



*CITY OF YAKIMA  
WASTEWATER DIVISION  
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January 28, 2010

Mr. Rick Frye  
Department Of Ecology  
Central Regional Office  
15 West Yakima Ave., Suite 200  
Yakima, WA 98902

**RE: 2009 Infiltration and Inflow Report**

Dear Mr. Frye:

Pursuant to the requirements of NPDES Permit No. WA-002402-3 Section S4.D., the City of Yakima Wastewater Division is required to submit an Annual Infiltration and Inflow Report by January 31<sup>st</sup> of each year to the Department of Ecology. The report is to outline activities associated with the Wastewater Division's effort in monitoring and reducing the amount of infiltration and inflow entering into the City's publicly owned treatment works.

Enclosed is the submitted 2009 Annual Infiltration and Inflow Report.

If you have any questions regarding this report, please feel free to contact me at (509) 249-6815.

Sincerely,

Scott Schafer  
Wastewater Division Manager



City of Yakima  
Wastewater Division  
Annual Infiltration and Inflow Report  
2009

## 2009 Annual Inflow and Infiltration Evaluation

Reduction of inflow and infiltration (I/I) is a major priority for the City of Yakima Wastewater Division. In 2009, the City continued its effort to reduce I/I to the wastewater collection system.

Municipal Wastewater Facilities must demonstrate that wastewater collection systems are not and will not contribute to excessive infiltration or inflow. EPA's Infiltration/Inflow I/I Analysis and Project Certification brochure (Ecology Publication No. 97-03) is being used to determine if there is excessive I/I to the City's wastewater system. The submittal of this report by January 31, 2010 to the Department of Ecology satisfies the requirement of Section S4. D., of the City of Yakima's National Pollution Discharge Elimination System (NPDES) permit WA-002402-03, Infiltration and Inflow Evaluation.

EPA's guidance uses a national average to determine dry weather flow (DWF) and wet weather flow (WWF). For DWF, 120 gallons per capita per day (gpcd) is used and for WWF, 275 gpcd is used to determine non-excessive flows. Flows exceeding these values are considered to be excessive. For 2009, the highest average flow recorded over a 7-14 day period during high seasonal ground water was used to calculate the DWF. The highest single day flow was used as the WWF. The total flow, calculated from the plant loadings, consists of a combination of residential, commercial, and industrial flows as well as infiltration and inflow. These flows were determined by using the 2009 total sewer billed flows. The residential, commercial and industrial flows are used to calculate the I/I by being subtracted from the total flow. With the Urban Service area for both Terrace Heights and Union Gap subtracted and recent annexations added, a Service Area population of 87,557 (Table 3-1a, Sec. 3 Draft 2004 Wastewater facility Plan) is used to calculate the per capita flow rate for the City of Yakima. Terrace Heights and Union Gap flows were classified as industrial.

*The City reads retail customer's water meters every two months and bills accordingly. For example: September billing is based upon meter readings for July and August. The City will incorporate the bi-monthly billing into the I/I report as oppose to monthly, to illustrate a more representative depiction of events based on recorded influent flows at the plant and when customers were actually billed.*

In 2009, the DWF for the Yakima Treatment Plant was determined using the highest 14-day period during the billing period with the highest flow (September). The highest 14-day average was during the month of August. The following Table illustrates this and the 2009 Infiltration/Inflow Data shows the gpcd for the entire year of 2009.

### September Billing Period 2009 DWF (July/August)

Date	Ave. Daily Flow Rate (mgd)	Ave. Daily Industrial Flow rate for Jul/Aug 2009 (mgd)	Residential + Commercial + I/I (mgd)	Ave. Daily Flow Rate (gpcd)
Aug. 10 - 23	11.99	1.37	10.62	121.3

This table indicates that the DWF for this 14 day average during the September billing period for 2009 Average Daily Flow Rate was 121.3 gpcd and does exceed the EPA national average of 120 gpcd in determining excessive I/I. The reported value for 2008 was 119.9 gpcd; resulting in an increase of 1.2% from last year.

The enclosed spreadsheet (2009 Infiltration/Inflow Data) shows that the plant's high flows occur in late summer to early fall rather than in the winter and spring. This is typically the case because the Yakima area is heavily irrigated with many canals running through the city limits.

### 2009 Infiltration/Inflow Data

Bi-Monthly Billing Period	Plant Flow & Meter Read Months	# Days	Total Plant Flow per Billing Mg	BI-MONTHLY BILLED FLOWS			DAILY AVERAGE FLOWS					Res+Com+ I/I Mg	Flow/Capita Gpcd
				Res flow Mg/billing	Com flow Mg/billing	Ind Flow Mg/billing	Total Mgd	Res Mgd	Com Mgd	Ind Mgd	I/I Mgd		
January	Nov/Dec '08	61	549.97	282.41	126.77	69.28	9.02	4.63	2.08	1.14	1.17	7.88	90
March	Jan/Feb	59	518.58	273.91	109.84	74.91	8.79	4.64	1.86	1.27	1.02	7.52	86
May	Mar/Apr	61	558.65	249.52	124.23	71.77	9.16	4.09	2.04	1.18	1.85	7.98	91
July	May/June	61	627.94	284.62	121.27	77.55	10.29	4.67	1.99	1.27	2.37	9.02	103
September	Jul/Aug	62	696.37	427.33	183.47	79.55	11.23	6.89	2.96	1.28	0.10	9.95	114
November	Sep/Oct	61	696.30	376.40	204.11	90.35	11.41	6.17	3.35	1.48	0.42	9.93	113
Yearly Total			3647.81	1894.19	869.69	463.41							
Yearly Daily Averages							9.98	5.18	2.38	1.27	1.15	8.71	100
total flow %								52	24	13	11		
billed flow %								59	27	14			

(Union Gap & Terrace Heights classified as industry)  
 (Population of Union Gap & Terrace Heights omitted)

To formulate a more realistic picture of I/I, one could utilize a simplified version of EPA's Infiltration/Inflow by taking the difference between the Total Flow and Billed Flow to represent the I/I Flow.

<u>2009</u>		<u>2008</u>	
Total Flow:	3,647.81 mg	Total Flow:	3,700.82 mg
Total Billed:	<u>-3,227.29 mg</u>	Total Billed:	<u>-3,242.56 mg</u>
I/I Flow:	420.52 mg	I/I Flow:	458.26 mg
420.52 mg/365 days = 1.15 mgd		458.26 mg/365 days = 1.26 mgd	
1.15 mgd x 100/8.7557 = <b>13.1 gpcd</b>		1.26 mgd x 100/8.7557 = <b>14.4 gpcd</b>	

Using this simplified format, the Yearly Daily Average for I/I calculates to 13.1 gpcd for 2009 and 14.4 gpcd in 2008; compared to 100 gpcd and 101 gpcd for 2009 and 2008 respectively as officially reported by using EPA's formula. The City is concerned that by utilizing the summation of the residential, commercial, and I/I flows to determine the Flow/Capita, this appears misleading and actually inflates the I/I report since industrial is not part of the equation.

The total flows from 2008 to 2009 decreased by 1.53% with the total yearly flows decreasing by 15.34% since 2000. Billed flows decreased 0.47% since 2008.

## Total Yearly Flows

Month	Hydraulic 2000	Hydraulic 2001	Hydraulic 2002	Hydraulic 2003	Hydraulic 2004	Hydraulic 2005	Hydraulic 2006	Hydraulic 2007	Hydraulic 2008	Hydraulic 2009
January	219.94	298.21	269.37	275.26	269.74	259.62	264.32	289.19	276.55	276.10
February	244.57	255.62	236.33	242.45	252.59	231.57	229.00	271.29	255.29	242.48
March	274.19	283.17	262.45	260.33	286.40	261.60	250.69	275.94	267.31	265.97
April	330.75	313.36	303.48	321.34	349.61	310.03	300.47	321.48	303.19	292.68
May	370.69	381.00	349.50	337.52	364.56	348.36	345.57	328.34	322.54	324.31
June	391.48	395.40	353.62	369.70	364.16	313.85	376.52	334.37	318.58	303.63
July	463.96	436.24	394.40	429.87	395.88	347.31	420.62	366.61	340.95	329.25
August	519.15	476.89	416.94	419.10	433.67	375.78	418.08	395.87	358.89	367.12
September	484.75	443.34	427.06	416.47	409.58	382.44	402.94	384.19	350.84	358.32
October	395.02	347.18	354.52	361.89	365.09	295.40	353.91	355.13	330.74	337.98
November	309.30	269.19	264.39	267.63	270.33	252.04	283.87	286.04	281.65	278.68
December	300.46	269.61	270.08	270.88	265.37	260.63	288.70	289.90	268.32	267.53
Total	4,304.26	4,169.21	3,902.14	3,972.44	4,026.98	3,638.63	3,934.69	3,898.35	3,700.82	3,644.05
% Change Yearly		-3.14%	-6.41%	1.80%	1.37%	-9.64%	8.14%	-0.92%	-5.07%	-1.53%
% Change Compared to 2000		-3.14%	-9.34%	-7.71%	-6.44%	-15.46%	-8.59%	-9.43%	-14.02%	-15.34%

Leakage from irrigation pipes and canals, during the irrigation season, significantly raises the shallow ground water table that runs under the City of Yakima and along the Yakima River. When the irrigation is shut down in the fall, the City's Wastewater Treatment Plant flows are reduced significantly. When turned on in the spring, the plants flows begin to increase and top out in the late summer and early fall. Winter flows are generally well below 100 gpcd and thus not even close to the excessive WWF flow rate of 275 gpcd. Even the highest single day flow of 13.31 mgd (August 22<sup>nd</sup>) is well below this threshold. One can deduce from this data that inflow is not a significant problem because the flows during the wetter weather seasons (winter and spring) are well below this threshold. On the other hand it is obvious that during the irrigation season, the dry weather season, infiltration is a problem and much of the Wastewater Division's focus is on reducing the impacts from this infiltration.

The City of Yakima will continue to pressurize and rehabilitate a major portion of its irrigation system over the next several years to reduce leaking of irrigation water into the water table. The increase in the water table level has been documented as a major source of I/I for the Wastewater Treatment Plant. Phase 3 of the City's irrigation pipe replacement program for the 308 System was initiated in the fall of 2007. It is highly anticipated that when this project is completed, the water table level will be greatly reduced eliminating as much as 2 to 3 million gallons a day of irrigation water from entering into the wastewater system during the irrigation season.

## Rainfall Gauges (inches)

Rainfall Gauge Location	Address	2009 Recorded Levels
Fire Station #94 (Airport)	2404 W. Washington Ave.	5.57
Fire Station #92	7707 Tieton Dr.	6.24
Yakima City Shops	2301 Fruitvale Blvd.	5.73
Wastewater Treatment Plant	2220 E. Viola	4.69

The four rainfall-monitoring locations selected provide spatial distribution of rainfall and ease of service and gauge security. The rainfall gauges represent a gauge density of 1 gauge per 9 square miles. The four locations have remained the same since 2004.

### Yakima Precipitation (inches)

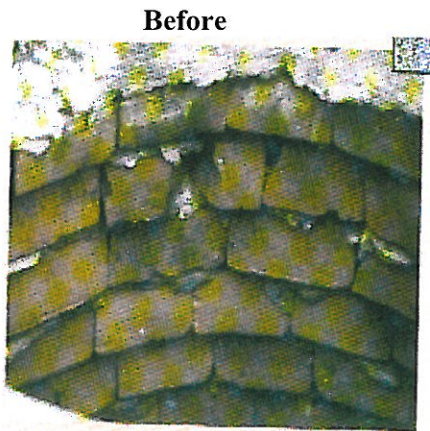
Month	2009 Monthly Total	2008 Monthly Total
January	0.97	0.81
February	0.67	0.51
March	0.84	0.27
April	0.25	0.13
May	0.76	0.21
June	0.52	0.29
July	0.03	0.05
August	0.09	0.32
September	0.43	0.19
October	0.89	0.44
November	0.55	0.98
December	0.97	0.83
<b>Total</b>	<b>6.97</b>	<b>5.03</b>

Data provided by the National Climatic Data Center

Comparing 2009 to 2008, reported yearly total precipitation levels increased by 38.6%.

Wastewater Collection crews performed a significant amount of TV inspections of pipe during 2009 to help identify leaking systems to maximize future grouting and repair projects. Through their efforts, they were able to inspect a total of 104,570 feet of pipe, of which 18,368 feet was new construction. The camera inspections identified (22) broken pipes, (9) of which were repaired. In addition, (36) cracked sewer pipes were identified and documented for future repair.

The City of Yakima has approximately 7,000 manholes, of which 50% are block or brick and mortar. As these manholes have aged over the years, much of the mortar has deteriorated and created voids in which infiltration can enter. Repairing or replacing these manholes is a top priority in reducing groundwater infiltration into the wastewater system. The City has an aggressive manhole rehabilitation program to address this very issue. In 2009, City crews rehabilitated 40 manholes. The manholes have been relined with fiber-impregnated cementatous grout, effectively eliminating the previous infiltration. See photos below.



The City also has the ability to perform “cured in place pipe (CIPP) repair.” This has allowed the City to complete needed work, without contracting it out. The CIPP process is useful for the permanent repair of cracks or voids in sewer pipes, effectively eliminating infiltration, all without having to excavate the pipe. In 2009, of the (9) repaired broken pipes, (4) were repaired utilizing the CIPP repair method.

Additional utility work performed in 2009:

Sanitary Sewer

- Manholes raised to grade 56
- Channel repairs 42
- Replacement of hinged manhole lids 24
- Replacement of standard manhole lids 6
- Manhole rings sealed 48

Stormwater

- Inlet repairs 44
- Replacement of hinged manhole lids 4
- Pipe repairs 5
- Replacement of basins 5
- Replacement of basin covers 1


Camera Observations

- Needing CIPP repairs 4
- Needing lateral repairs 3
- Needing joint repairs 14

In summary, flow volumes discharged by the commercial and industrial sectors are more accurately depicted within the report due to the record keeping of the City’s Pretreatment Program. Through smoke-testing and dye-testing, extensive time and effort is also being exerted by the City’s Collection crew in identifying flows from wastewater dischargers connected to the WWTP, with no previous account history and billing information. The City continues to identify and prioritize projects in its efforts to further reduce infiltration to its wastewater system.

The City was well below the threshold for excessive I/I for the year in accordance with the EPA flow guideline for DWF even with the increased level of recorded precipitation from the previous year. The City recorded a DWF value of only 114 gpcd during its peak high flow period. Much credit must be given to the efforts of the City’s Collection and Stormwater crews for their continued success in reducing the amount of infiltration into the City’s wastewater system.

Report Submitted By:

  
Scott Schafer  
Wastewater Division Manager  
January 28, 2010