SANITARY SEWER BACKUP EVENTS OF MAY AND JULY 2019

City of Rapid City
Public Works Department

July 30, 2019
2019 STORM EVENTS IMPACTED THE SANITARY SEWER SYSTEM.

Sewer Mains Observed Flowing Full

Sewer Flows Observed Coming out of Manhole Lids

Manhole inundated by surface water
HEADLINES REGARDING EXTRAORDINARY PRECIPITATION IN 2019

High Plains Region: Several locations ranked among the top 10 wettest Mays, including Rapid City, South Dakota, which had the 2nd wettest May on record. – NOAA

The last 12 months have been the wettest in South Dakota in more than a century. – Rapid City Journal, July 7, 2019

Rapid City nearing two-year precipitation record – Rapid City Journal, July 23, 2019
SO FAR 2019 HAS BEEN A VERY WET YEAR

**Climate Summary for March 1 to May 31, 2019**

<table>
<thead>
<tr>
<th></th>
<th>Inches of Precipitation</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Record Maximum</strong></td>
<td>12.99</td>
<td>1920*</td>
</tr>
<tr>
<td><strong>Observed Totals</strong></td>
<td>12.17</td>
<td>2019</td>
</tr>
<tr>
<td><strong>Last Year</strong></td>
<td>8.75</td>
<td>2018</td>
</tr>
<tr>
<td><strong>Normal</strong></td>
<td>7.28</td>
<td>-</td>
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</table>

2019 observed totals is 170% of normal March to May

*Major flooding occurred in Rapid City in 1920

**Significant Daily Rainfall Events in May and July 2019, East Rapid City at National Weather Service**

<table>
<thead>
<tr>
<th>Date</th>
<th>Inches of Precipitation</th>
<th>*Record Daily Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 21</td>
<td>1.97&quot;*</td>
<td></td>
</tr>
<tr>
<td>May 28</td>
<td>1.81&quot;*</td>
<td></td>
</tr>
<tr>
<td>July 4</td>
<td>2.03&quot;</td>
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</table>

*Record Daily Amount

Significant precipitation has affected the entire region including rural areas in Western South Dakota. There have been numerous reports of damaged or destroyed infrastructure.

Significant precipitation leading up to May 2019 has caused the ground to be completely saturated.

Saturated ground = increased water runoff for subsequent rain events
NORMAL WATER AND WASTEWATER SYSTEM FLOWS

Normal Dry Weather Water Production = 7.0 MGD
Normal Dry Weather Wastewater Treatment = 8.0 MGD
Normal Difference = 1.0 MGD

MGD = million gallons per day
## Water Production VS Flows Received at Water Reclamation Facility

The differences of 5 - 21.8 MGD is the result of groundwater or surface water entering the sewer system.

<table>
<thead>
<tr>
<th>Date</th>
<th>Water Production (MGD)</th>
<th>Water Reclamation Facility (MGD)</th>
<th>Difference (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 21</td>
<td>7.6</td>
<td>12.6</td>
<td>5.0</td>
</tr>
<tr>
<td>May 22</td>
<td>8.6</td>
<td>25.5</td>
<td>16.9</td>
</tr>
<tr>
<td>May 23</td>
<td>8.9</td>
<td>27.2</td>
<td>18.3</td>
</tr>
<tr>
<td>May 28</td>
<td>5.8</td>
<td>18.6*</td>
<td>12.8</td>
</tr>
<tr>
<td>May 29</td>
<td>8.0</td>
<td>29.8</td>
<td>21.8</td>
</tr>
<tr>
<td>May 30</td>
<td>7.7</td>
<td>27.3</td>
<td>19.6</td>
</tr>
</tbody>
</table>

*On May 28, an instantaneous peak flow of 38.8 MGD was observed at the Water Reclamation Facility.

MGD = million gallons per day

The differences of 5 - 21.8 MGD is the result of groundwater or surface water entering the sewer system.
WATER RECLAMATION OPERATIONS - MISSION

• To protect the public health by providing for efficient and economical collection and treatment of wastewater.

• The Collection group is responsible for:
  • Sewer line Cleaning
  • Minor sewer line repairs and maintenance
  • Inspection of sewer lines and manholes
  • Operation and maintenance of Lift Stations
  • Sewer Taps
  • Reporting of Sanitary Sewer Overflow information to the SDDENR
DURING THE MAY STORMS, CITY STAFF OBSERVED A COMBINATION OF EVENTS HAPPENING TO THE SANITARY SEWER SYSTEM THAT HAD NOT BEEN SIMULTANEOUSLY OBSERVED BEFORE.

- Sewer Mains Observed Flowing Full
- Sewer Flows Observed Coming out of Manhole Lids
- Manhole inundated by surface water
The backup events of May and July 2019 were isolated to 4 areas.

Identifies Areas of Backups in May and July 2019
A sanitary sewer backup represents an occurrence reported to the City where sewage was confirmed to be backing up into a structure from the City sewer main.

May and July 2019 sewer backups occurred simultaneous to record rainfall events.

<table>
<thead>
<tr>
<th>Approx. Number of Sanitary Sewer Services in Rapid City</th>
<th>22,000</th>
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<tbody>
<tr>
<td>Sewer Backups in 2015</td>
<td>22</td>
</tr>
<tr>
<td>Sewer Backups in 2016</td>
<td>7</td>
</tr>
<tr>
<td>Sewer Backups in 2017</td>
<td>15</td>
</tr>
<tr>
<td>Sewer Backups in 2018</td>
<td>13</td>
</tr>
<tr>
<td>Sewer Backups May 22-23, 2019</td>
<td>11</td>
</tr>
<tr>
<td>Sewer Backups May 28-29, 2019</td>
<td>27</td>
</tr>
<tr>
<td>Sewer Backups July 4, 2019</td>
<td>7</td>
</tr>
</tbody>
</table>
RAPID CITY IS ON TRACK WITH NATIONAL GUIDELINES REGARDING SANITARY SEWER BACKUPS FOR MUNICIPALITIES

The City follows American Public Works Association (APWA) guidelines for sanitary sewer backups.

In recent years, the City has experienced less than 3 sanitary sewer overflows per 100 miles of sewer main per year, a guideline established by the Environmental Protection Agency (EPA).

- Note: Sanitary sewer overflows may cause multiple sewer backups.
REASONS SEWER BACK UPS OCCUR

• Clogs in sewers from rags, flushable wipes, FOG (fats, oils, greases), root intrusion

• Infrastructure overloaded with ground water and surface water infiltration and inflow
  • Sump Pump Connections / Floor Drain Discharge
  • Roof Drain Connections
  • Ground water / saturated soils
  • Aging / Deteriorating Infrastructure
  • Deteriorating Private Sewer Service Lines
  • Water in flooded basements entering floor drain
INFILTRATION AND INFLOW (I & I)

- Infiltration and inflow is clean storm water and/or groundwater that enters the sewer system through cracked pipes, private service lines, leaky manholes, or improperly connected storm drains, downspouts and sump pumps.

- Note that City Ordinance prohibits any person from discharging clean water into the sanitary sewer system, including sump pump connections.
CITY CREWS CONTINUOUSLY MONITOR THE SEWER COLLECTION SYSTEM

- Public can help by:
  - Not discharging sump pumps into the sewer system
  - Keeping a cap on service line cleanout exterior to buildings
  - Notify the City when concerns with the sewer system are observed
- **No wipes in the pipes!**
CITY PERFORMS ROUTINE PREVENTATIVE MAINTENANCE ON SYSTEM TO DECREASE THE NUMBER OF SEWER BACKUPS

• Jetting of mains to clear debris and FOG
  • Goal is to clean all sewer mains 12” and below every year
  • Problematic mains are jetted on a more frequent basis
  • When a sewer backup is reported, the City cleans, when possible, the surrounding mains to remove blockage or confirm there is no blockage

• Root cutting from mains

• Replacement and/or Rehabilitation of mains and manholes

• Standard Operating Procedures are followed for Maintenance Activities
### SEWER LINE CLEANING & MAINTENANCE STATISTICS

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<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewer Cleaning feet*</td>
<td>400,839 feet YTD</td>
<td>1,135,178 feet</td>
<td>1,452,989 feet</td>
<td>1,520,341 feet</td>
</tr>
<tr>
<td>Sewer Root cutting feet</td>
<td>1,398 feet YTD</td>
<td>3,349 feet</td>
<td>4,734 feet</td>
<td>3,434 feet</td>
</tr>
<tr>
<td>Sewer TV insp Feet</td>
<td>29,061 feet YTD</td>
<td>89,306 feet</td>
<td>89,798 feet</td>
<td>103,149 feet</td>
</tr>
<tr>
<td>Sewer Manhole inspections</td>
<td>163 YTD</td>
<td>225</td>
<td>739</td>
<td>167</td>
</tr>
</tbody>
</table>

*Goal is to clean all sewer mains 12” and below every year.*
SEWER CLEANING (JETTING) & BACKUP REPORTS BY YEAR

- Miles of line cleaned
- Backups

- 2009: 284, 10
- 2010: 352, 8
- 2011: 226, 10
- 2012: 302, 11
- 2013: 282, 16
- 2014: 290, 21
- 2015: 154, 22
- 2016: 288, 7
- 2017: 275, 15
- 2018: 215, 13
- 2019: 76, 49
STANDARD PROCEDURES FOR SEWER BACKUPS

- Respond to Call
- Determine if source of water is from groundwater or sewer backup
- If sewer backup, determine if from service line or City main
- If blockage is in the City main, jet the line to remove the blockage
- Measure impacted area of the structure
- Provide cleanup information and the City clean up policy to the resident
- Resident decides if they wish to file a claim with the City Risk Manager
WHAT CAN PROPERTY OWNERS DO TO HELP PROTECT THEMSELVES

**Backflow prevention:**
Devices are available to install on individual sewer service lines to prevent backups from entering a structure. These devices require continuous maintenance.

**Positive stormwater drainage:**
Ensure stormwater drains away from the structure.

**Insurance:**
In South Dakota, an endorsement can be purchased to cover the cost of water entering a home through a pipe, (i.e. water service, sump pump inlet, sewer service). For a $200,000 house valuation, an insurance estimate of $110 per year was provided to cover $10,000 for structure repair and $2,500 for personal property replacement. Source: Local Rapid City Insurance Agent
RAPID CITY POLICY ON SEWER BACKUP REIMBURSEMENT

- Reimbursement for backup from City sewer main not to exceed $3.00 per affected square foot of building.

- Reimbursement limited to the cost of commercial cleaning and disposal only, including carpet removal and disposal, with no payment for loss, damage to or replacement of property.

- Pays up to $200 for rental of equipment for self cleanup.

- No reimbursement is made if the obstruction occurred in the service line or if the claimant will be reimbursed by insurance.

- Once a claim has been paid, the matter is considered settled.
REGIONAL POLICIES ON SEWER BACKUP REIMBURSEMENT

- No Policy, pays if negligent
- Fee on monthly bill to fund cleanup costs
- Pays cleanup costs or insurance deductible
- Pays up to $500 in cleanup costs
CAPITAL IMPROVEMENT PROJECTS TO IMPROVE THE SEWER SYSTEM

• Studies on sewer system initiated when unique or challenging situations arise.

• Funding for all sewer capital improvements including treatment, collection and maintenance are from user fees.

• Projects are selected based on:
  • Input from Utility Maintenance
  • Priorities for other infrastructure in vicinity to sewer (water, streets, drainage)
  • Identified needs from studies or master plans
  • System expansion for growth
QUESTIONS?

Number to call in case of a backup or for general sewer questions
Utility Maintenance 394-4163
After Hours/Weekends 394-4160
ADDITIONAL SUPPORTING INFORMATION FOR QUESTIONS

26. Video: How Hydrojetting works
27. Manhole Cover Inflow Estimates
28. Area 1: Blaine Ave & College Ave
29. Area 2: Downing St & Woodlawn Ave
30. Area 3: Maple Ave & Grand Blvd
31. Area 4: Bar Five Ranch Rd & Tate Crt
32. Historical Reports of backups in Racine area
33. Cities with no policy
34. Sioux Falls Policy
35. Bismarck Policy
36. Minot Policy
HOW HYDRO JETTING WORKS VIDEO

https://youtu.be/6QCgGXUYm-s
## MANHOLE COVER INFLOW ESTIMATIONS

<table>
<thead>
<tr>
<th>Water Head over cover</th>
<th>Bearing Surface Only-concealed Pickholes: no gasket (gpm)</th>
<th>Inflow (gpd)</th>
<th>One 1.5 inch Open Pick Hole (gpm)</th>
<th>Inflow (gpd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/16 inch</td>
<td>10</td>
<td>14,400</td>
<td>10</td>
<td>14,400</td>
</tr>
<tr>
<td>¼ inch</td>
<td>12</td>
<td>17,280</td>
<td>15</td>
<td>21,600</td>
</tr>
<tr>
<td>½ inch</td>
<td>14</td>
<td>20,160</td>
<td>19</td>
<td>27,360</td>
</tr>
<tr>
<td>1 inch</td>
<td>17</td>
<td>24,480</td>
<td>26</td>
<td>37,440</td>
</tr>
<tr>
<td>4 inch</td>
<td>23</td>
<td>33,120</td>
<td>40</td>
<td>57,600</td>
</tr>
</tbody>
</table>

Data taken from 1976 Neenah Foundry Company’s “A Report on inflow of surface water through manhole covers.”

33 OPH Manhole covers with ¼” water head can contribute: 712,800 gpd.
AREA 1 – BLAINE AVENUE AND COLLEGE AVENUE

5 Backups Reported May 22-23, 2019
AREA 2 – DOWNING STREET AND WOODLAWN DRIVE

10 Backups Reported May 28-29, 2019
AREA 3 – MAPLE AVENUE AND GRAND BOULEVARD

6 Backups Reported May 22-23, 2019

17 Backups Reported May 28-29, 2019

2 Backups Reported July 4, 2019
AREA 4 – BAR FIVE RANCH ROAD AND TATE COURT

5 Backups Reported July 4, 2019
HISTORICAL REPORTS OF BACKUPS IN RACINE AREA AND MAPLE AREA

• Area 2 Downing and Racine Area: 404 Racine – 11/17/2013, 1202 Racine – 4/10/2014, 1206 Downing – 12/06/14 (private), 1411 Downing – 10/28/2017 (in tub), 1408 Downing (Morgan drain request no cause found) – 04/11/18

• Area 3 Maple Area: 2116, 2120, 2124, 2128 Maple – 5-28-2015 (believed contractor caused)
CITIES WITH NO POLICY ON SEWER BACKUP REIMBURSEMENT

- Aberdeen, South Dakota
- Spearfish, South Dakota
- Billings, Montana
- Gillette, Wyoming
- Cheyenne, Wyoming
- Dickinson, North Dakota

- Customer must prove negligence on the part of the City in order for any payment to be made.
SIOUX FALLS POLICY ON SEWER BAC KUP REIMBURSEMENT

• Has a sewer backup relief program that is intended to assist homeowners with cleanup resulting from sewer backups and is not intended to replace private insurance or to fully compensate homeowner’s losses. The program is intended to pay for the associated cleanup costs to alleviate the health risk, which would require submission of claim details including evidence.

• Pays cleanup costs or insurance deductible, if owners have insurance, up to $5,000.

• Reimbursement limited to the cost of commercial cleaning and disposal only, with no payment for loss, damage to or replacement of property.

• The city shall not be responsible for any costs associated with the following:
  (1) Damage to personal or real property associated with any sewer backup;
  (2) Sewer backups caused within any sanitary sewer service (private) line;
  (3) Sewer backups caused by flood or other catastrophic acts of God; and
  (4) Sewer backups incurred by industrial users subject to the high-strength rates
BISMARCK, NORTH DAKOTA POLICY ON SEWER BACKUP REIMBURSEMENT

- Has a no fault policy. All customers pay monthly fee to cover cleanup, restoration and personal property costs from sewer backup events
  - Residential Customers pay $0.50 per month
  - Commercial Customers pay $1.00 per month

- Monthly fees collected pay for actual cleanup and restoration costs and actual present cash value for any personal property damage resulting from such sewer backups. The property owner must file a damage claim with the City Attorney’s office and provide documentation to support the claim.

- Damages that result from blockages or deficiencies in private sewer service lines or private sewer mains are not covered by this policy.

- The charge shall be reviewed annually and adjusted as necessary by the Board of City Commissioners.

- Payment of a claim is not determined under principles of negligence or legal responsibility but rather is a payout from a fund that is collected by the City to relieve the financial burden that may be caused by sewer backups.
MINOT, NORTH DAKOTA POLICY ON SEWER BACKUP REIMBURSEMENT

• Pays up to $500 for cleanup costs due to sewer backups

• No written policy on how this is handled, has simply been done for many years