Responsible Position: Fire Chief
  - Control Measures: TBD
  - Workflow:
    - Sample: 2022
    - Inspect: 2022
    - Generate Inspection Report: 2022
    - Meet with Facility Leadership: 2022
    - Develop and implement FSWPPP: 2022
    - Train: Fall/Winter 2022
    - Confirm: Spring 2023
- 5.3: Fire Station #3 (1705 Vaquero Pkwy)
  - Use: Emergency services
  - Pollutants of Concern: TBD
  - Responsible Department: Fire Department
  - Responsible Position: Fire Chief
  - Control Measures: TBD
  - Workflow:
    - Sample: 2022
    - Inspect: 2022

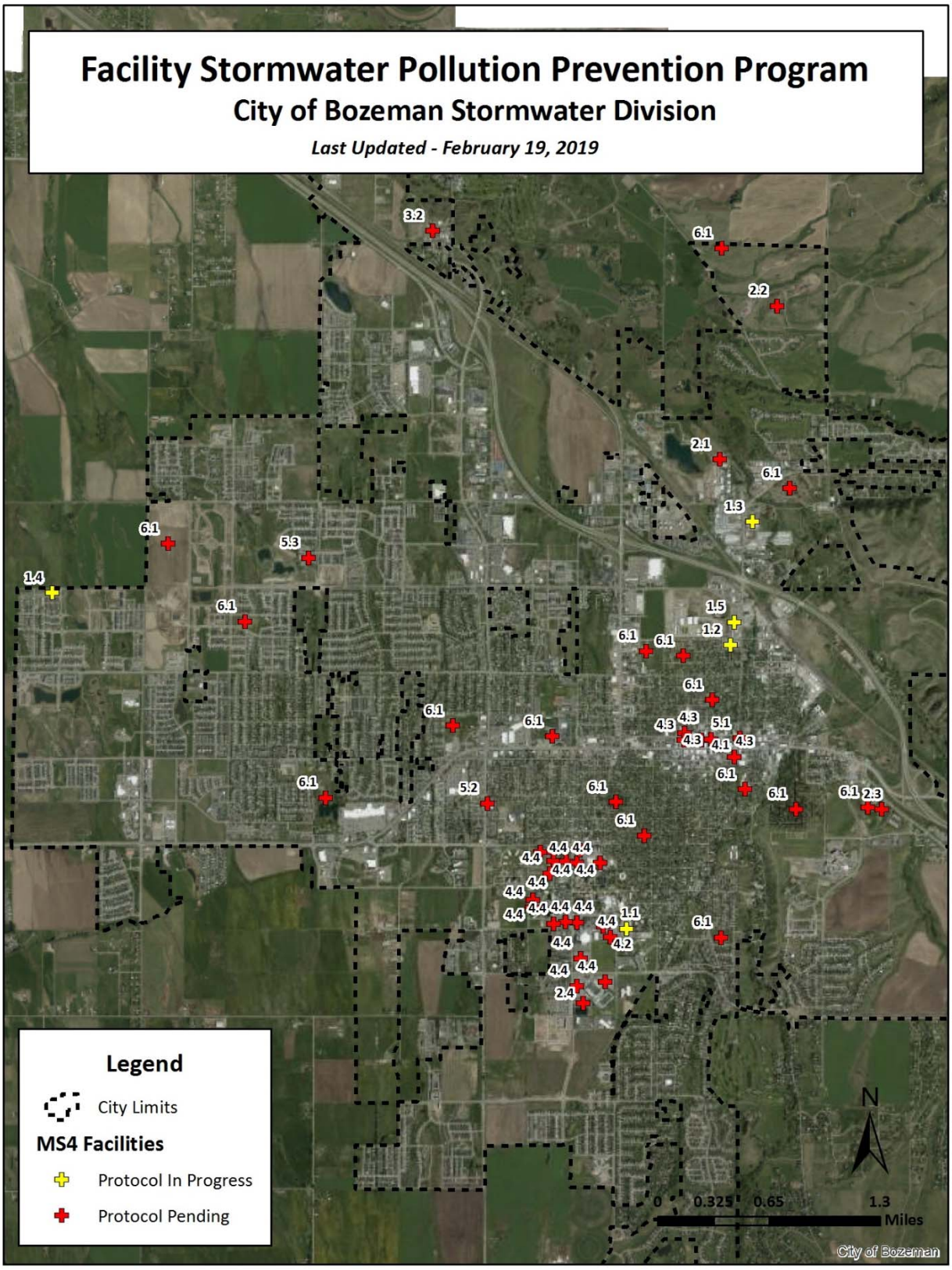
- ❖ Generate Inspection Report: 2022
- ❖ Meet with Facility Leadership: 2022
- ❖ Develop and implement FSWPPP: 2022
- ❖ Train: Fall/Winter 2022
- ❖ Confirm: Spring 2023

6. Recreational Facilities

➢ 6.1: Parks and Recreation (16)

- o Use: Numerous parks and recreation facilities exist citywide
- o Pollutants of Concern: TBD
- o Responsible Department: Parks
- o Responsible Position: Parks Director
- o Control Measures: TBD
- o Workflow:

  - ❖ Sample: 2022
  - ❖ Inspect: 2022
  - ❖ Generate Inspection Report: 2022
  - ❖ Meet with Facility Leadership: 2022
  - ❖ Develop and implement FSWPPP: 2022
  - ❖ Train: Fall/Winter 2022
  - ❖ Confirm: Spring 2023



Graphic 7.3.1: Facility Stormwater Pollution Prevention Program

The MS4 tracks workload by totaling activities deemed complete by those still requiring assessment.

- 2017: 0% (0/53)
- 2018: 0% (0/53
- 2019: TBD
- 2020: TBD
- 2012: TBD

The MS4 generates a compliance score to analyze performance using the following protocol:

1. Calculate a score for each FMS based on the following criteria:
   - 0-Points: Does not meet the standard
   - 1-Point: Partially meets the standard
   - 2-Points: Meets the standard
2. Sum the points assigned and divided by the total possible points to compute a percentage score
3. Describe scoring and rational in applicable FSWPPP

For example, Sample Facility A scored the following:

- FMS #1: 0-Points
- FMS #2: 2-Points
- FMS #3: 1-Point
- FMS #4: 0-Points
- FMS #5: 2-Points
- FMS #6: 1-Point
- FMS #7: 2-Points
- FMS #8: 0-Points
- FMS #9: 1-Point
- FMS #10: 1-Point
- FMS #11: 0-Points

Sample Facility A scored 11-points out of the 22 points possible, resulting in a compliance score of 50%. This compliance score acts as a baseline for the MS4 and provides a mechanism to track future progress.

7.4 Activity Stormwater Pollution Prevention Program

The purpose of the MS4's Activity Stormwater Pollution Prevention Program (ASWPPP) is to mitigate stormwater pollutants generated from municipal operations. To complete, the MS4 works to ensure all operations meet or exceed the following Activity Minimum Standards (AMS):

- Street surfaces and inlets must be protected by deploying controls that capture, contain, absorb, and allow disposal of generated pollutants
- Material stockpiles must be covered or contained, and run-on controls in place
- Disturbed areas must be contained, and stabilized within 14-days of activites
- Tracking controls must be in place to prevent the off-site migration of debris
- Concrete waste must be captured and disposed
- Dewatering flows must be treated to remove sediment to the maximum extent practicable before entering the storm sewer system or waterways. Additional considerations required for Tetrachloroethylene (PCE) and Pentachlorophenol (PCP) when conducting operations in controlled groundwater discharge areas.

The MS4 uses the following ASWPPP inspection protocol:

1. Inspect activity and establish baseline compliance with AMSs
2. Review existing documents, including SOGs and safety data sheets
3. Generate inspection report that includes inspection notes
4. Meet with applicable leadership to review the inspection report
5. Develop ASWPPP that includes:
    - Overview
    - Leadership
    - Activity Description
    - FMS and Pollution Assessment
    - Deployed BMPs and SOGs
    - High-Priority Areas (if applicable)
    - Training Program
    - Inspection Frequency
    - Record Keeping and Reporting
    - Site Map (if applicable)
    - Corrective Action Tracking Sheet
6. Implement ASWPPP
7. Re-inspect and compare compliance with AMSs and update ASWPPP one year after implementation and on a three-year interval moving forward

The MS4 will subject the following activities to the ASWPPP inspection protocol:

1. Water and Sewer Operations
    - 1.1: Water main breaks
        - Pollutants of Concern: TBD
        - Responsible Department: Public Works
        - Responsible Position: Public Works Director
        - Minimum Standards: TBD
        - Location: Citywide
        - Workflow:
            - Investigate: 2019
            - Develop ASWPPP: 2019
            - Train: 2019
            - Confirm: 2020
    - 1.2: Sanitary sewer overflows
        - Pollutants of Concern: TBD
        - Responsible Department: Public Works
        - Responsible Position: Public Works Director
        - Minimum Standards: TBD
        - Location: Citywide
        - Workflow:
            - Investigate: 2019
            - Develop ASWPPP: 2019

        - Train: 2019
        - Confirm: 2020

- 1.3: Trenching and excavation
    - Pollutants of Concern: TBD
    - Responsible Department: Public Works
    - Responsible Position: Public Works Director
    - Minimum Standards: TBD
    - Location: Citywide
    - Workflow:
        - Investigate: 2019
        - Develop ASWPPP: 2019
        - Train: 2019
        - Confirm: 2020

2. Streets, Water, and Sewer Operations

- 2.1: Sidewalk and curb construction
    - Pollutants of Concern: TBD
    - Responsible Department: Public Works
    - Responsible Position: Public Works Director
    - Minimum Standards: TBD
    - Location: Citywide
    - Workflow:
        - Investigate: 2020
        - Develop ASWPPP: 2020
        - Train: 2020
        - Confirm: 2021

- 2.2: Curb-cut slurry capture, collection, and disposal
    - Pollutants of Concern: TBD
    - Responsible Department: Public Works
    - Responsible Position: Public Works Director
    - Minimum Standards: TBD
    - Location: Citywide
    - Workflow:
        - Investigate: 2020
        - Develop ASWPPP: 2020
        - Train: 2020
        - Confirm: 2021

3. Streets Operations

- 3.1: Roadway traction sand and chemical application rates and techniques
    - Pollutants of Concern: TBD
    - Responsible Department: Public Works
    - Responsible Position: Public Works Director
    - Minimum Standards: Street sweeping

- Location: Citywide
- Workflow:
  - Investigate: 2020
  - Develop ASWPPP: 2020
  - Train: 2020
  - Confirm: 2021

4. Solid Waste Operations
   - 4.1: Solid waste collection and disposal
     - Pollutants of Concern: TBD
     - Responsible Department: Public Works
     - Responsible Position: Public Works Director
     - Minimum Standards: TBD
     - Location: Citywide
     - Workflow:
       - Investigate: 2020
       - Develop ASWPPP: 2020
       - Train: 2020
       - Confirm: 2021
5. University Operations
   - 5.1: Arena construction
     - Pollutants of Concern: TBD
     - Responsible Department: University
     - Responsible Position: University Facilities Director
     - Minimum Standards: TBD
     - Location: University Stadium Complex
     - Workflow:
       - Investigate: 2020
       - Develop ASWPPP: 2020
       - Train: 2020
       - Confirm: 2021

The MS4 tracks workload by totaling activities deemed complete by those still requiring assessment.

- 2017: 0% (0/8)
- 2018: 0% (0/8)
- 2019: TBD
- 2020: TBD
- 2012: TBD

The MS4 generates a compliance score to analyze performance using the following protocol:

1. Calculate a score for each AMS based on the following criteria:
   - 0-Points: Does not meet the standard
   - 1-Point: Partially meets the standard
   - 2-Points: Meets the standard

2. Sum the points assigned and divided by the total possible points to compute a percentage score
3. Describe scoring and rational in applicable ASWPPP

For example, Sample Activity A scored the following:

- FMS #1: 0-Points
- FMS #2: 2-Points
- FMS #3: 1-Point
- FMS #4: 0-Points
- FMS #5: 2-Points
- FMS #6: 1-Point

Sample Facility A scored 6-points out of the 12 points possible, resulting in a compliance score of 50%. This compliance score acts as a baseline for the MS4 and provides a mechanism to track future progress.

7.5 Training

The MS4 participates in local, state, and national training, conferences, and certification programs. The following lists completed efforts:

1. Comprehensive Stormwater Training
    - Stormwater Program Coordinator (Kyle Mehrens)
        - 2017: Weekly meeting, Montana Water Environment Association Conference (April 19-20), Bellevue StormCon Conference (August 29-31)
        - 2018: Weekly meeting, Montana Stormwater Conference (May 1-3), Denver StormCon Conference (August 13-15)
    - Stormwater Program Specialist (Frank Greenhill)
        - 2017: Weekly meeting, Montana Water Environment Association Conference (April 19-20),
        - 2018: Weekly meeting, California International Erosion Control Association Conference (February 12-14), Montana Stormwater Conference (May 1-3)
    - Stormwater Program Technician (Cody Flammond)
        - 2018: Weekly meeting, California International Erosion Control Association Conference (February 12-14), Montana Stormwater Conference (May 1-3), Phase 1 Leadership Training (October 15-17), Hazardous Waste Training (February 6)
    - Stormwater Operations Foreman (Mike Dilbeck)
        - 2017: Monthly meeting
        - 2018: Monthly meeting, Montana Stormwater Conference (May 1-3)
    - MSU Director – Facilities Services (EJ Hook)
        - 2017: Monthly meeting
        - 2018: Monthly meeting, Montana Stormwater Conference (May 1-3)
2. Stormwater Awareness Training: The MS4 trains employees with the goal of increasing awareness and reducing stormwater pollutants generated from internal operations. Employees receive training every three years and new hires within the first 90 days of employment. The

MS4 utilizes an online-based application (Proprofs) to hold interactive training for field supervisors and employees that includes the following content:

- Stormwater Division Overview (7 minutes) - "Stormwater in Bozeman: The Big Picture."
  - A broad view of Bozeman's stormwater system
  - Information about the importance of mitigating stormwater pollution
- Facility Operations Training Videos: "Rain Check"
  - Notes and FYIs
  - Quiz questions
  - Detailed Best Management Practices related to the following activities:
    - Good Housekeeping and Spill Prevention
    - Spill Control and Response
    - Vehicle Fueling
    - Vehicle and Equipment Maintenance
    - Vehicle and Equipment Washing
    - Materials Management
    - Waste Management
    - Landscaping
- Participant Totals:
  - Stormwater Division
    - 2017: 2 (1.5 hours)
    - 2018: 1 (.6 hours)
  - Water, Sewer, and Storm Division
    - 2017: 18 (11.2 hours)
    - 2018: 7 (2.5 hours)
  - Water Reclamation Division (annual requirement)
    - 2017: 13 (13 hours)
    - 2018: 15 (8.5 hours)
  - Streets Division
    - 2017: 0 (0 hours)
    - 2018: 19 (12 hours)
  - Solid Waste Division (annual requirement)
    - 2017: 14 (8.6 hours)
    - 2018: 17 (11.7 hours)
  - Water Treatment Division
    - 2017: 0 (0 hours)
    - 2018: 10 (8.9 hours)
  - Parks Division
    - 2017: 0 (0 hours)
    - 2018: 0 (0 hours)

- Fire Division
  - 2017: 0 (0 hours)
  - 2018: 0 (0 hours)
- Montana State University Operations
  - 2017: 0 (0 hours)
  - 2018: 1 (.8 hours)

3. Construction Site Management Program
   - Stormwater Program Specialist (Frank Greenhill)
     - 2017: 101 Introduction to Stormwater Management Training (February 13), 201 SWPPP Administrator Training (February 14-15), 202 SWPPP Preparer Training (February 22), 101 Introduction to Stormwater Management Training (September 19), 102 BMP Field Academy (May 31 and June 1), 201 SWPPP Administrator Training (September 20-21), 202 SWPPP Preparer Training (September 22), 301 Compliance Evaluation Inspection Training (October 17 and 18)
     - 2018: California International Erosion Control Association Conference (February 12-14), 101 Introduction to Stormwater Management Training (March 27), 201/202 SWPPP Administrator and Preparer Training (March 28-29), 100 Construction Dewatering Training (March 30), 102 BMP Field Academy (June 12)
   - Stormwater Program Technician (Cody Flammond)
     - 2018: California International Erosion Control Association Conference (February 12-14), 101 Introduction to Stormwater Management Training (March 27), 201/202 SWPPP Administrator and Preparer Training (March 28-29), 100 Construction Dewatering Training (March 30), 102 BMP Field Academy (June 12)
   - MSU Director of Facilities Services (EJ Hook)
     - 2017: 301 Compliance Evaluation Inspection Training (October 17 and 18)
4. Post-Construction Program
   - Stormwater Program Coordinator (Kyle Mehrens):
     - 2017: Weekly meeting, Montana Water Environment Association Conference (April 19-20), Bellevue StormCon Conference (August 29-31)
     - 2018: Weekly meeting, Montana Stormwater Conference (May 1-3), Denver StormCon Conference (August 13-15)
   - Development Review Engineer (Anna Russell P.E.)
     - 2018: Onboarding with Stormwater Coordinator, engineering certification credits
   - Development Review Engineer (Griffin Nielsen E.I):
     - 2017: Onboarding with Stormwater Coordinator, engineering certification credits
     - 2018: Engineering certification credits
5. FSWPPP and ASWPPP Training
   - See SWMP Sections 7.3 and 7.4

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Section 8.0

Sampling and Evaluation Program

Graphic: 8.0.1: In-stream sampling equipment

Graphic 8.0.2: Stormwater runoff nutrient analysis

8.1 Introduction

The MS4 strives to improve waterway health, protect public safety, and comply with its MS4 Permit through the collection of stormwater and waterway data points that:

- Monitor stormwater and surface water quality over time
- Evaluate the effectiveness of infrastructure and administrative program investments
- Generate data that advises policy, capital, and operational decisions
- Provide a data-driven performance metric easily communicated to the public

SWMP Section 8.0 details the following components necessary to administer the MS4's Sampling and Evaluation Program, including:

- Targeted Waterways
- Regulatory Requirements
- Urban Runoff Monitoring
- In-stream Wet Weather Monitoring
- Sediment Reduction Monitoring
- Long-term Trend Monitoring
- Evaluation
- Discussion

8.2 Targeted Waterways

Bozeman Creek, a.k.a. Sourdough Creek, originates in the Gallatin Mountains south of the MS4. Flowing north, Bozeman Creek enters the MS4 at E. Kagy Boulevard and continues until its confluence with the E. Gallatin River at E. Griffin Dr. The Montana DEQ determined that Bozeman Creek contained impairments from natural and anthropogenic sources when preparing the 2013 Lower Gallatin Planning Area TMDL.

Bozeman Creek Impairment Information			
Probable Cause	**Probable Sources**	**Associated Uses**	**TMDL**
Alteration in stream-side or littoral vegetative cover	Agricultural grazing, crop production	Aquatic Life	No
Chlorophyll-a	Agricultural grazing and crop production, residential districts, municipal area	Primary Contact and Recreation	No
E.coli	Septic tanks, urban runoff, storm sewers, pet waste, livestock	Primary Contact and Recreation	Yes
Nitrogen (Total)	Agricultural grazing and crop production, residential districts, municipal area	Aquatic Life, Primary Contact, and Recreation	Yes
Sediment	Natural sources, unpaved roads/trails, urban runoff, storm sewers, municipal area	Aquatic Life	Yes

Graphic 8.2.1: Bozeman Creek Impairment Information

Mandeville Creek, a small spring feed watercourse, originates south of Bozeman. Flowing north, Mandeville Creek enters the MS4 at Alder Creek Dr. and continues until its confluence with the E. Gallatin River. The Montana DEQ determined Mandeville Creek contained impairments from anthropogenic sources when preparing the 2013 Lower Gallatin Planning Area TMDL.

Mandeville Creek Impairment Information			
Probable Cause	**Probable Sources**	**Associated Uses**	**TMDL**
Nitrogen (Total)	Municipal point source discharges, residential districts, municipal area	Aquatic Life, Primary Contact, and Recreation	Yes
Phosphorous (Total)	Municipal point source discharges, residential districts, municipal area	Aquatic Life, Primary Contact, and Recreation	Yes

Graphic 8.2.2: Mandeville Creek Impairment Information

8.3 Regulatory Requirements

The MS4 General Permit requires that the MS4 perform sampling, testing, and reporting of stormwater discharges annually, including:

1. Monitor stormwater discharges based on residential and industrial land-use types
   - See SWMP Section 8.4 Urban Runoff Monitoring
2. Assess in-stream water quality impacts of stormwater discharges to Bozeman and Mandeville Creeks (Self-Monitoring Requirements: Monitoring Option 2)
   - See SWMP Section 8.5 In-Stream Wet-Weather Monitoring and SWMP Section 8.7 Long-Term Trend Monitoring.
3. Conduct TMDL-related monitoring to evaluate the effectiveness of best management practices (BMPs) implemented to reduce pollutant loading from the MS4 to impaired waters (TMDL Related Monitoring: Monitoring Option 2)
   - See SWMP Section 8.6 Sediment Reduction Monitoring
4. Self-evaluate results relative to long-term medians
   - See SWMP Section 8.8 Evaluation

For each of the monitoring requirements above, the MS4 conducts sampling, testing, and reporting of the following parameters:

1. Total Suspended Solids (TSS), mg/L
2. Chemical Oxygen Demand (COD), mg/L
3. Total Nitrogen (TN), mg/L
4. Total Phosphorus (TP), mg/L
5. Copper (Cu), mg/L
6. Lead (Pb), mg/L
7. Zinc (Zn), mg/L
8. Oils and Greases, mg/L
9. pH, standard units
10. Estimated Flow

8.4 Urban Runoff Monitoring

Introduction: The MS4 collects urban runoff samples from representative watersheds to characterize pollutant loading occurring from various land-use types before system treatment, such as stormwater basins, sumps, infiltration galleries, and mechanical separation. In general, urban runoff pollutant

concentrations are variable and dependent on numerous environmental conditions, such as precipitation cycles, wind, tree cover, and human activities.

Sites: The MS4 has a network of four monitoring locations: two within residential drainage basins and two within commercial/industrial drainage basins, including:

1. Site: RES_01
    - Location: Near the intersection of S. Bozeman Ave. and E. Garfield St.
    - Land-use: Residential
    - Drainage Basin: Seven acres
    - Inlet ID: I.F06.00082
        - Latitude: 45.667143
        - Longitude: -111.034474
    - Inlet ID: I.F06.00083
        - Latitude: 45.667143
        - Longitude: -111.034724
    - Parameters: TSS, COD, TP, TN, pH, Copper, Lead, Zinc, Oils and Greases, and Flow
    - Frequency: Two samples per year
2. Site: IND_01
    - Location: Near Commercial Dr. cul-de-sac (west)
    - Land-use: Commercial and Industrial
    - Drainage Basin: 10 acres
    - Inlet ID: I.E01.00184
        - Latitude: 45.703061
        - Longitude: -111.030112
    - Inlet ID: I.E01.00185
        - Latitude: 45.703164
        - Longitude: -111.030428
    - Parameters: TSS, COD, TP, TN, pH, Copper, Lead, Zinc, Oils and Greases, and Flow
    - Frequency: Two samples per year
3. Site: RES_02
    - Location: MSU Campus near the intersection of S. 12th Ave. and W. Garfield St.
    - Land-use: Residential
    - Drainage Basin: Four acres
    - Inlet ID: I.H06.00329
        - Latitude: 45.666911
        - Longitude: -111.054301
    - Inlet ID: I.H06.00259
        - Latitude: 45.666970
        - Longitude: -111.054226
    - Parameters: TSS, COD, TP, TN, pH, Copper, Lead, Zinc, Oils and Greases, and Flow

- Frequency: Two samples per year

4. Site: IND_02
   - Location: MSU Campus near the intersection of S. 6th Ave. and W Garfield St.
   - Land-use: Industrial
   - Drainage Basin: Two acres
   - Inlet ID: I.G06.00603
     - Latitude: 45.664409
     - Longitude: -111.044957
   - Inlet ID: I.G06.00630
     - Latitude: 45.664409
     - Longitude: -111.044942
   - Parameters: TSS, COD, TP, TN, pH, Copper, Lead, Zinc, Oils and Greases, and Flow
   - Frequency: Two samples per year

Methods: The MS4 collects urban runoff samples from storm sewer inlets at each site using Thermo-Scientific Nalgene Samplers (Samplers). Before runoff events, Staff installs each Sampler at the selected inlet grate and positions it to collect the first flush of urban runoff. Once full, the Sampler closes itself prohibiting additional collection or dilution of the original sample.

Analysis: The MS4 collects, transfers, packages, and ships samples to a certified laboratory, which analyzes the following parameters:

5. Total Suspended Solids (TSS), mg/L
6. Chemical Oxygen Demand (COD), mg/L
7. Total Nitrogen (TN), mg/L
8. Total Phosphorus (TP), mg/L
9. Copper (Cu), mg/L
10. Lead (Pb), mg/L
11. Zinc (Zn), mg/L
12. Oils and Greases, mg/L
13. pH, standard units
14. Estimated Flow

The MS4 estimates flow, in gallons per minute (gpm), using the Rational Formula where:

$$Q = CiA \qquad \textit{Equation 1}$$

1. Q is peak runoff rate (cfs converted to gpm)
2. C is the runoff coefficient (C-Factor, Bozeman Engineering Standards)
3. i is rainfall intensity (in./hr., MSU Rain Gage)
4. A is the drainage area (acres)

Sampling Location Runoff Coefficients (C-Factors)		
Location Name	**Primary Land Use**	**Runoff Coefficient (C-Factor)**
RES_01	Low to Medium Density Residential	0.35
RES_02	Dense Residential	0.50
IND_01	Industrial	0.80
IND_01	Industrial	0.80

Graphic 8.4.1: Sampling location runoff coefficients C-factors

	Monitoring Results									
	TSS (mg/L)	Oil & Grease (mg/L)	Total Nitro. (mg/L)	Phosp. (mg/L)	Zinc (mg/L)	Lead (mg/L)	Copper (mg/L)	COD (mg/L)	pH	Flow (gpm)
RES_01: 2017 (1)	203.0	2.00	6.20	0.908	0.1160	0.0052	0.0220	251.00	6.7	N/A
RES_01: 2017 (2)	368.0	5.10 RL	12.00	1.230	0.1790	0.0073	0.0300	175.00	7.0	N/A
RES_01: 2018 (1)	460.0	4.00	14.00	1.920	0.2720	0.0092	0.0290	708.00	6.4	55.0
RES_01: 2018 (2)	113.0	1.00 RL	2.30	0.544	0.1220	0.0033	0.0130	129.00	6.5	22.0
RES_01: 2019 (1)										
RES_01: 2019 (2)										
RES_01: 2020 (1)										
RES_01: 2020 (2)										
RES_01: 2021 (1)										
RES_01: 2021 (2)										
RES_01 Median	**285.5**	**3.00**	**9.10**	**1.069**	**0.1505**	**0.0063**	**0.0255**	**213.00**	**6.6**	**38.5**
RES_02: 2017 (1)	-	-	-	-	-	-	-	-	-	-
RES_02: 2017 (2)	-	-	-	-	-	-	-	-	-	-
RES_02: 2018 (1)	1430.0	15.00	8.40	2.030	0.6520	0.0367	0.0840	605.00	7.0	18.0
RES_02: 2018 (2)	199.0	3.00	3.40	0.457	0.2610	0.0081	0.0220	234.00	6.8	18.0
RES_02: 2019 (1)										
RES_02: 2019 (2)										
RES_02: 2020 (1)										
RES_02: 2020 (2)										
RES_02: 2021 (1)										
RES_02: 2021 (2)										
RES_02 Median	**814.5**	**9.00**	**5.90**	**1.244**	**0.4565**	**0.0224**	**0.0530**	**419.50**	**6.9**	**18.0**
IND_01: 2017 (1)	149.0	4.00	17.30	1.380	0.5780	0.0160	0.0440	292.00	7.0	-
IND_01: 2017 (2)	1820.0	5.10 RL	11.68	1.320	33.3500	0.0371	0.0867	151.00	6.9	-
IND_01: 2018 (1)	602.0	15.00	8.50	1.890	4.7100	0.0371	0.0620	606.00	7.3	179.5
IND_01: 2018 (2)	293.0	4.00	3.40	0.588	0.1910	0.0081	0.0270	195.00	7.0	71.8
IND_01: 2019 (1)										
IND_01: 2019 (2)										
IND_01: 2020 (1)										
IND_01: 2020 (2)										
IND_01: 2021 (1)										
IND_01: 2021 (2)										
IND_01 Median	**447.5**	**4.55**	**10.09**	**1.350**	**2.6440**	**0.0266**	**0.0530**	**243.50**	**7.0**	**125.7**
IND_02: 2017 (1)	-	-	-	-	-	-	-	-	-	-
IND_02: 2017 (2)	-	-	-	-	-	-	-	-	-	-
IND_02: 2018 (1)	899.0	4.00	8.80	1.600	0.5600	0.0158	0.0570	592.00	6.7	14.4
IND_02: 2018 (2)	380.0	5.00	4.40	0.737	0.2450	0.0099	0.0320	271.00	3.4	14.4
IND_02: 2019 (1)										
IND_02: 2019 (2)										
IND_02: 2020 (1)										
IND_02: 2020 (2)										
IND_02: 2021 (1)										
IND_02: 2021 (2)										
IND_02 Median	**639.5**	**4.50**	**6.60**	**1.169**	**0.4025**	**0.0129**	**0.0445**	**431.50**	**5.1**	**14.4**

Graphic 8.4.2: Monitoring Results. RL is the minimum Reporting Limit.

Evaluation: The MS4 enters monitoring results into a local spreadsheet, stores analysis reports for safe record, and analyzes the data using the following Scoring Matrix (Matrix) and protocol to interpret, evaluate, and communicate the results. The Matrix includes scores ranging from 0 to 4-points, representing a set increase from EPA benchmarks provided in previous MS4 General Permits.

For example, the TSS Benchmark is 125 mg/L. As such, the 3-Point range is two times that amount (250), the 2-Point range is three times that amount (375), etc.

Urban Runoff Monitoring: Scoring Matrix					
	4-Points	**3-Points**	**2-Points**	**1-Point**	**0-Points**
TSS (mg/L)	0 – 125	126 - 250	251 - 375	376 - 500	> 500
Oil and Grease (mg/L)	0 - 10	11 - 20	21 - 30	31 - 40	> 41
Total Nitrogen (mg/L)	0 - 2.0	2.1 - 4.0	4.1 - 6.0	6.1 - 8.0	> 8.0
Phosphorus (mg/L)	0 - .41	.42 - .82	.83 - 1.23	1.24 - 1.65	> 1.65
Zinc (mg/L)	0 - .20	.21 - .40	.41 - .60	.61 - .80	> .80
Lead (mg/L)	0 - .10	.11 - .20	.21-.30	.31 - .40	> .40
Copper(mg/L)	0 - .04	.041 - .08	.081 - .12	.121 - .160	> .160
COD	0 - 80	81 - 160	161 - 240	241 – 320	> 320
PH (High End)	7.6 - 9.0	9.1 - 10.0	10.1 - 11.0	11.1 -12.0	12.1 - 14.0
PH (Low End)	6.0 - 7.5	5.0 - 5.9	4.0 - 4.9	3.0 - 3.9	1.0 - 3.0

Graphic 8.4.3: Urban Runoff Monitoring: Scoring Matrix

The MS4 relates results to the Matrix and then populate the appropriate Urban Runoff Monitoring charts with the corresponding point totals.

For example, a 2018 RES_01 sample contained 135 mg/L of TSS. The MS4 assigns and populates the Urban Runoff Monitoring: RES_01 chart TSS box with 3-points. The same approach applies to all sites and parameters.

Urban Runoff Monitoring: RES_01								
	2018		**2019**		**2020**		**2021**	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
TSS	1	4						
Oil and Grease	4	4						
Total Nitrogen	0	3						
Phosphorus	0	3						
Zinc	3	4						
Lead	4	4						
Copper	4	4						
COD	0	3						
PH	4	4						
Event Points:	**20**	**33**						
Annual Points:	**53**							

Graphic 8.4.4: Urban Runoff Monitoring: RES_01

Urban Runoff Monitoring: IND_01								
	2018		2019		2021		2022	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
TSS	0	2						
Oil and Grease	3	4						
Total Nitrogen	0	3						
Phosphorus	0	3						
Zinc	0	4						
Lead	4	4						
Copper	3	4						
COD	0	2						
PH	4	4						
Event Points:	14	30						
Annual Points:	44							

Graphic 8.4.5: Urban Runoff Monitoring: IND_01

Urban Runoff Monitoring: RES_02								
	2018		2019		2021		2022	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
TSS	0	3						
Oil and Grease	3	4						
Total Nitrogen	0	3						
Phosphorus	0	3						
Zinc	1	3						
Lead	1	4						
Copper	2	4						
COD	0	2						
PH	4	4						
Event Points:	11	30						
Annual Points:	41							

Graphic 8.4.6: Urban Runoff Monitoring: RES_02

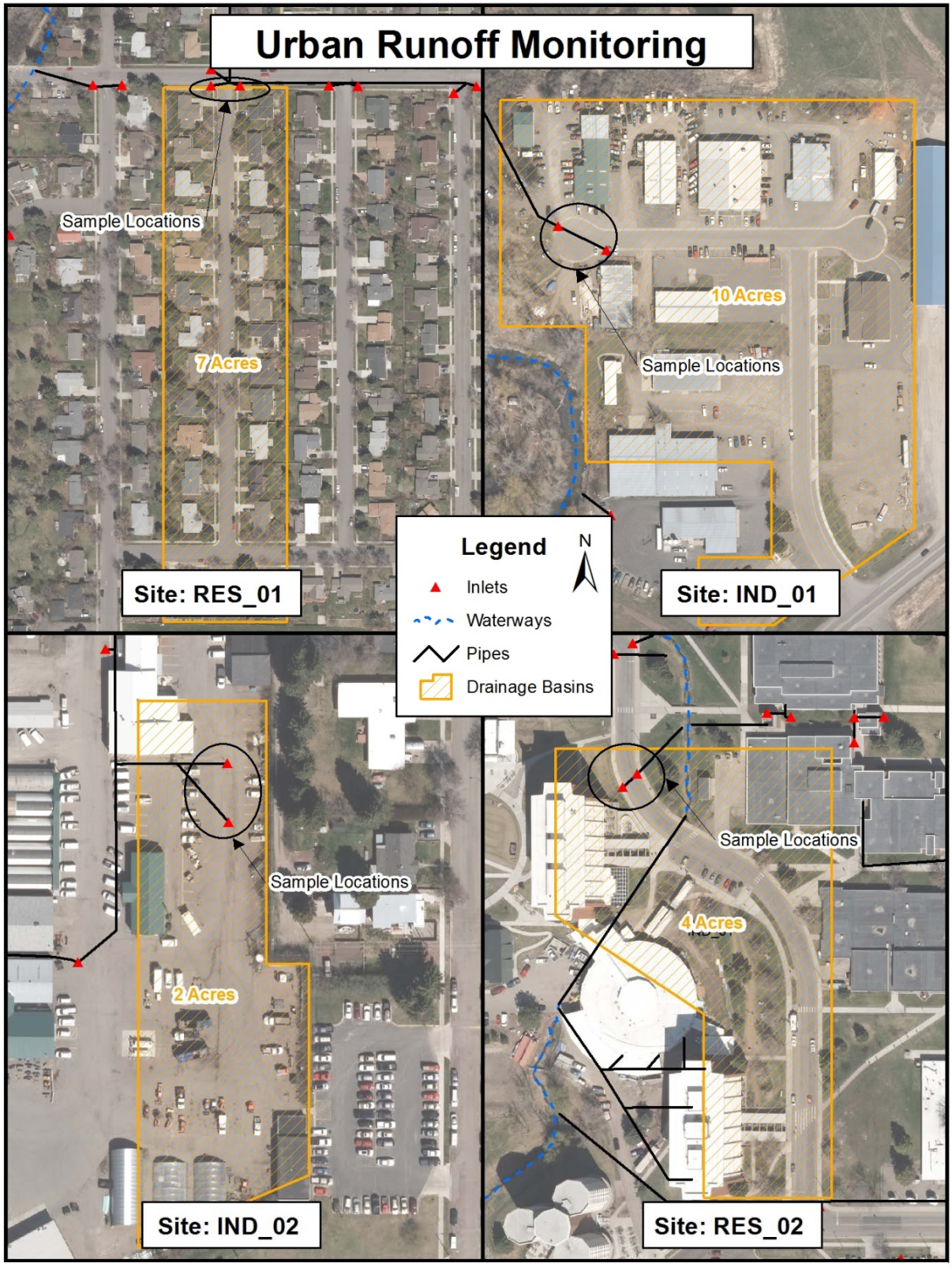
Urban Runoff Monitoring: IND_02								
	2018		2019		2021		2022	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
TSS	0	1						
Oil and Grease	4	4						
Total Nitrogen	0	2						
Phosphorus	1	3						
Zinc	2	3						
Lead	4	4						
Copper	3	4						
COD	0	1						
PH	4	1						
Event Points:	18	23						
Annual Points:	41							

Graphic 8.4.7: Urban Runoff Monitoring: IND_02

The MS4 sums the individual scores to obtain an Event Point Total, sums both Event Scores to obtain an Annual Point Total, and calculates a Final Score by transferring and summing the Annual Points in the Urban Runoff Monitoring: Results chart. Finally, the MS4 divides the Total Points by the Possible Points to calculate the Final Score and transfers the Final Score to SWMP Section 8.8.

Urban Runoff Monitoring: Results				
	2018	**2019**	**2021**	**2022**
RES_01 Annual Points	53			
IND_01 Annual Points	44			
RES_02 Annual Points	41			
IND_02 Annual Points	41			
Total Points:	**179**			
Possible Points:	**288**	**288**	**288**	**288**
Final Score (decimal):	**.62**			

Graphic 8.4.8: Urban Runoff Monitoring: Results



Graphic 8.4.9: Urban Runoff Monitoring

8.5 In-Stream Wet-Weather Monitoring

Introduction: The MS4 conducts In-Stream Wet-Weather Monitoring to analyze the impacts of urban runoff to Bozeman and Mandeville Creeks during wet weather. Combined, the Creeks receive urban runoff from over 1,700 acres of dense development at over 100 individual discharge points or outfalls. Non-point source pollution sources exist upstream of the MS4 as identified in the Lower Gallatin Planning Area TMDL. This approach allows the MS4 to take sole responsibility for and mitigate the impacts stemming from urban runoff.

Sites: The MS4 monitors two (2) locations on Bozeman Creek and two (2) locations on Mandeville Creek. Each Creek has one (1) station upstream and one (1) downstream of the MS4 boundary. Sample sites include:

1. Site: UPS_01
   - Location: Bozeman Creek upstream of MS4, near Kagy Blvd.
   - Latitude: 45.657248
   - Longitude: -111.028584
   - Parameters: TSS, COD, TP, TN, pH, Copper, Lead, Zinc, Oils and Greases, and Flow
   - Frequency: Two (2) samples per year
2. Site: DWS_01
   - Location: Bozeman Creek downstream of MS4, near Gold Ave.
   - Latitude: 45.699668
   - Longitude: -111.027347
   - Parameters: TSS, COD, TP, TN, pH, Copper, Lead, Zinc, Oils and Greases, and Flow
   - Frequency: Two (2) samples per year
3. Site: UPS_02
   - Location: Mandeville Creek upstream of MS4, near Campus Blvd.
   - Latitude: 45.656506
   - Longitude: -111.05803
   - Parameters: TSS, COD, TP, TN, pH, Copper, Lead, Zinc, Oils and Greases, and Flow
   - Frequency: Two (2) samples per year
4. Site: DWS_02
   - Location: Mandeville Creek downstream of MS4, near E. Baxter Ln.
   - Latitude: 45.697742
   - Longitude: -111.051959
   - Parameters: TSS, COD, TP, TN, pH, Copper, Lead, Zinc, Oils and Greases, and Flow
   - Frequency: Two (2) samples per year

Methods: The MS4 collects in-stream samples using Thermo-Scientific Nalgene Samplers (Sampler). Before rain events, Staff mounts each Sampler to a metal post driven into the creek bed and positions it to collect a sample as soon as the water levels rise one-half to three-quarters of an inch. The Sampler closes itself and does not allow additional collection or dilution of the original sample once full.

Analysis: The MS4 collects, transfers, packages, and ships samples to a certified laboratory, which analyzes the following parameters:

1. Total Suspended Solids, mg/L

2. Chemical Oxygen Demand, mg/L
3. Total Nitrogen, mg/L
4. Total Phosphorus, mg/L
5. Copper, mg/L
6. Lead, mg/L
7. Zinc, mg/L
8. Oils and Greases, mg/L
9. pH, standard units

The MS4 determines Bozeman Creek's stream-flow using real-time data collected from the Bozeman Creek gaging station. The MS4 estimates flow for Mandeville Creek using historical data collected by Gallatin Local Water Quality District, since no permanent gauging station exists.

	Monitoring Results								
	TSS (mg/L)	Oil & Grease (mg/L)	Total Nitro. (mg/L)	Phosp. (mg/L)	Zinc (mg/L)	Lead (mg/L)	Copper (mg/L)	COD (mg/L)	pH
UPS_01: 2017 (1)	7.0	5.80 RL	0.41	0.085	0.0054	0.0005	0.0036	11.60	8.2
UPS_01: 2017 (2)	14.0	1.00 RL	0.50 RL	0.022	0.0100 RL	0.0010 RL	0.0050 RL	15.00	8.1
UPS_01: 2018 (1)	14.0	1.00 RL	0.50 RL	0.052	0.0100 RL	0.0010 RL	0.0050 RL	10.00	8.1
UPS_01: 2018 (2)	10.0 RL	1.00 RL	0.60	0.028	0.0090	0.003 RL	0.0020 RL	5.00	8.3
UPS_01: 2019 (1)									
UPS_01: 2019 (2)									
UPS_01: 2020 (1)									
UPS_01: 2020 (2)									
UPS_01: 2021 (1)									
UPS_01: 2021 (2)									
UPS_01 Median	**12.0**	**1.00**	**0.50**	**0.040**	**0.0095**	**0.0010**	**0.0043**	**10.80**	**8.1**
UPS_02: 2017 (1)	-	-	-	-	-	-	-	-	-
UPS_02: 2017 (2)	-	-	-	-	-	-	-	-	-
UPS_02: 2018 (1)	185.0	1.00 RL	3.10	0.430	0.0330	0.0027	0.0060	49.00	8.2
UPS_02: 2018 (2)	53.0	1.00 RL	0.50 RL	0.081	0.0180	0.0004	0.0020	16.00	8.1
UPS_02: 2019 (1)									
UPS_02: 2019 (2)									
UPS_02: 2020 (1)									
UPS_02: 2020 (2)									
UPS_02: 2021 (1)									
UPS_02: 2021 (2)									
UPS_02: Median	**119.0**	**1.00**	**1.80**	**0.256**	**0.0255**	**0.0016**	**0.0040**	**32.50**	**8.2**
DWS_01: 2017 (1)	10.0	5.40 RL	0.55	0.088	0.0070	0.0006	0.0036	15.30	8.2
DWS_01: 2017 (2)	134.0	1.00 RL	1.80	0.264	0.0300	0.0060	0.0060	42.00	8.1
DWS_01: 2018 (1)	34.0	1.00 RL	0.50 RL	0.082	0.0100 RL	0.0010 RL	0.0005 RL	18.00	8.1
DWS_01: 2018 (2)	17.0	1.00 RL	0.70	0.057	0.0220	0.0007	0.0002 RL	14.00	8.3
DWS_01: 2019 (1)									
DWS_01: 2019 (2)									
DWS_01: 2020 (1)									
DWS_01: 2020 (2)									
DWS_01: 2021 (1)									
DWS_01: 2021 (2)									
DWS_01: Median	**25.5**	**1.00**	**0.62**	**0.085**	**0.0160**	**0.0009**	**0.0043**	**16.65**	**8.2**
DWS_02: 2017 (1)	-	-	-	-	-	-	-	-	-
DWS_02: 2017 (2)	-	-	-	-	-	-	-	-	-
DWS_02: 2018 (1)	297.0	1.00 RL	2.80	0.368	0.0700	0.0168	0.0150	53.00	8.2
DWS_02: 2018 (2)	43.0	1.00 RL	0.80	0.102	0.0280	0.0026	0.0030	18.00	8.2
DWS_02: 2019 (1)									
DWS_02: 2019 (2)									
DWS_02: 2020 (1)									
DWS_02: 2020 (2)									
DWS_02: 2021 (1)									
DWS_02: 2021 (2)									
DWS_02 Median	**170.0**	**1.00**	**1.80**	**0.235**	**0.0490**	**0.0097**	**0.0090**	**35.50**	**8.2**

Graphic *8.5.1: Monitoring Results. RL is the minimum Reporting Limit.*

Evaluation: The MS4 enters data into a local spreadsheet and stores analysis reports for a safe record upon receipt. Further, the MS4 analyzes the data using the following Scoring Matrix (Matrix) and protocol to interpret, evaluate, and communicate the results. The Matrix includes points ranging from 0 to 4-points, which relate to the percent change of pollutants between the upstream and downstream sites.

For example, a percent change of 0-20% equals 4-points, 21-40% equals 3-points, 41-60% equals 2-points, 61-80% equals 1-point, and 81- >100% equals 0-points.

Percent change is determined using the following formula:

$$\% \triangle = ((Y_2 - Y_1) / Y_1) * 100 \qquad \text{Equation 2}$$

For example, TSS: ((200-150)/150) x 100 = 33.3%, resulting in a score of 3-points.

In-Stream Wet-Weather Monitoring: Scoring Matrix					
	4-Points	**3-Points**	**2-Points**	**1-Point**	**0-Points**
TSS (% △)	(<0) – (20)	(21) – (40)	(41) – (60)	(61) – (80)	(81) – (>100)
Oil/Grease (% △)	(<0) – (20)	(21) – (40)	(41) – (60)	(61) – (80)	(81) – (>100)
Total Nitrogen (% △)	(<0) – (20)	(21) – (40)	(41) – (60)	(61) – (80)	(81) – (>100)
Phosphorus (% △)	(<0) – (20)	(21) – (40)	(41) – (60)	(61) – (80)	(81) – (>100)
Zinc (% △)	(<0) – (20)	(21) – (40)	(41) – (60)	(61) – (80)	(81) – (>100)
Lead (% △)	(<0) – (20)	(21) – (40)	(41) – (60)	(61) – (80)	(81) – (>100)
Copper (% △)	(<0) – (20)	(21) – (40)	(41) – (60)	(61) – (80)	(81) – (>100)
COD (% △)	(<0) – (20)	(21) – (40)	(41) – (60)	(61) – (80)	(81) – (>100)
PH (% △)	(<0) – (20)	(21) – (40)	(41) – (60)	(61) – (80)	(81) – (>100)

Graphic 8.5.2: In-Stream Wet-Weather Monitoring Scoring Matrix

The MS4 relates results to the Matrix and then populates the appropriate Urban Runoff Monitoring charts with the corresponding scores.

For example, a 2018 Bozeman Creek UPS_01 and DWS_01 TSS percent change equaled 35%. The MS4 assigns and populates the In-Stream Wet-Weather Monitoring: Bozeman Creek UPS_01 and DWS_01 chart TSS box with 3-points. The same approach applies to all sites and parameters.

In-Stream Wet-Weather Monitoring: Bozeman Creek UPS_01 and DWS_01								
	2018		**2019**		**2021**		**2022**	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
TSS	0	1						
Oil and Grease	4	4						
Total Nitrogen	4	4						
Phosphorus	2	0						
Zinc	4	0						
Lead	4	0						
Copper	4	4						
COD	2	0						
PH	4	4						
Event Points:	**28**	**17**						
Annual Points:	**45**							

Graphic 8.5.3: In-Stream Wet-Weather Monitoring: Bozeman Creek UPS_01 and DWS_01.

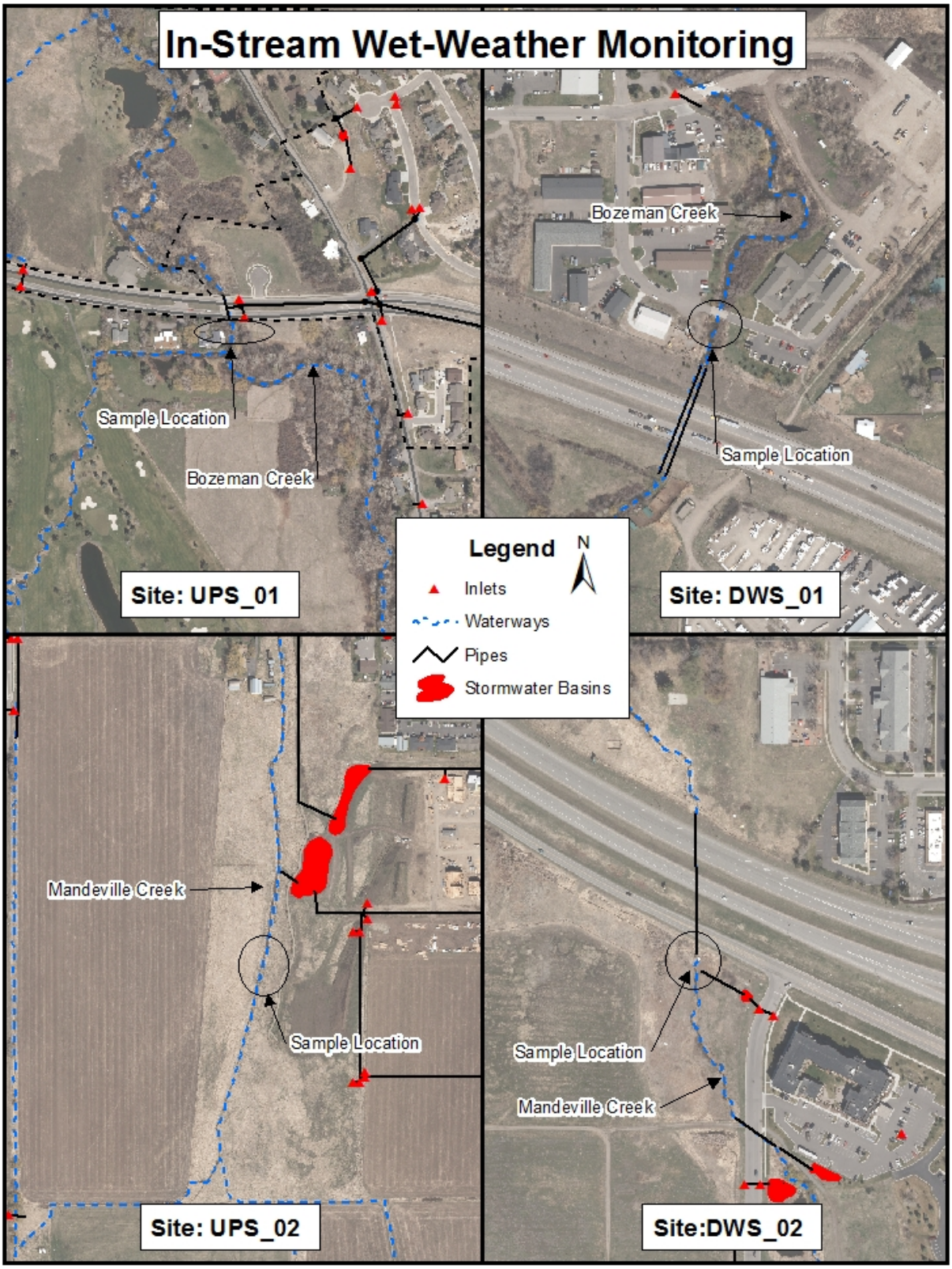
In-Stream Wet-Weather Monitoring: Mandeville Creek UPS_02 and DWS_02								
	2018		2019		2021		2022	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
TSS	1	4						
Oil and Grease	4	4						
Total Nitrogen	4	2						
Phosphorus	4	3						
Zinc	0	2						
Lead	0	0						
Copper	0	2						
COD	4	4						
PH	4	4						
Event Points:	**21**	**25**						
Annual Points:	**46**							

Graphic 8.5.4: In-Stream Wet-Weather Monitoring: Mandeville Creek UPS_02 and DWS_02.

The MS4 sums the individual scores to obtain an Event Point Total, sums both Event Scores to obtain an Annual Point Total, and calculates a Final Score by transferring and summing the Annual Points in the In-Stream Wet-Weather Monitoring: Results chart. Finally, the MS4 divides the Total Points by the Possible Points. The MS4 transfers the Final Score to SWMP Section 8.8.

In-Stream Wet-Weather Monitoring: Results				
	2018	2019	2021	2022
Bozeman Creek Annual Points	45			
Mandeville Creek Annual Points	46			
Total Points:	**91**			
Possible Points:	**144**	**144**	**144**	**144**
Final Score (decimal):	**.63**			

Graphic 8.5.5: In-Stream Wet-Weather Monitoring: Results



Graphic 8.5.6: In-Stream Wet-Weather Monitoring

8.6 Sediment Reduction Monitoring

Introduction: The MS4 conducts Sediment Reduction Monitoring to comply with the Montana DEQ's sediment load reduction requirements detailed in the 2013 Lower Gallatin Planning Area TMDL. The MS4 tracks tons captured in BMPs detailed in SWMP Section 2.3 and SWMP Section 2.4.

Bozeman Creek Sediment Waste Load Reduction				
Sediment Source	**Estimated Load**	**Waste Load Allocation**	**Required Load Reduction**	**Required Load Reduction**
Municipal Storm Sewer	218 tons/year	137 tons/year	37%	81 tons/year **DEQ Imposed**

Graphic 8.6.1: 2013 Lower Gallatin Planning Area TMDL - Bozeman Creek Sediment Waste Load Reduction

Mandeville Creek Sediment Waste Load Reduction				
Sediment Source	**Estimated Load**	**Waste Load Allocation**	**Required Load Reduction**	**Load Reduction Goal**
Municipal Storm Sewer	None	None	None	10 tons/year **Self Imposed**

Graphic 8.6.2: 2013 Lower Gallatin Planning Area TMDL Mandeville Creek Sediment Waste Load Reduction

Sites: Stormwater treatment units described in SWMP Section 2.5.

Methods: Measurement process described in SWMP Section 2.5.

Analysis: The MS4 analyzes the following parameter:

- Total Sediment Captured (tons)

Evaluation: The MS4 enters data into a local spreadsheet for safe record upon receipt. Further, the MS4 incorporates the data into the following Scoring Matrix (Matrix) to interpret, evaluate, and communicate the results. The Matrix includes scores ranging from 0 to 4-points, which relate to total annual sediment capture. For example, a load reduction for Bozeman Creek of ≥ 81 tons equals 4-points, 60 – 80 tons equals 3-points, 40 – 59 tons equals 2-points, 20 – 39 tons equals 1-point, and 0 – 19 equals 0-points.

Sediment Reduction Monitoring: Scoring Matrix (Bozeman Creek)					
	4-Points	**3-Points**	**2-Points**	**1-Point**	**0-Points**
Sediment Captured (tons)	≥81	60 – 80	40 – 59	20 – 39	0 – 19

Graphic 8.6.3: Sediment Reduction Monitoring: Scoring Matrix (Bozeman Creek)

Sediment Reduction Monitoring: Scoring Matrix (Mandeville Creek)					
	4-Points	**3-Points**	**2-Points**	**1-Point**	**0-Points**
Sediment Captured (tons)	≥10	7.5 – 9.9	5.0 – 7.4	2.5 – 4.9	0 – 2.4

Graphic 8.6.4: Sediment Reduction Monitoring: Scoring Matrix (Mandeville Creek)

Results: The MS4 relates results to the Matrix and then populate the Sediment Reduction Monitoring: Results chart with the corresponding scores. The MS4 weighs Bozeman Creek more heavily than Mandeville Creek because of DEQ's imposed reduction requirements.

- 2018 Totals:
  - Bozeman Creek: 45.7 tons
  - Mandeville Creek: 1.0 tons

The MS4 calculates a Final Score by summing the weighted Annual Points in the Sediment Reduction Monitoring: Results chart and dividing by the Possible Points to calculate the Final Score. Finally, the MS4 transfers the Final Score to SWMP Section 8.8.

Sediment Reduction Monitoring: Results				
	2018	**2019**	**2021**	**2022**
Bozeman Creek Annual Points	(2) x (1.5) = 3			
Mandeville Creek Annual Points	(0) x (.5) = 0			
Total Points:	3			
Possible Points:	8	8	8	8
Final Score (decimal):	.38			

Graphic 8.6.5: Sediment Reduction Monitoring: Results.

8.7 Long-Term Trend Monitoring

Introduction: Aquatic macroinvertebrate assemblages respond predictably to sedimentation by shifting from sediment-intolerant to sediment-tolerant taxa. Changes in macroinvertebrate assemblages are quantified using the Observed:Expected (O:E) ratio biological index model, which compares the observed taxa at a site with the expected taxa that would be present at a site under a variety of environmental conditions. Using the percent difference in O:E ratios between upstream and downstream sites the MS4 is able to assess stormwater discharge impacts to macroinvertebrate assemblages. A positive percent difference in O:E ratios indicate that stormwater discharges are not negatively impacting macroinvertebrate community assemblages. Conversely, negative percent differences in O:E ratios indicate that stormwater discharges are negatively impacting macroinvertebrate community assemblies. Sedimentation affects macroinvertebrates community assemblages by:

- Filling interstitial voids in gravel substrate
- Reducing gravel attachment sites
- Altering stream morphology
- Increasing stream temperature

Sites: The MS4 monitors benthic macroinvertebrates on Bozeman and Mandeville Creeks at the In-Stream Wet-Weather Monitoring Sites (SWMP Section 8.5).

Methods: Derives macroinvertebrate biological index monitoring protocols from MDEQ Sample Collection, Sorting, and Taxonomic Identification of Benthic Macroinvertebrate Communities Standard Operating Procedures (*one sample taken per location per year*).

Analysis: The MS4 collects and preserves macroinvertebrate samples and then delivers to an accredited lab, which completes the analysis of the following parameters:

- Taxonomic Sorting and Identification
- Species Abundance
- Species Diversity
- Observed / Expected Ratios
- Percentage of Sediment Tolerant Species

Upon receiving macroinvertebrate analysis results, the MS4 enters the calculated O:E ratios in the table below and then calculates the percent change between upstream and downstream sites.

Monitoring Results: UPS_01 & DWS_01			
	O:E Ratio: UPS_01	**O:E Ratio: DWS_01**	**O:E Ratio (% △)**
2017	-	-	-
2018	0.20	0.37	+85%
2019			
2020			
2021			
Median			

Graphic 8.7.1: UPS_01 & DWS_01 Monitoring Results

Monitoring Results: UPS_02 & DWS_02			
	O:E Ratio: UPS_02	**O:E Ratio: DWS_02**	**O:E Ratio (% △)**
2017	-	-	-
2018	0.29	0.16	-45%
2019			
2020			
2021			
Median			

Graphic 8.7.2: UPS_01 & DWS_01 Monitoring Results

Evaluation: The MS4 enters data into a local spreadsheet and stores analysis reports for a safe record upon receipt. Further, the MS4 analyzes the data using the following Scoring Matrix and protocol to interpret, evaluate, and communicate the results. The Scoring Matrix includes scores ranging from 0 to 4-points, which relate to percent change in O:E ratios between the upstream and downstream sites for each creek.

For example, an O:E ratio percent change of 0-(-20%) equals 4-points,- 21-(-40%) equals 3-points,- 41-(-60%) equals 2- points, -61-(-80%) equals 1-point, and >-80% equals 0-points.

Percent change is determined using *Equation 2* found in SWMP Section 8.3.

For example, an upstream Bozeman Creek sample has an O:E ratio of 1.1, and the downstream sample has an O:E ratio of 0.8. The MS4 finds the difference and divides by the original to arrive at a percentage ((0.8 - 1.1)/1.1) x 100 = -30%, resulting in a score of 3-points.

Long-Term Trend Monitoring: Scoring Matrix					
	4-Points	**3-Points**	**2-Points**	**1-Point**	**0-Points**
O:E Ratio (% △)	>0 – (-20)	-21 – (-40)	-41 – (-60)	-61 – (-80)	-81 – (-100)

Graphic 8.7.3: Long-Term Trend Monitoring: Scoring Matrix

The MS4 relates results to the Matrix and then populates the Long-Term Trend Monitoring: Results chart with the corresponding scores, and calculates a Final Score by summing the Event Points in the Long-Term Trend Monitoring: Results chart and dividing by the Possible Points. Finally, the MS4 transfers the Final Score to SWMP Section 8.8.

Long-Term Trend Monitoring: Results				
	2018	2019	2020	2021
Bozeman Creek Event Points	4			
Mandeville Creek Event Points	2			
Total Points:	6			
Possible Points:	8	8	8	8
Final Score (decimal):	.75			

Graphic 8.7.4: Long-Term Trend Monitoring: Results

8.8 Evaluation

The MS4 calculates a Final Grade to determine the overall effectiveness of its programs and initiatives detailed in SWMP Section 1.0 to 7.0 by transferring scores from each protocol (SWMP Sections 8.4 - 8.7) to the Programmatic Evaluation: Final Points chart, and utilizes a weighted sum calculation to make the four scores comparable.

Programmatic Evaluation: Final Points (2018)				
	Final Scores	Weight	Weighted Total	Weighted Total (%)
Urban Runoff Monitoring	.62	.25	.155	15.5
In-Stream Wet-Weather Monitoring	.63	.25	.16	16.0
Sediment Reduction Monitoring	.38	.25	.10	10.0
Stream Health Monitoring	.75	.25	.19	19.0
			Final Weighted Total (%):	60.5%

Graphic 8.8.1: Programmatic Evaluation: Final Points (2018)

Programmatic Evaluation: Final Points (2019)				
	Final Scores	Weight	Weighted Total	Weighted Total (%)
Urban Runoff Monitoring		.25		
In-Stream Wet-Weather Monitoring		.25		
Sediment Reduction Monitoring		.25		
Stream Health Monitoring		.25		
			Final Weighted Total (%):	

Graphic 8.8.2: Programmatic Evaluation: Final Points (2019)

Programmatic Evaluation: Final Points (2020)				
	Final Scores	Weight	Weighted Total	Weighted Total (%)
Urban Runoff Monitoring		.25		
In-Stream Wet-Weather Monitoring		.25		
Sediment Reduction Monitoring		.25		
Stream Health Monitoring		.25		
			Final Weighted Total (%):	

Graphic 8.8.3: Programmatic Evaluation: Final Points (2020)

Programmatic Evaluation: Final Points (2021)				
	Final Scores	**Weight**	**Weighted Total**	**Weighted Total (%)**
Urban Runoff Monitoring		**.25**		
In-Stream Wet-Weather Monitoring		**.25**		
Sediment Reduction Monitoring		**.25**		
Stream Health Monitoring		**.25**		
			Final Weighted Total (%):	

Graphic 8.8.4: Programmatic Evaluation: Final Points (2021)

The MS4 relates the Final Weighted Total (%) to the following equally distributed ranges (100-percent scale) and their associated Final Grades, and populates the Stream Health Report Card with a Final Grade for the corresponding year.

1. Final Grade A: 90% - 100%
2. Final Grade B: 80% - 89%
3. Final Grade C: 70% - 79%
4. Final Grade D: 60% - 69%
5. Final Grade F: 0% - 59%

Stream Health Report Card			
2018 Final Grade	**2019 Final Grade**	**2020 Final Grade**	**2021 Final Grade**
D-	**X**	**X**	**X**

Graphic 8.8.5: Stream Health Report Card

The MS4 utilizes its empirical knowledge, performance measures, and data to continually evaluate and optimize its programmatic workloads detailed in this SWMP. Also, the MS4 compares its Final Grades to the criteria below and, as necessary, works to implement the following improvement strategies:

1. Grade = A: No stormwater impact on receiving waters, allowing for a continuation of administrative programs and reduction of TMDL Action Plan investment to maintain grade.
2. Grade = B: Low stormwater impact to receiving waters, requiring continuation of administrative programs and TMDL Action Plan investment to increase grade.
3. Grade = C: Moderate stormwater impact on receiving waters, requiring an expansion of administrative programs and continuation of TMDL Action Plan investment to increase grade.
4. Grade = D: Significant stormwater impact on receiving waters, requiring an expansion of administrative programs and TMDL Action Plan investment to increase grade.
5. Grade = F: Major stormwater impact on receiving waters, reassessment of administrative programs and TMDL Action Plan investment strategy required.

8.9 Discussion

1. 2017 Result: The MS4 did not document sampling efforts using the scoring matrices described above because Staff had not developed the evaluation. Implementation begins with the first sampling event of 2018.

   Preliminary analysis of available 2017 data indicates that the developed evaluation methodology is effective at tracking program performance, and likely would have resulted in an F. The MS4 expects a positive trend over the MS4 Permit Term as Staff implements the content of this SWMP.

2. 2018 Results: The MS4 received a Stream Health Report Card grade of D. The MS4 has analyzed data, compiled point scores, and developed strategies to improve its grade for 2019, including:

   - Residential Urban Runoff Monitoring
     - Problem Statement: Residential urban areas generally yield TSS, total nitrogen, phosphorus, and COD levels that result in suboptimal point scores. Conversely, oil, grease, zinc, lead, and copper concentrations generally result in satisfactory levels.
     - Hypothesis: Grass clippings are primarily responsible for elevated levels of TSS, total nitrogen, phosphorus, and COD.
     - Rationale: Elevated pollutant levels coincide directly with the growing season, providing justification for the MS4's hypothesis. Fall samples traditionally yield optimal point scores due to growing season subsidence. Organic matter in stormwater runoff:
       - Increases TSS concentrations
       - Increases total nitrogen and phosphorus via decomposition
       - Increases COD via organic matter decomposition
     - Action Plan: Increase outreach and education program described in SWMP Section 3.0 and complete capital projects described in SWMP Section 2.3.
   - Industrial Urban Runoff Monitoring
     - Problem Statement: Industrial urban areas generally yield TSS, total nitrogen, phosphorus, zinc, lead, copper, and COD levels that result in suboptimal point scores. Conversely, oil and grease concentrations generally result in satisfactory levels.
     - Hypothesis: Gravel parking lots, outdoor equipment storage, and heavy commercial traffic are primarily responsible for elevated levels of TSS, total nitrogen, phosphorus, zinc, copper, lead, and COD.
     - Rationale: The MS4 documented these pollutant generating activities and site conditions at both industrial monitoring areas, resulting in:
       - Increased offsite TSS migration (TSS adsorbs and transports pollutants)
       - Increased nutrient levels originating from erosive landscapes
       - Increased metal levels from corrosion, combustion, and brake-dust
       - Increase COD levels via organic and inorganic particle decomposition
     - Action Plan: Enforce development regulations described in SWMP Section 6.0, construct capital projects described in SWMP Section 2.3, maintain good housekeeping performance levels described in SWMP Section 7.0, and implement the outreach and education program described in SWMP Section 3.0.

- Instream Wet-Weather Monitoring
    - Problem Statement: Instream wet-weather samples generally yield TSS, total nitrogen, phosphorus, zinc, lead, copper, and COD levels that result in suboptimal point scores. Conversely, oil and grease concentrations generally result in satisfactory levels.
    - Hypothesis: Stormwater discharges from urban areas with a direct connection to aquatic systems negatively affect instream water quality.
    - Rationale: Documented increases in pollutant levels between all upstream and downstream instream-monitoring locations, resulting from developments constructed pre-1980 lacking on-site stormwater treatment.
    - Action Plan: Enforce development regulations described in SWMP Section 6.0, construct capital projects described in SWMP Section 2.3 and implement administrative programs described in SWMP Sections 3.0, 4.0, 5.0, 6.0, and 7.0.
- Sediment Reduction Monitoring
    - Problem Statement: Remove 81 tons/year of sediment from stormwater discharges to Bozeman Creek and 10 tons/year to Mandeville Creek.
    - Hypothesis: Achieve MDEQ and self-imposed sediment reduction requirements by 2023.
    - Rationale: Quantified sediment removal totals by treatment units as detailed in SWMP Section 2.5 and calculated sediment-loading totals of 0.14 tons/acre.
    - Action Plan: Continue TMDL Action Plan described in SWMP Section 2.2, construct capital projects described in SWMP Section 2.3, and maintain utility operations goals described in SWMP Section 7.0.
- Long-Term Trend Monitoring
    - Problem Statement: Macroinvertebrate O:E ratios decreased in Mandeville Creek, resulting in suboptimal point scores. Conversely, macroinvertebrate O:E ratios increased in Bozeman Creek, resulting in optimal point scores.
    - Hypothesis: Physical habitat characteristics and stream origination points impact macroinvertebrate O:E ratios in addition to stormwater discharges.
    - Rationale:
        - 85% improvement in Bozeman Creek O:E ratios between upstream and downstream sites.
        - 45% reduction in Mandeville Creek O:E ratios between upstream and downstream sites.
    - Action Plan: Continue TMDL Action Plan described in SWMP Section 2.2, construct capital projects described in SWMP Section 2.3, maintain utility operation goals described in SWMP Section 7.0, and implement administrative programs described in SWMP Sections 3.0, 4.0, 5.0, 6.0, and 7.0.

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