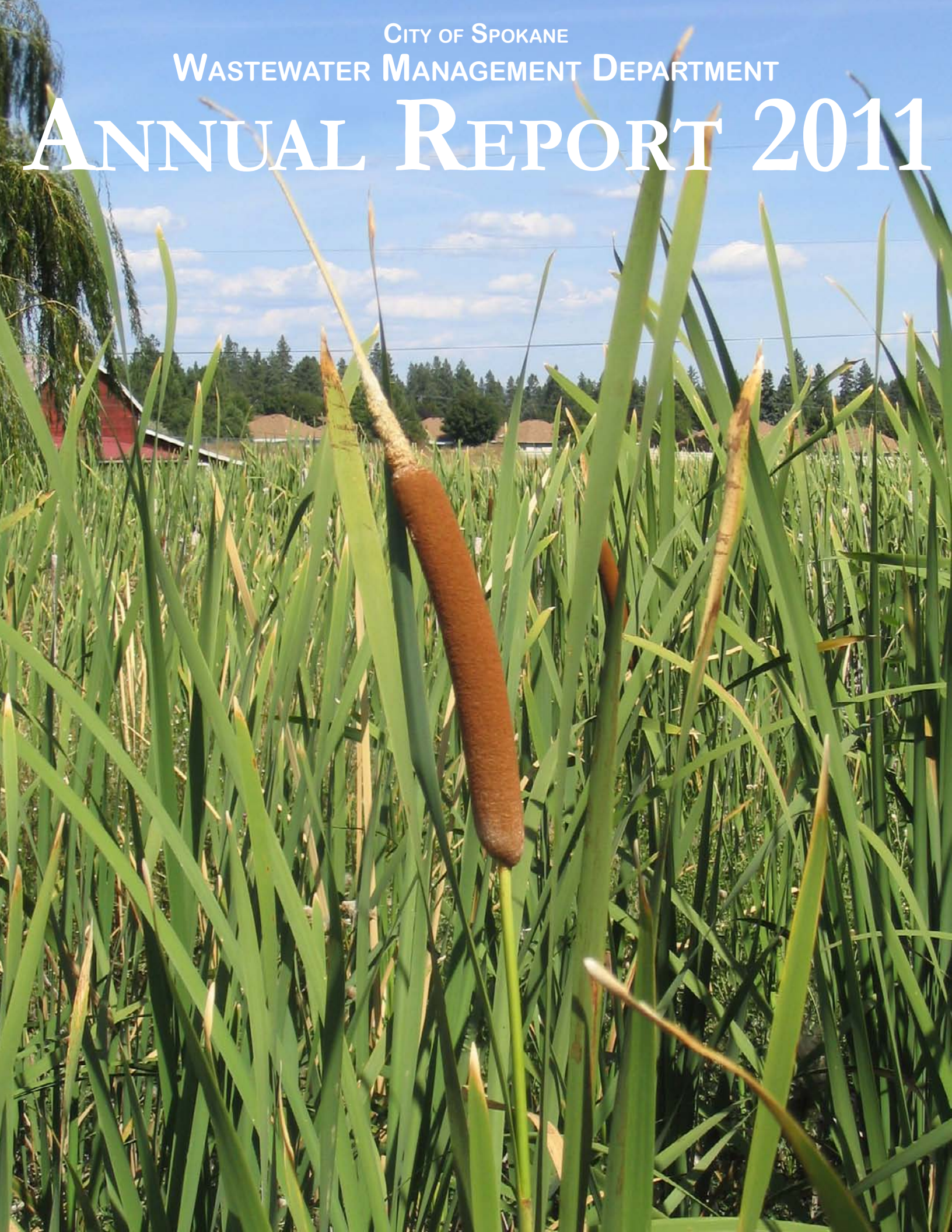

City of Spokane

Wastewater Management Department

Annual Report 2011


CITY OF
SPOKANE

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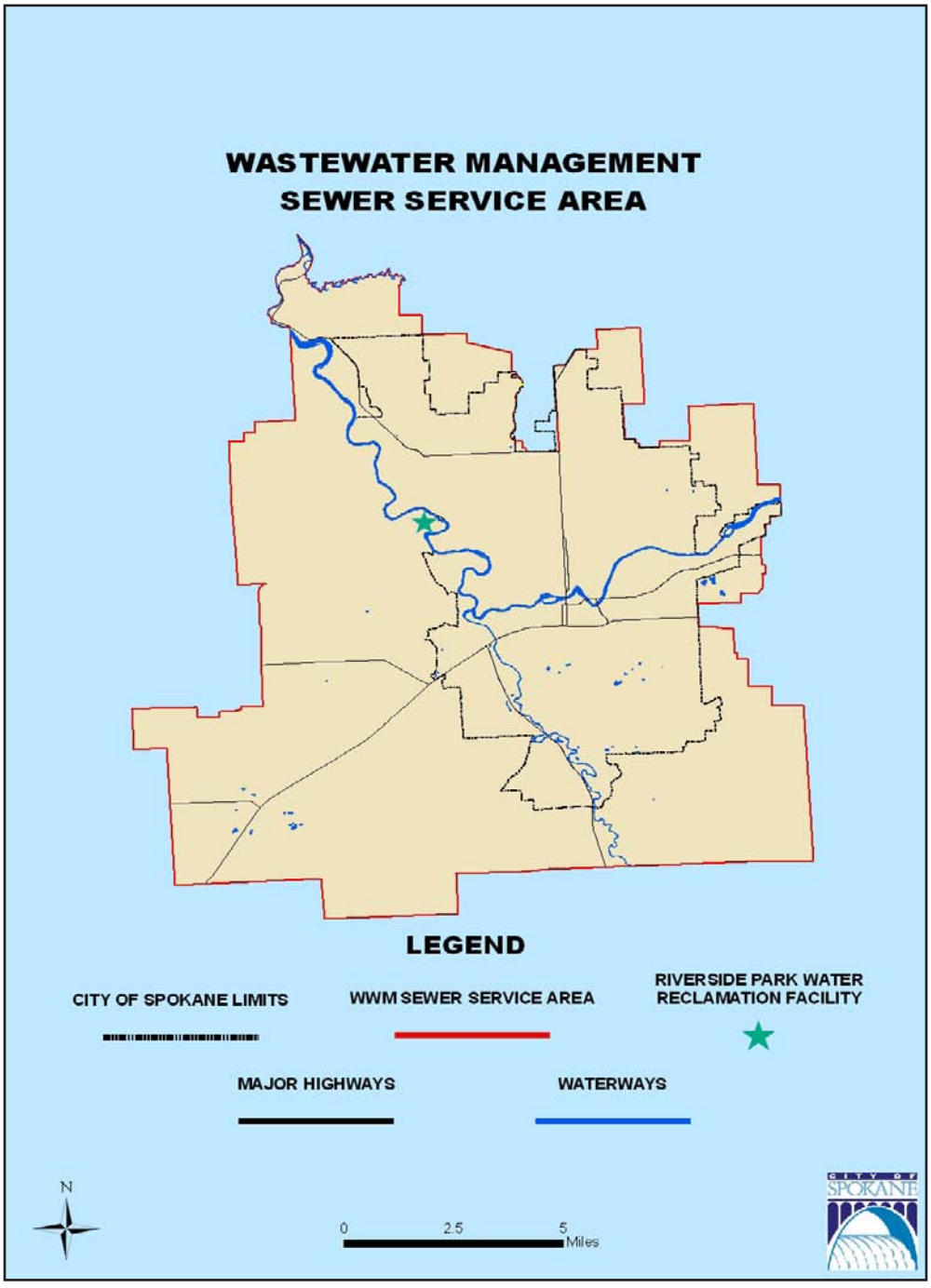
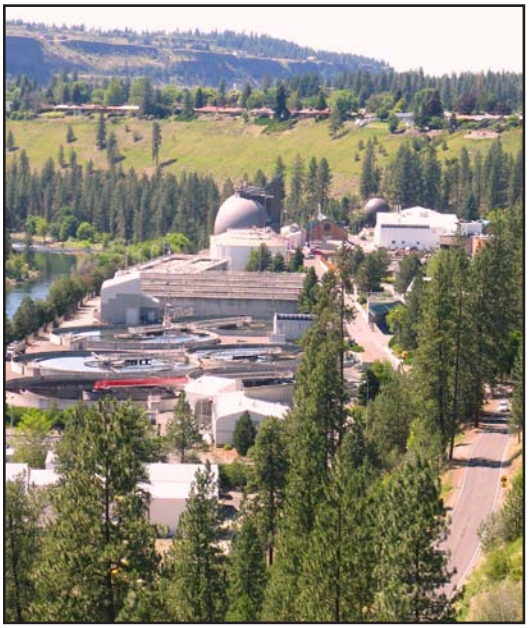


Overview



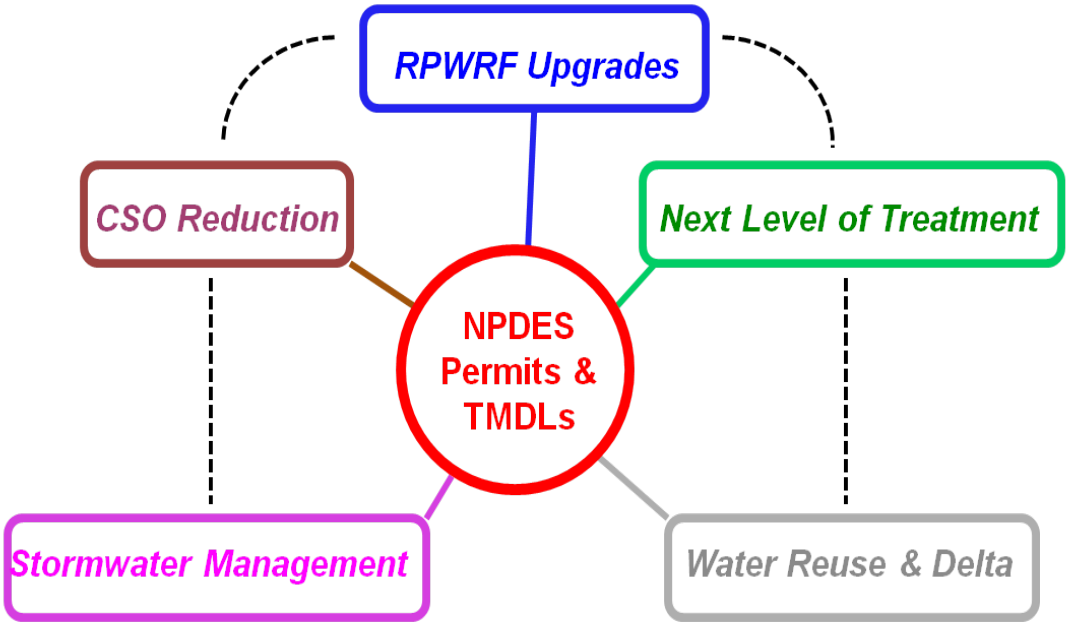
Riverside Park Water Reclamation Facility

The Wastewater Management Department is comprised of two divisions: Sewer Maintenance at 909 East Sprague Avenue and the Riverside Park Water Reclamation Facility (RPWRF) located at 4401 North Aubrey L. White Parkway. Sewer Maintenance is responsible for the collection system, including maintenance of sanitary and stormwater lines and constructing trunks, pump stations, and wet weather facilities. RPRWF is responsible for treating wastewater before discharging into the Spokane River, and for process upgrades and operating pump stations.

Mission

We believe that clean water is fundamental to life and we strive to protect public health, property, and the environment. We provide services by utilizing sound financial and natural resource management practices. We recognize that our customers are members of our community and are key to helping us succeed.

WATER QUALITY IMPROVEMENT PROGRAM



Regulations

Federal Clean Water Act
Revised Code of WA
WA Administrative Code
Shoreline Master Plan

Process

Facility Plans
Preliminary Designs
Real Estate
Final Designs
Construction

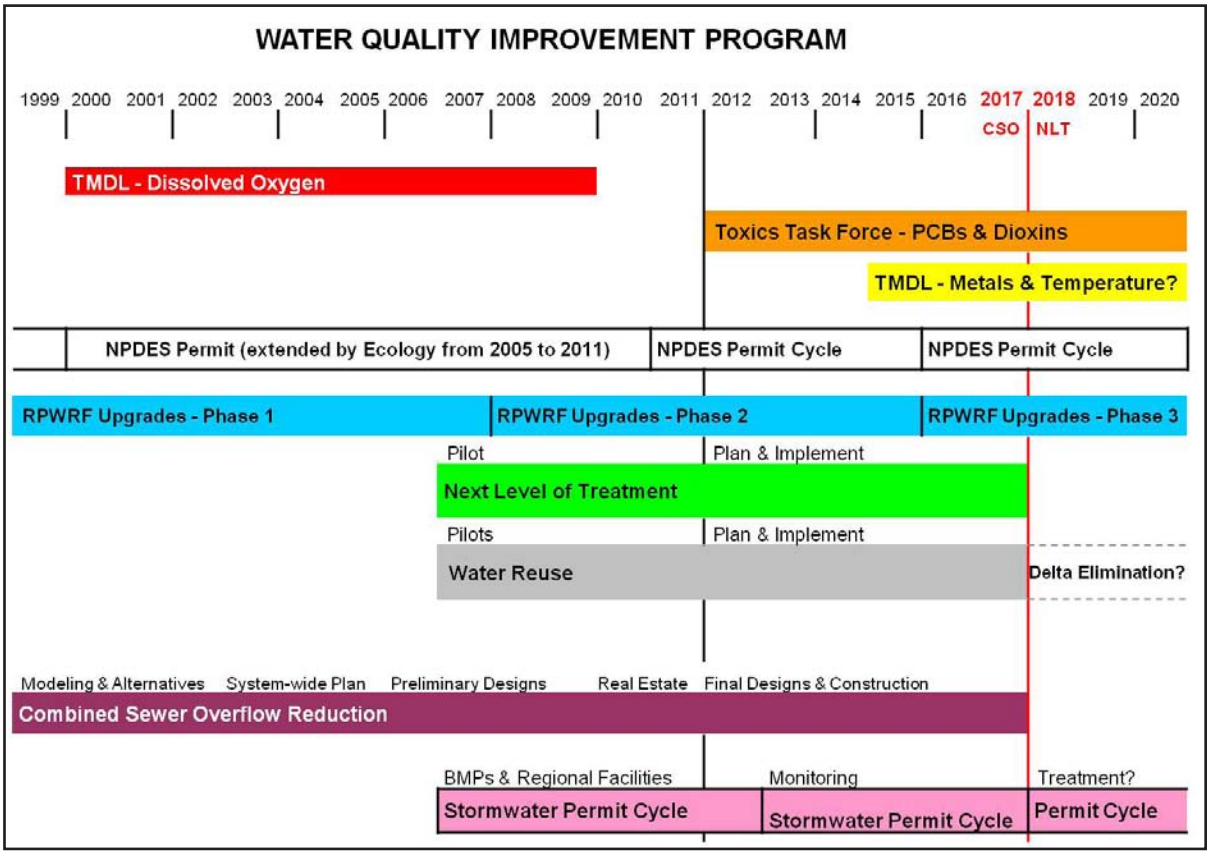
Funding

Rates & Reserves
Spokane County
PWTF & SRF Loans
Bonding

NPDES = National Pollutant Discharge Elimination System (Federal EPA)
TMDL = Total Maximum Daily Load (WA State Dept of Ecology)
RPWRF = Riverside Park Water Reclamation Facility (treatment plant)
CSO = Combined Sewer Overflow (sewage mixed with rain or snowmelt)
Delta = any "gap" between plant performance and the Permit Requirements

PWTF = Public Works Trust Fund
SRF = State Revolving Fund

Regulations



The Federal Water Pollution Control Act of 1948 was the first major law to address water pollution. Growing public awareness and concern for water pollution issues led to sweeping amendments in 1972, in what became known as the Clean Water Act (CWA). This Act established the basic structure for regulating pollutant discharges and gave the Environmental Protection Agency (EPA) the authority to implement pollution control programs and set water quality standards. This is implemented by Ecology through the EPA's National Pollutant Discharge Elimination System (NPDES) permit program which regulates point source pollution. Point sources refer to contaminants that enter a waterway from a single, identifiable source such as a sewage treatment plant, combined sewer overflow, or storm sewer system.

The Wastewater Management Department (WWM) operates under two permits issued by Ecology: The Waste Discharge Permit for the Riverside Park Water Reclamation Facility (RPWRF) and the Eastern Washington Phase II Municipal Storm Permit for small municipal separate storm sewer systems (MS4's). These permits largely guide the actions and define the responsibilities of WWM.

WWM is implementing a broad Water Quality Improvement Program (WQIP), which is an evolving effort to address pollution issues associated with wastewater. It is driven by the Federal and State regulations mentioned above, environmental groups, businesses, and citizens' concern for improving the quality of life of the Spokane community. It focuses on RPWRF upgrades, Next Level of Treatment (NLT), combined sewer overflow (CSO) reduction, stormwater management, and water re-use.

Next Level of Treatment is driven by recent, stricter standards in the RPWRF Discharge Permit for phosphorous, ammonia, and carbonaceous biological oxygen demand which are related to dissolved oxygen levels in Lake Spokane. The City's Shoreline Master Plan affects RPWRF projects and CSO projects. WWM is also guided by the Underground Injection Control (UIC) Rule which is a federal regulation enforced by Ecology to protect groundwater by regulating discharges to facilities such as drywells.

In July of 2011, Ecology issued RPWRF a NPDES Discharge Permit containing numerous compliance milestones. The effluent limits for nutrients and several metals were significantly reduced, including expanded monitoring requirements for toxic organic pollutants (PCB's and PBDE's) and continuous Spokane River temperature monitoring above and below the facility discharge point. On November 30, 2011, a memorandum of agreement governing the organization and operation of a Regional Toxics Task Force in conjunction with other Spokane River stakeholders was established. By January 3, 2013, an approvable Engineering Report must be submitted to Ecology to address the design of Next Level of Treatment processes needed to comply with the Spokane River and Lake Spokane Dissolved Oxygen Total Maximum Daily Load (TMDL), as well as provisions for "Reclaimed Water". By June 30, 2014, plans must be submitted to Ecology for the NLT upgrade of RPWRF to meet the Permit effluent limitations. Submittal to Ecology of an updated Mercury Abatement and Control Plan must be completed by February 1, 2016. By December 31, 2017, all CSO outfalls must meet all final State and Federal requirements applicable to such discharges.

Basic Treatment Process

Aeration Basin

Secondary Clarifier

Treated effluent discharging to the Spokane River

When water is used in homes or workplaces, it goes down the drain into the wastewater pipes. Wastewater is 99% water, but it contains human wastes, toilet paper, soap, detergent, fat, food scraps, cleaning chemicals and everything else we pour or flush down our drains. Anything other than human waste and toilet paper can cause problems and should not be flushed. Wastewater contains chemicals and microorganisms which can make people ill and damage the environment.

Liquids Process

Preliminary: Screening removes sticks, rocks, and trash from the influent wastewater before they could damage or clog the pumps and skimmers of primary treatment process. The wastewater goes through perforated plate screens to remove large objects before the velocity is reduced in the grit tank where smaller inert waste, like sand and gravel, drop out.

Primary: In the primary sedimentation stage, wastewater flows through large tanks called primary clarifiers. The tanks are used to settle out solids while grease and oils rise to the surface and are skimmed off. Mechanical scrapers continually drive the collected solids towards a hopper in the base of the tank where they are pumped to the solids process. The primary clarifiers remove 50 to 70 percent of the suspended solids.

Advanced Secondary: Secondary treatment removes dissolved solids derived from human waste, food waste, soaps, and detergent. The biological process is a conventional fine-bubble diffused-air activated sludge system. It creates conditions favorable for microorganisms in aeration tanks to consume organic matter as their food supply. Alum is added to settle out these microbes and particles in secondary clarifiers. Secondary treatment raises the level of pollution removal to over 85 percent.

Disinfection: Sodium hypochlorite is used to disinfect the water. Sodium bisulfate is then added to neutralize the chlorine in the effluent before it is discharged to the River.

Solids Process

Digestion: Anaerobic digestion of solids occurs in large egg-shaped vessels to further break down nutrients and destroy pathogens.

Biosolids Application: The resulting biosolids are nutrient-rich, organic material that is recycled fertilizer for agriculture use. Biosolid fertilizer improves soil productivity, replaces costly commercial fertilizers, and reduces the City's disposal costs.

Collection System

WWM provides all services related to maintenance, repair, and replacement of the existing wastewater collection infrastructure.

Spokane has two sewer systems: sanitary and storm. The *sanitary system* collects and conveys sewage. Portions of it are a *combined system* that collects and conveys both sewer and stormwater runoff. The *municipal separate storm sewer system (MS4)* collects and conveys stormwater runoff to the Spokane River.

Sewer and Stormwater Maintenance responsibilities include inspecting new or repaired collection systems, inspecting existing pipes, and performing preventive maintenance. Television trucks are used to visually inspect pipe conditions and determine if maintenance or repairs are needed. Damaged pipelines are repaired, older pipes are upgraded, worn manhole rings and covers are replaced, and storm inlet structures are cleaned.

Maintenance to existing sanitary and combined sewer pipes includes hydroing, vactoring, and rodding. Hydroing removes debris from sewer pipes by using a high-pressure hose and nozzle. Another pipe cleaning technique is balling, which uses water to force a rubber ball to rotate in the pipe and remove accumulated debris. Rodding uses a curved saw to remove roots that have grown into the pipes. An additional routine maintenance procedure is Vactoring which uses a high powered suction hose to withdraw debris from a catch basin or manhole for disposal at the North Side Landfill.

The City's street bond program has enabled WWM to upgrade existing facilities at reduced costs. Inferior assets are replaced without the cost of pavement removal and replacement, extending design life and avoiding pavement cuts in the near future. Cured In Place Pipe (CIPP) is an economical pipe re-lining repair that eliminates the need to excavate. WWM also has an Infiltration and Inflow reduction program to lower treatment costs by reducing groundwater infiltration and runoff flows to the RPWRF.

The *Sewer Construction Program* ensures the collection system and its associated sewer and stormwater pipes and pump stations are sufficient to serve the needs of the community and meet regulations.

Replacing a manhole cover

Inspecting pipelines with T.V. truck

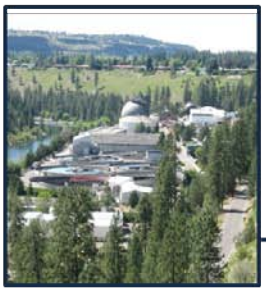
Vactoring pipelines free of debris

Wet Weather Management

This program has two parts: Combined Sewer Overflow Reduction and Stormwater Management.

The first program strictly limits the frequency and reduces the volume of untreated sewage that can overflow to the Spokane River and Latah Creek from the combined sewers during larger storms. The second program seeks to reduce stormwater pollution loading to the River and Latah Creek.

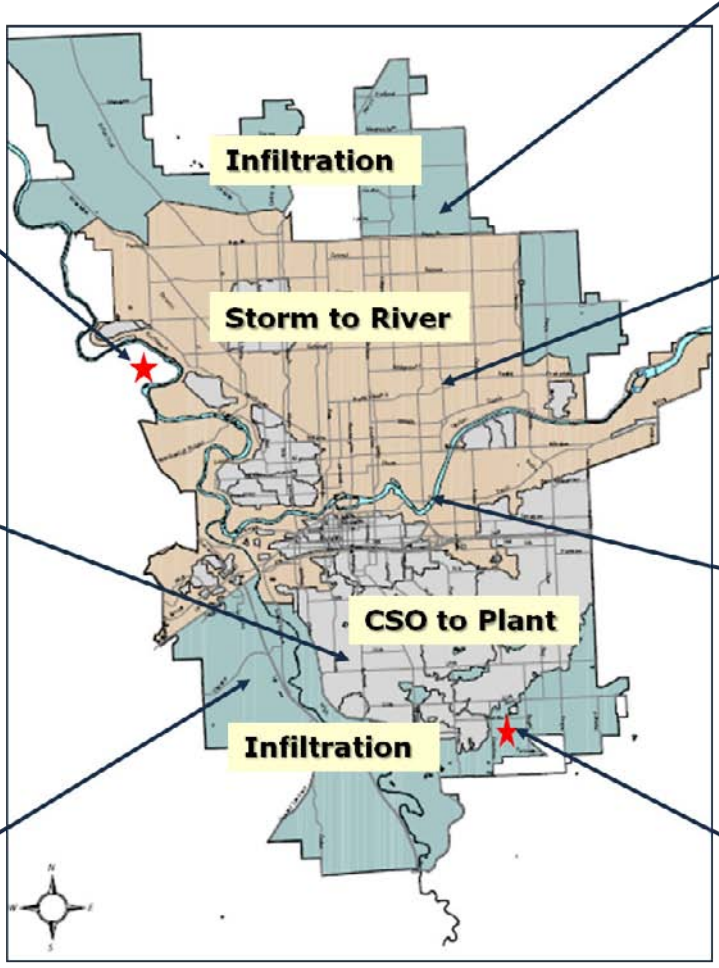
3 Ways We Manage Stormwater Runoff



RPWRF

CSO Tank

Grassy Swale



Grassy Swale

Storm Garden

Outfall

Hazel's Creek

Combined Sewer Overflow Reduction

There are 400 miles of combined sewers, located mostly on the south side of the City, that carry both sewage and precipitation to the RPWRF. Heavy storms or snowmelt beyond those pipes' capacity cause untreated sewage to overflow to the Spokane River or Latah Creek. These overflows prevent overloading sewer interceptor pipes and the RPWRF.

The CSO Reduction Program will limit overflows to once per year per outfall by 2017. No more than 20 outfalls will remain. This will be an immense improvement compared to 1980 when there were about 42 outfalls and more than 1,000 overflows per year. To achieve this, several CSO technologies were considered and control facilities were chosen as the most cost effective and reliable. These underground tanks store combined sewage that would otherwise overflow into the Spokane River during storms. When the storm has subsided, the control facilities feed the stored combined sewage to the RPWRF for treatment.

Construction of CSO #10

Stormwater Managment

The City's separated stormwater system collects rainfall and snowmelt from public right-of-way and disposes of it in one of two ways: infiltration to the ground or through a Municipal Separate Storm Sewer System (MS4) to the Spokane River and Latah Creek.

Much of this stormwater runoff is treated prior to discharge. The preferred method for treating infiltrated runoff is through bio-infiltration swales, which capture surface runoff in shallow trough-like depressions and use sod and soil to filter out sediment, grease, oil, and other pollutants. Curb drop inlets allow stormwater to drain from rights-of-way into bio-infiltration swales. Regional facilities such as Hazel's Creek function in a similar manner. Another approach is drywells which are underground structures that dissipate runoff into the ground.

The MS4, located predominantly in north Spokane, collects and conveys stormwater to the Spokane River or Latah Creek. Catch basins provide partial treatment. An MS4 is not a combined sewer system, and its operation is governed by the Stormwater Permit.

The City has also constructed two trial plant-based stormwater systems on Broadway Avenue and on Lincoln Street. The Spokane Urban Runoff Greenways Ecosystems (SURGE) constructed these Low Impact Development (LID) "storm garden" planters in 2010 to capture, treat, and infiltrate runoff.

Bio-Infiltration Swale at Northwest and Knox Street

Accomplishments

Riverside Park Water Reclamation Facility Upgrades and Pilots

Upgrades- Headworks Screening and Grit Improvements are substantially complete along with much of the Primary Clarifier Odor Control and Secondary Effluent Piping Modifications.

Phosphorous Removal and Water Reuse Pilot Projects- Concluded operations of 'Next Level of Treatment' pilot at RPWRF and water re-use pilot at Downriver Golf Course (Qualchan pilot concluded in 2010). Both pilots are now in the data analysis phase with reports scheduled for 2012.

Chemically Enhanced Primary Treatment (CEPT)- A full scale CEPT Pilot Test was initiated at RPWRF to evaluate its ability to improve primary clarifier nutrient removal. CEPT has the potential to defer the cost of constructing additional aeration basin capacity. Test data indicates that CEPT will offer significant treatment benefits as well as substantially reduce treatment chemical costs. The information from the CEPT pilot will help refine the design and implementation of a permanent CEPT facility at RPWRF.

Collection System Upgrades and Activities

CIPP Rehabilitation

Maintenance and Repair- The *WWM Maintenance Crews* maintained 568 of the over 1,200 total miles of sewer and storm pipes, inspected 173 miles for damage, and pumped over 1,800 of about 20,000 catch basins in the City. Cured In Place Pipe (CIPP) rehabilitated 8,583 feet of 8" to 36" diameter sewer pipe. WWM also reinforced a storm drainage facility at Weile Avenue and Skyline Drive that was severely damaged in an intense summer storm.

Combined Sewer Overflow (CSO) Reduction Program- The underground Control Facility for CSO #10 was constructed and three more Control Facilities were substantially designed.

Weile/Skyline Storm Drainage Facility

Inflow and Infiltration Reduction Program (I&I)- Another 70 million gallons of water per year will no longer consume treatment capacity at the RPWRF, which saves rate payers $85,000 per year.

Storm Sewer Pipe Replacement- Five Mile Road and Maple Street replacement of 48" diameter storm sewer pipe to prevent structural failure of arterial. A mile-long drainage swale rehabilitation along Magnesium and Holland improved 36,700 square feet of bio-infiltration swale. The Skyline and Weile facility was rehabilitated.

Street Bond Coordination- WWM worked with the Engineering Services Department to replace old sewer and storm lines. Approximately 8500 feet of pipe and 200

catch basins were identified for replacement in street bond projects constructed in 2011. WWM funded about $1.7 million of infrastructure upgrades in the 2011 street bond projects.

PCB Testing

Regulations and Permit Compliance

Environmental Protection Agency Audit- The EPA conducted a Clean Water Act compliance inspection of the City of Spokane combined sewer system in 2010. On May 18, 2011, WWM received the findings from the audit. No monetary fines were levied but four administrative violations were identified and have been addressed sufficiently for EPA.

Polychlorinated Biphenyls (PCBs) Removal- PCBs are compounds that negatively affect humans and animals. Working with Ecology and the Spokane Riverkeeper, WWM developed an Adaptive Management Plan, which resulted in testing and cleaning 431 catch basins for PCBs in 2010 and 362 in 2011. In 2010, 278,770 pounds of debris were pumped from the catch basins, including 0.05628 pounds (25 grams) of PCBs. 2011 data is not yet available. These activities are in addition to the routine annual maintenance performed by Wastewater Management.

Stormwater Public Education and Involvement-Among other stormwater permit requirements, WWM greatly expanded its campaign targeting various audiences to help reduce stormwater pollution. A stormwater survey to help guide our education efforts was conducted in August and yielded 380 responses. An element was added to educate the public about keeping fats, oils, and grease out of drains. Stormwater education presentations were made to six neighborhood meetings and two service clubs, reaching over 100 citizens. WWM had a public library display, attended five public events including Summer Parkways, Leaf Fall Festival, and Arbor Day, and continues to work with Cable 5. 1400 curb markers were installed in 2010 and 2011 to help educate the public about 'only rain down the drain.'

Public Library Stormwater Display

FINANCIALS

Wastewater Department Rate Model Summary

	2012	2013	2014	2015	2016	2017
SOURCES OF FUNDS:						
Utility Sales (Treatment)	36,911,344	42,103,847	46,545,803	50,286,922	53,065,275	55,997,131
Budget Adjustment Utility Sales (Treatment)	0	0	0	0	0	0
Sewer Collection Revenues	8,721,113	9,947,956	10,997,465	11,881,386	12,537,833	13,230,548
Rate Stabilization Fees	26,198,913	29,884,445	33,037,254	35,692,624	37,664,641	39,745,613
Stormwater Fees	6,836,201	6,870,257	6,904,483	6,938,880	6,973,450	7,008,192
Rate Revenues	78,667,572	88,806,505	97,485,006	104,799,812	110,241,198	115,981,483
Other Revenues	3,853,781	3,729,179	4,597,596	5,865,418	6,135,660	5,102,988
Total Revenues	**82,521,353**	**92,535,684**	**102,082,602**	**110,665,231**	**116,376,858**	**121,084,471**
USES OF FUNDS:						
Operations & Maintenance	36,567,803	38,184,556	39,671,939	41,233,188	42,873,038	47,096,587
Operating Transfer to Urban Forestry	209,890	210,842	211,798	212,759	213,725	214,696
State Taxes	1,683,014	1,984,692	2,263,329	2,528,861	2,579,289	2,514,390
City Taxes	16,727,369	19,799,781	22,656,783	25,405,922	25,816,891	24,938,191
Total Operating Expenses	**55,188,076**	**60,179,871**	**64,803,850**	**69,380,730**	**71,482,943**	**74,763,863**
Excess of rate and other revenues available to fund capital program and debt service	**27,333,277**	**32,355,813**	**37,278,752**	**41,284,501**	**44,893,915**	**46,320,608**
Beginning Cash Balance	**41,575,082**	**26,687,137**	**28,267,310**	**33,578,344**	**45,499,572**	**58,204,246**
Excess from Rate Revenues to fund capital	27,333,277	32,355,813	37,278,752	41,284,501	44,893,915	46,320,608
Contributed Capital County	2,559,408	7,706,624	13,224,176	19,561,466	16,076,445	5,839,040
Grant Proceeds	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	0
Debt Proceeds^^	20,151,489	13,663,544	64,049,848	142,268,320	136,225,048	40,628,277
Debt Service	(1,519,118)	(2,697,809)	(5,903,742)	(14,508,058)	(25,773,735)	(33,395,442)
Capital Projects (Six Year Plan)	(64,663,000)	(50,698,000)	(104,588,000)	(177,935,000)	(159,967,000)	(54,645,000)
Total Cash Reserve	**26,687,137**	**28,267,310**	**33,578,344**	**45,499,572**	**58,204,246**	**62,951,729**
Less Reserve For Debt Service	**(1,203,639)**	**(2,327,035)**	**(7,623,046)**	**(19,017,493)**	**(30,331,698)**	**(34,263,585)**
Total Available Cash Reserve	**25,483,498**	**25,940,275**	**25,955,298**	**26,482,079**	**27,872,548**	**28,688,144**

Personnel

Riverside Park Water Reclamation Facilty Staff

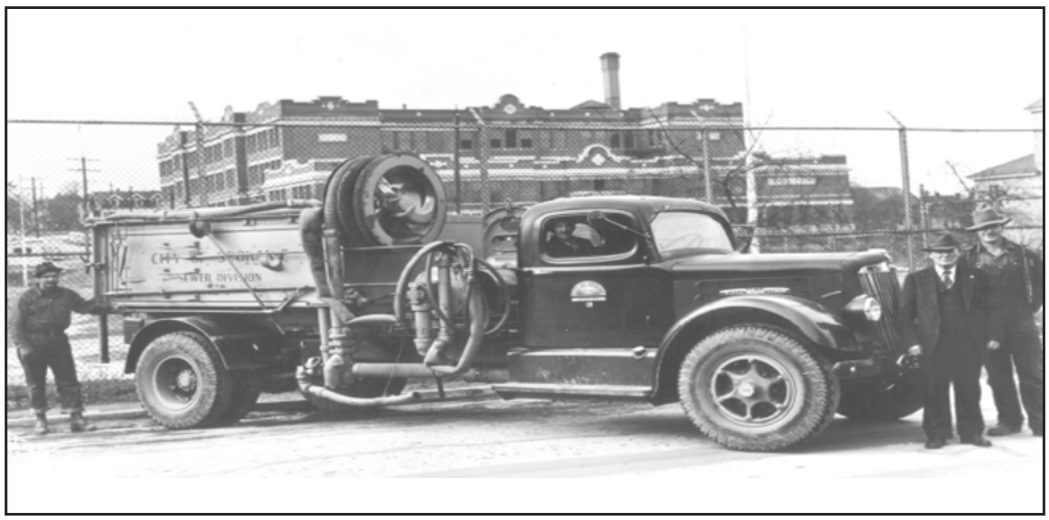
South Side Sewer Maintenance Crew

North Side Sewer Maintenance Crew

Construction Crew

Administration and Engineering

History



First truck used to clean the sewer pipelines.

Twenty seven blocks of downtown Spokane burned on August 4, 1889 in what became known as The Great Fire. When contemplating reconstructing, the City chose to expand the sewer system. Prior to the fire, only one sewer had existed. It collected sewage along Howard Street from First Avenue to the Spokane River. There was no sewage treatment. During reconstruction, the City expanded the sewer system to serve from the Spokane River to the South Hill and from Division Street to Cedar Street. The Sewer Division was established on April 1, 1891. A superintendent and several laborers were hired. The superintendent was paid $150 per month and laborers were paid $2 to $3 a day depending on experience. They only had a wheelbarrow, fire hose donated by the Fire Department, cables, rope, homemade winches, and wooden or iron sewer cleaning rods. A horse named Possum was used to haul this equipent. The Sewer Division obtained a GMC truck in the early 1920's.

A catch basin is designed to trap debris that could clog the pipes. The unpleasant job of hand-dipping catch basins to remove debris ended in 1928 with the purchase of an Eductor. An Eductor used high pressured water and a venturi to create a vacuum to remove water and debris from the catch basins. The crew could clean catch basins ten times faster with it.

Although no sewers were built during the early years of the Great Depression, miles of sewer lines were constructed in cooperation with the Works Progress Administration, the large New Deal Agency that helped put America back to work. This made the 1930's one of the most productive decades for sewer construction. By 1936, the sewer system had grown beyond the capabilities of one crew. The Sewer Division expanded so that one repair crew attended to the North Side, one crew the South Side, and a third crew operated the Eductor. In 1938, the crews obtained their first flexible rods, which allowed them to remove tree roots from sewer pipes to prevent blockage. Thus began preventive maintenance.

Through the 1920's and 1930's, Washington State grew concerned with untreated sewage in the Spokane and Columbia Rivers. The State increased pressure on cities to build sewer treatment plants. After being voted down twice, Spokane's Sewage Treatment System Bond passed in 1946. The $3,600,000 bond funded the original plant which began operation in 1958. It was originally designed to treat 55% of the City's sewage but was expanded in 1962 to handle primary treatment of sewage from up to 250,000 people. A sewer usage charge was implemented to maintain the system and to fund updates and improvements. In 1959, the Sewer Division became a part of the City's Public Utilities.

By the 1960's, the older pipes needed to be replaced. Before TV inspection technology, the crews would lower a lamp into the pipe and go to opposite ends of the pipe to look down the line toward each other. This was not an effective method of inspecting sewer pipes, as crews were unable to see structural damage until the pipe was about to collapse. In 1968, the Sewer Division purchased its first TV truck, which

Digging a new sewer pipeline at Sprague and Division Street, 1915

allowed them to use cameras to inspect the pipes for early indications of failure.

The Clean Water Act (CWA) passed in 1972 and established the basic structure for regulating discharges of pollutants into the waters of the United States, including quality standards for surface waters. Spokane's treatment plant discharged to the Spokane River, so it had to be upgraded. It was upgraded by 1977 to expand its capacity and improve contaminant removal.

Shortly thereafter, the Sewer Division began the first phase of combined sewer overflow (CSO) reduction by separating stormwater from sanitary wastewater. Separate storm lines were built, mostly on the north side of town, to reduce sewage overflows to the river.

On May 18, 1980 Mount St. Helen's erupted. Spokane residents were advised to wash the ash from their driveways and sidewalks to the nearest storm inlet. Unfortunately this created a material similar to cement in the catch basins below the inlet. The Federal Emergency Management Administration paid for two more VacAll trucks, totaling four in the department. With these, the crews worked 12 hours a day, six days a week to remove ash from the catch basins. Fifteen years later, crews were still removing hardened ash.

In the mid-1980's, the plant merged with the Sewer Division to form the Wastewater Management Department (WWM). From the late 1980's through the 1990's, most of the downtown sewers were relined with Cure In Place Pipe (CIPP) technology. This process rehabilitates pipe without digging up the street.

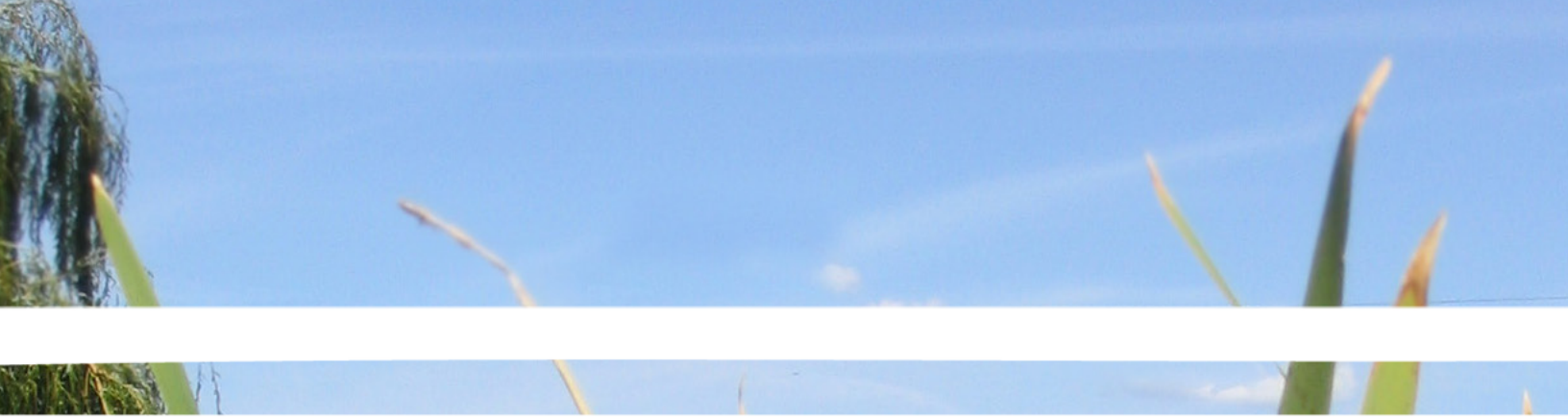
In 1995, the Sewer Maintenance shop moved to a larger, more modern building at 909 E Sprague Avenue. At the time, WWM reorganized and formed a construction crew able to quickly respond to dig and repair small and/or urgent sewer problems. An additional crew was established to replace worn manhole rings and covers and to repair bioinfiltration swales and drywells.

In response to stricter regulations in the Clean Water Act overseen by Ecology, the now-called Riverside Park Water Reclamation Facility (RPWRF) developed a phased upgrade program to increase capacity, efficiency, and effluent quality. These upgrades have included egg-shaped digesters, an improved aeration basin, odor control, process improvement, and electrical and mechanical updates. Phase One began in 1998, Phase Two began in 2008, and Phase Three will begin after 2016.

In 1999, the second phase of the CSO Reduction Program was initiated to limit overflows to one a year per outfall by 2017.

In September of 2010, the Environmental Protection Agency conducted a Clean Water Act compliance audit of the City's CSO program. In May of 2011, WWM received the audit findings. A number of issues required correction, but no monetary fines were levied. This was excellent news for the City.

1992 Aerial Photo of RPWRF



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