City of Salmon Arm Wastewater Collection & Treatment

2007 Annual Wastewater Collection & Treatment Report

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1.0 Community General

The City of Salmon Arm is located in the southern interior of British Columbia on the southwest shoreline of the extensive Shuswap Lake system. With over 16,000 residents, Salmon Arm is the largest urban centre in the Columbia Shuswap Regional District. It serves as the commercial, cultural and administrative hub for an additional 35,000 residents of the Shuswap Lake region. Located at the junction of the Trans Canada Highway (TCH) and Highway 97B, Salmon Arm is a one-half day drive to Vancouver or Calgary and a 70 minute drive to Kelowna or Kamloops.

With a land base of 175 km², Salmon Arm is a relatively large municipality by area with most of the population concentrated within a few kilometers of the Trans Canada Highway and the downtown core. The surrounding terrain varies from the low lying marsh flats of Salmon Arm Bay to the extinct volcanic peak of Mt. Ida and the ridge lines of Fly Hills to the west and Larch Hills to the east. These highlands form the Canoe Creek and Salmon River watersheds which empty into Shuswap Lake. Sustainable land use planning over the years has resulted in the formation of an attractive, bustling, compact community surrounded by thousands of hectares of arable farmland, green space and natural shorelines.

Salmon Arm's commercial and industrial base is continuing to diversify. The housing market continues to remain tight. Retail, construction, professional services and healthcare, along with a wide array of entrepreneurial activities, are major sources of employment. Small businesses flourish in Salmon Arm's business friendly environment. Key economic drivers are value-added wood processing, high tech and traditional manufacturing, tourism and agri-business. The continuing surge in construction activity points to a healthy market demand for new housing and floor space for commercial, industrial and institutional uses. By all indications, an average annual growth rate of 1.5% - 2% with an increase to be expected over the next three to four years.

1.1 Staffing

The City of Salmon Arm Engineering and Public Works Department is responsible for this municipal function. The Utilities Division is responsible for the operation and maintenance of the sanitary collection system and the Water Pollution Control Centre (WPCC) staff is responsible for the operation and maintenance of the Wastewater Treatment facility. The WPCC is manned seven days of the week with 24-hour standby provisions for after hour alarm response. Operational staff and appropriate Environmental Operators Certification Program (EOCP) levels:

Staff Overview:

Dale McTaggart, P. Eng., Director of Engineering & Public Works
Robert Niewenhuizen, AScT, City Engineer
John Rosenberg, AScT, Manager of Public Works

Utilities Division:

Gerry Rasmuson, B. Sc., Utilities Forman,
- Level IV - Water Distribution
- Level IV - Wastewater Treatment
- Level I Wastewater Collection

Rodger Parks, Utilities Sub-Forman
- Level I Wastewater Collection

Mike Davie,
- Level II Wastewater Collection
- Level I Wastewater Treatment

Don Smith
- Level II Wastewater Collection

Larry Kipp
- Level I Wastewater Collection

Rick Webb
- Level II Wastewater Collection

Water Pollution Control Centre

Hart Frese, Chief Operator/Manager (direct supervisor),
- Level IV - Wastewater Treatment

Lee Robinson, Senior Operator,
- Level II – Wastewater Treatment

John Kalinczuk, Operator II,
- Level II - Wastewater Treatment

Doug Stalker, Operator III,
- Level IV – Wastewater Treatment

2.0 Wastewater Treatment & Collection System History

2.1 Wastewater Collection System - History

The District of Salmon Arm and the Village or Salmon Arm amalgamated in 1971 to form the District Municipality of Salmon Arm on January 1, 1971, and then became the City of Salmon Arm in 2005. The Village was the original urban core area and sewer lines were installed during the 1930's to collect septic tank effluent and some crude wastes which were then discharged into an open ditch leading into Shuswap Lake. The surrounding District Municipality relied on septic systems as sewer collection was not an issue until the urban development of the Village overflowed into the surrounding Municipality. By 1964, the Village had initiated plans for sewage treatment which included the construction of a lagoon along the waterfront for treatment. The lagoons would also service the Adams lake Indian Band lands. Concerned about the level of treatment that a lagoon offered, the Village decided to review their plans and objectives. By 1966, the review board recommended that the Village and District combine in their efforts to collect and treat wastewater. However, unable to agree upon implementation of various plans the Village applied to the Pollution Control Board for a permit to discharge highly treated effluent into Shuswap Lake. By the time this permit was granted in 1972, the Village and District had amalgamated.

Ultimately the Engineering firm of Dayton and Knight Ltd were hired to undertake a Wastewater survey in 1972 to study various different treatment and effluent disposal methods. The Survey resulted in the construction and official opening of the existing Water Pollution Control Centre on May 14, 1977. Furthermore, the survey identified collection system priorities and set in motion the construction of the infrastructure that currently exists. The City's sewage collection and treatment systems have evolved into a well maintained collection system and a state of the art Wastewater Treatment Centre.

2.2 Wastewater Treatment Plant History

The original plant was constructed on the current site, 121 Narcisse Street NW, in 1977 after the proposed site at Minion Field, 2191 30th Street SW. was rejected by the B.C. Agricultural Land Commission and Provincial Pollution Control Board. It was constructed at a cost of $0.9 M and consisted of primary sedimentation, activated sludge, secondary clarification with chlorine disinfection. Solids were aerobically digested and stored in two 1 acre lagoons. Capacity of the plant was 3,000 m^3 per day for a design service population of 6,250.

In 1982, phosphorus removal was added at a cost of $0.1 M and consisted of precipitating phosphorus out of the effluent by the addition of ferrous chloride. Phosphorus was determined to be the limiting nutrient which contributes to the eutrophication and degradation of water quality in Shuswap Lake, particularly, Salmon Arm Bay.

2.2 Wastewater Treatment Plant – History (continued)

In 1986 the $1.8 M Stage II Upgrade was the first major upgrade to the facility. The liquid process was altered from a common activated sludge process to an experimental trickling filter biological nutrient removal (BNR) system (Fixed Growth Reactor – Suspended Growth Reaction or FGR-SGR). As well, the aerobic digester was upgraded to an Autothermal Thermophilic Aerobic Digester (ATAD). Plant Capacity was increased to 3,500 m^3 per day for a design service population of 8,750.

Improvements were made in 1991 to the solids process at a cost of $0.5 M. The improvements consisted of changing aeration and solids pumping equipment. Rebuilding the ATAD tanks and added waste biological sludge thickening.

The Stage III Upgrade was split into two upgrades with the first part, Stage IIIA completed in 1998 at a cost of $5.2 M. It consisted of improvements to the FGR-SGR process, new secondary clarifier, Supervisory Control and Data Acquisition system, increased ATAD capacity and biosolids dewater. These improvements led to better control and monitoring, the ability to beneficially recycle biosolids and the decommissioning of the solids storage lagoons. Capacity was increased to 5,000 m^3 per day for a design service population of 12,500.

Aerial Photo Stage IIIB prior to Landscaping

Stage IIIB was completed in 2005 without the Laboratory/Administration expansion. Of the $7.4 M upgrade, $2.3 M was funded by the Federal and Provincial Governments. The upgrade consisted of a complete rebuild of the main lift station at Marine Drive with odor control, added redundancy to critical equipment, stand-by power, effluent filtration, replacement of the chlorination/de-chlorination system with Ultra Violet disinfection, an elaborate odor control system and architectural improvements to the original exterior of the original building. Capacity was increased 6,700 m^3 per day average flow for a design service population of 15,000.

Cost Summary Table 1.1

Project	Cost	Year
Stage I - 6,250 connected population	$0.9 M	1977
Chemical Phosphorus Removal	$0.1 M	1982
Stage II - 8,250 connected population	$1.8 M	1986
Solids Improvements	$0.5 M	1991
Stage IIIA - 12,500 connected population	$5.3 M	1998
Stage IIIB – 15,000 connected population	$7.4 M	2004
FGR Pilot Project	$0.1 M	2006
Total	**$16.1 M**	
Estimated Insurable/Replacement Value (2005)	$35.0 M	

3.0 Wastewater Collection System

3.1 Overview of Collection System

The Utilities Division, through a schedule of systematic new improvements, upgrades and replacements, strives to maintain and improve the efficient delivery and the high quality of water and sanitary sewer services to the community. This Division plays an integral role in maintaining the health, safety and well being of the community. The Water and Sewer Utilities are self-liquidating funds which must provide for their own revenues through fees, taxes and other charges to support the expenditures required to operate and maintain infrastructure into the future.

3.2 Collection System

The City of Salmon Arm's sanitary sewer collection system consists of 14 sewerage sub areas and 128 km of gravity and force main sanitary sewer pipes covering approximately 1800 hectares. There are approximately 5,350 sewer connections within the system serving close to 9,500 residents. There are eight tributary lift stations that collect and pump sewerage to the Lakeshore Sewer Interceptor located on the foreshore where the main lift station, Wharf Street Pump Station, pumps the sewerage directly to the WPCC (see Map 3.2). The Interceptor provides storage and flow equalization capabilities.

3.3 Lift Stations

All 8 of the tributary Lift stations are inspected once a week by the City of Salmon Arm's Utilities Division. Stations are monitored 24 hrs/day by a remote telemetry system which enables staff to troubleshoot and trend data on the Cities SCADA system.

Wastewater Facilities Table 2.1

No.	Wastewater Lift Stations & Facilities	Address
1	Water Pollution Control Centre	121 Narcisse Street NW
2	Mosquito Park Lift Station	4290 Canoe Beach Drive NE
3	Clare's Cove Lift Station	5391-75 Avenue NE
4	Tippy Canoe Lift Station	Pump in MH under road at 50th Street & 75th Avenue NE intersection
5	Captain's Cove Lift Station	2251-73 Avenue NE
6	Canoe Beach Lift Station	7720-36 Street NE
7	Wharf Street Pump Station	1000 Marine Park Drive NE
8	Rotten Row Lift Station	681-10 Avenue SW
9	10 Avenue SW Lift Station	2270-10 Avenue SW [TCH]

3.4 Wharf Street Pump Station

The Wharf Street Lift station is gravity fed by the Lakeshore Interceptor. Three 30 Hp pumps with Variable Speed Drives are used to feed the wastewater facility at rates determined by WPCC operators. The station was upgraded in 2002 with each pump rated at 80 liters/sec flow. The foul air is treated by the addition of ozone into the lift station itself. In the event of an extended power outage, there is the capability to connect a generator to the station to run the pumps.

Wharf Street Pump Station

3.5 Lift Station Repairs and Modifications

Two new 20 Hp Flygt pumps complete with a new kiosk, soft starts and controls were installed at the Rotten Row Lift Station.

3.6 Sanitary Flushing

The Utilities Division flushed approximately 25 km of sanitary mains in 2007 as part of their maintenance program. Certain areas and services of concern are flushed annually.

3.7 Inflow and Infiltration Monitoring Program

The program identifies locations where storm water or ground water enters the sanitary system. Currently the City has an on going contract with Geotivity to provide flow monitoring services to help determine the sources of Inflow and Infiltration (I&I) within the sewer system. Upon completion of the study a rehabilitation program will be initiated in an effort to reduce the amount of rainwater and groundwater entering the sanitary sewer system when it is cost-effective to do so. Reduction of I&I in the system lowers the risk of sanitary sewer overflows and can decrease the costs of conveying and treating wastewater.

3.8 Wastewater Collection System upgrading

3.8.1 Capital Projects completed in 2007

- Fall Fair grounds sanitary sewer upgrade
- McLeod Street upgrade
- Rotten Row Lift Station Upgrade
- Ongoing SCADA and GIS development

3.8.2 Capital projects budgeted for 2008

- 4 Avenue SE (3 Street SE – 400 Block)
- Canoe Beach Lift Station
- Lakeshore Road – west of 10 Avenue NE
- Rotten Row Lift Station – replace discharge connections
- Sewer Video Camera
- Tippy Canoe Lift Station Upgrade
- Industrial Park collection & treatment system design
- Ongoing SCADA and GIS development

4.0 Wastewater Treatment - Water Pollution Control Centre (WPCC)

The City of Salmon Arm WPCC is located at 121 Narcisse Street N.W. which is located west of the City's Town Centre adjacent to the Shuswap Lake.

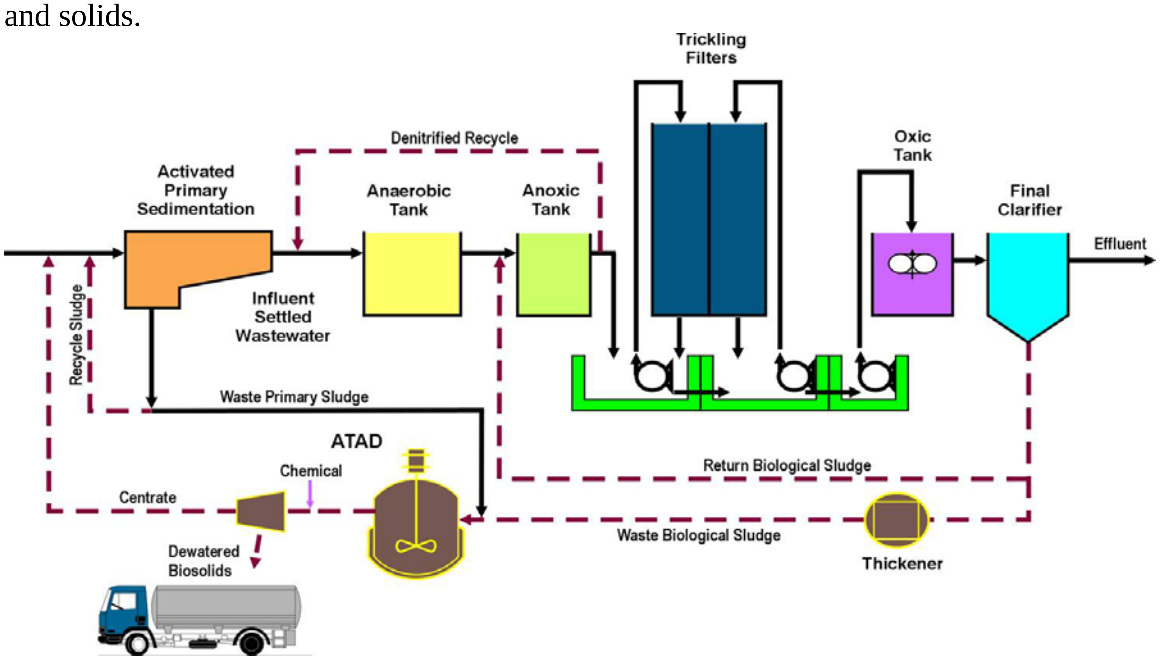
This section of the report will detail the performance and operational strategies of the plant during the past year.

WPCC

Location of Wharf Street Pump Station

4.1 Process Overview

The process of wastewater treatment can be separated into two flow streams – liquid and solids.



4.1 Process Overview (continued)

Initially the wastewater flows into the plant from a sewage lift station located at Marine Park Drive.

The influent then passes through several mechanical devices to remove large particles including rocks, rags, plastics and grit. This is done in the headwork's of the facility and prevents damage to downstream equipment.

Headworks

Primary Sedimentation Tanks

The flow then enters the Primary Sedimentation Tanks where heavier organic and inorganic solids are settled out of the liquid stream. These particles are then pumped to the ATAD for stabilization. The liquid, on the other hand, then enters the tertiary BNR SGR-FGR part of the facility for further treatment.

SGR's

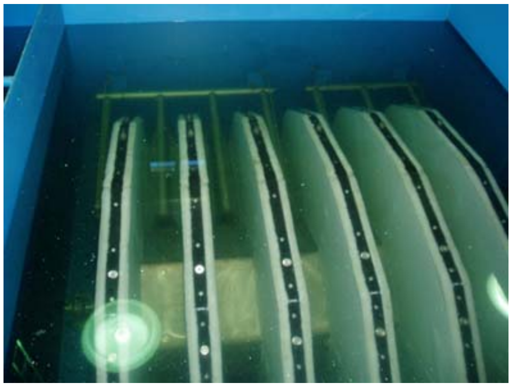
FGR

The tertiary treatment involves the use of bacteria to convert degradable organic matter into bacterial cells. These cells are then separated from the liquid in the secondary clarifiers.

4.1 Process Overview (continued)

The growth portion of the bacteria is removed from the process by thickening and

Secondary Clarifiers



Cloth Disk Filters

pumped to the ATAD while the remainder is recycled back to the incoming wastewater. This maintains a balance of food (wastewater organics) to micro organisms.

The secondary effluent then passes through a filter for polishing prior to Ultra Violet disinfection and discharge to the Salmon Arm Bay.

Solids are digested to form biosolids in the high temperature ATAD. This process uses high temperature bacteria (60 to 70 degrees Celsius) to stabilize and pasteurize the biosolids. Following processing, the biosolids are thickened with the use of high speed centrifuges and the biosolids are then incorporated with soil to produce a high quality top soil.

Centrifuge

ATAD

4.1 Process Overview (continued)

Odor control is another major component of the plant operation. The odor control has been separated into two trains based on the concentration of odor generating compounds. One train deals with a large air volume of low odor concentration while the second train deals with a low air volume with a high concentration of odor compounds. The latter system uses a multi treatment system – biofilter, ozone contact, four (4) stage chemical scrubber and dilution while the other system uses a single stage chemical scrubber.

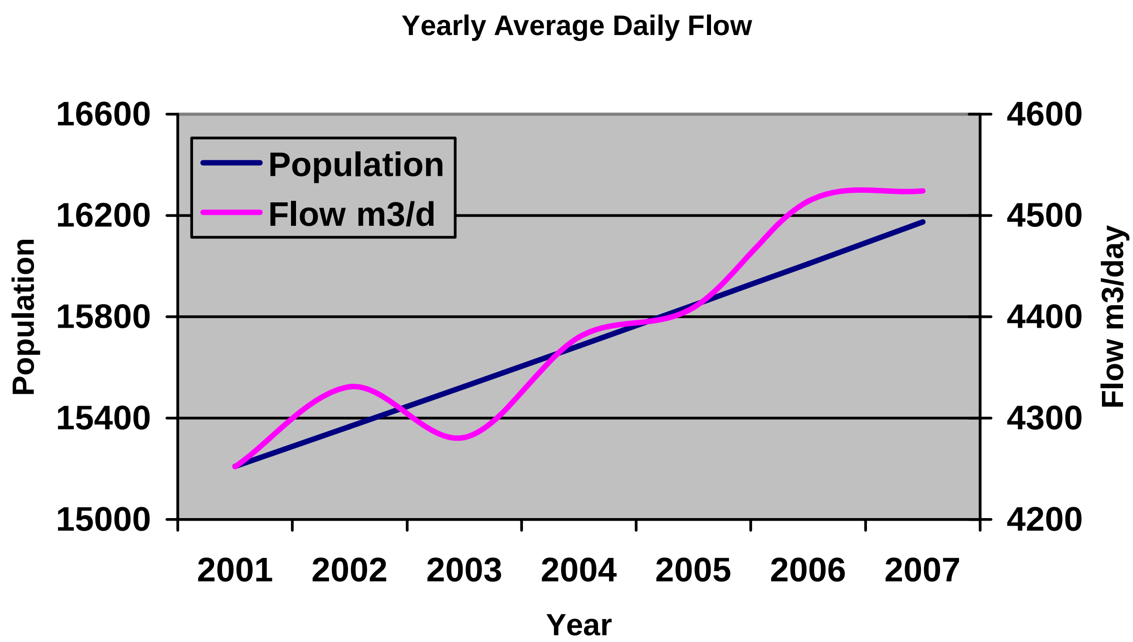
Single Stage Chemical Scrubber

ATAD & Piping

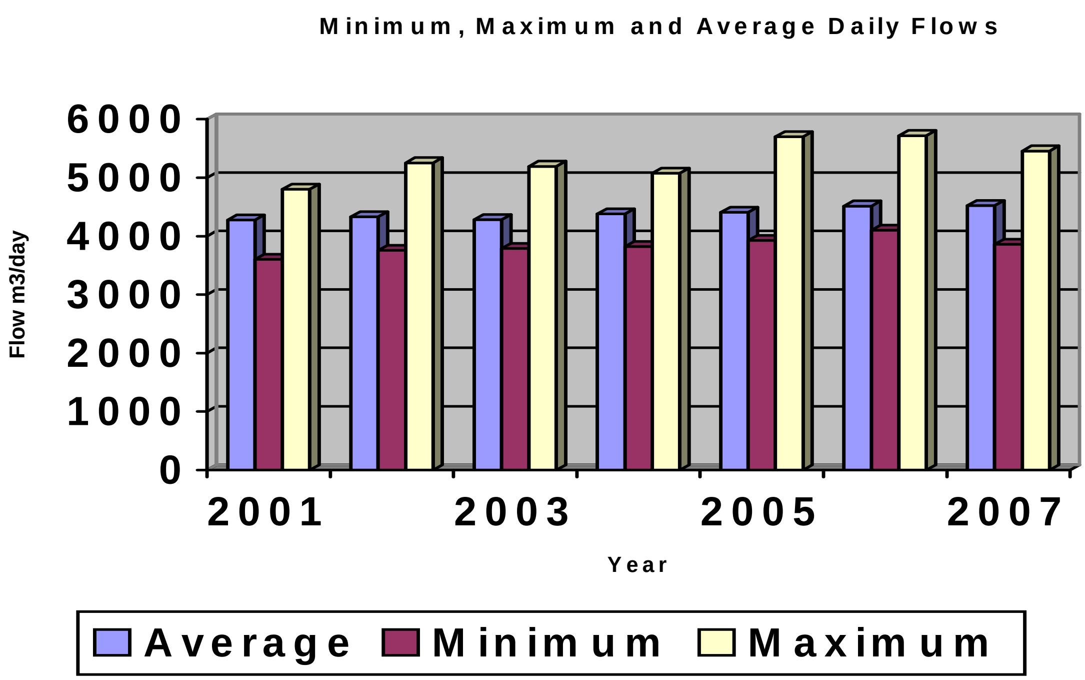
Acoustic Housing, Generator Set, Train B – Odor Control and Filtration Building

4.2 Flows

Plant flows averaged 4,524 m^3 (see graph 1, Flow 2007) for the year. The highest flow was recorded on March 5 when 4.3 mm of rainfall combined with snowmelt increased the 24-hour total influent flow to 5,456 m^3. This compares to the 2006 average flow of 4514 m^3 with a peak of 5720 m^3 on January 10, 2006 when 14.5 mm of rain fell and combined with normal snowmelt. Currently, the City Engineering Department is in the 4th year of a 5 year sanitary sewer inflow – infiltration study. There were no bypasses of the treatment process during the year. The outfall was visually inspected on January 13, 2007 and January 30, 2008 with no evidence of any failures.



* Population based on the 2001 and 2006 census, other years provided for equal growth



4.3 FGR Pilot Study

The study to assess the cross flow media utilized in the FGR was started in November 2005 and was completed in March of 2007. A pilot scale filter consisting of four types of media, existing cross flow, a similar vertical flow, a pallet style and an experimental suspended ribbon style, have been erected in quadrants in a tower next to the FGR. All four quadrants are suspended and have load cells attached to monitor on-line the weight of biomass accumulating and sloughing off of the media. In addition the quadrants are accessible by the operators for visual and analytical examination. The study ran for 387 days and it was determined the existing cross flow had the greatest variation of biomass accumulation and sloughing.

Pilot FGR Vertical back left, Sessil, Pallet right, Cross Flow unseen

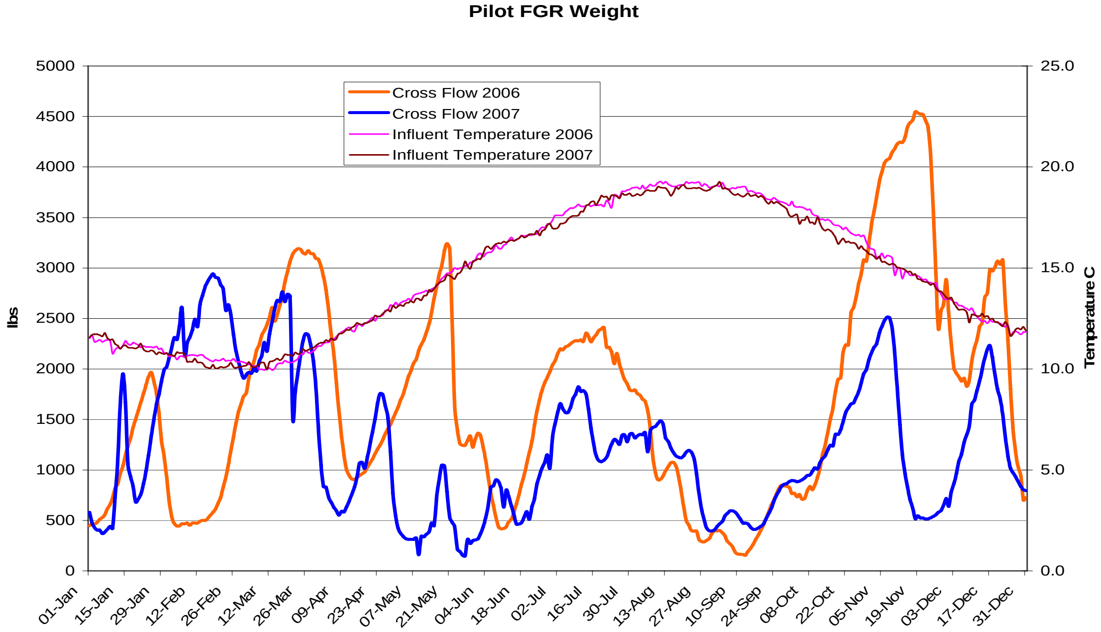
Although the study has been completed, it was determined additional information could be gained if the project was modified and continued. Operators removed the pallet style media and replaced it with more cross flow media resulting in two quadrants of cross flow. This allows for a control quadrant and a quadrant to experiment with by changing irrigation rates and timing. As well, the on-line monitoring allows the operators to make process changes and quantify the resulting changes in biomass in the pilot FGR.

Cross flow Media prior to sloughing

Cross Flow Media after sloughing

4.4 Process Alterations

Biomass stability in the FGR and SGR's is the key parameter to constant quality effluent. The biomass, or micro organisms (M), must be balance with the biodegradable organics (food or F) in the wastewater stream or the plant will produce effluent with poor settling characteristics, low F:M ratio, or excess organics in the effluent should the F:M be high. When the biomass accumulates in the FGR, little biomass recalculates through the SGR's to degrade the organic food. After some time, the biomass sloughs out of the FGR and enters the SGR's resulting in a low F:M.



FGR Pilot Weight

During the latter part of January 2007, the biomass (Mixed liquor Suspended Solids MLSS) began to accumulate in the FGR. This has been a typical occurrence in the cooler months of the year and is detrimental to effluent quality. In order to minimize the effect, 25% of the FGR was turned off to determine if the FGR was oversized for current loadings. The encouraging result was to reduce the average weight of biomass in the pilot FGR by 27% from 1,704 lbs in 2006 to 1,240 lbs in 2007 and maximum by 35 % from 4,550 lbs in 2006 to 2,940 lbs in 2007. During this time minimal changes to other process controls were made to fully assess this process alteration.

Oxic MLSS *mg/l*	2007	2006	2005	2004	2003	2002	2001
Average	4100	4400	5100	4700	3200	3500	3100
Maximum	7500	7000	7500	7100	4900	6600	5300
Minimum	100	2200	2100	2200	1100	1400	400

Oxic SGR MLSS Concentration Note: 2007 Oxic MLSS of 100 occurred in January

4.5 Nutrient Removal

Plant nutrient removal has met permit requirements for the year 2007. Total phosphorus loading was approximately 24.9 % of the permitted mass phosphorus loading while the final effluent Total Phosphorus 12 month moving average varied from a high of 0.46 mg/l to a low of 0.38 mg/l.

	2007	2006	2005	2004	2003	2002	2001	Permit
Flow m^3	4524	4514	4409	4380	4281	4331	4252	8200
Total Phosphorus *mg/l*	0.45	0.38	0.41	0.46	0.82	1.22	0.94	1.0
P per Day	2.04	1.72	1.81	2.01	3.51	5.28	4.0	8.2
Kg P per Year	745	626	660	736	1281	1927	1460	2993

Parameter (*mg/l*)	2007	2006	2005	2004	2003	2002	2001	Permit Limit
Suspended Solids	8.7	5.1	6.4	7.4	13.4	19.4	20.9	40
BOD_5	7.3	7.7	9.0	9.4	13.5	17.1	18.1	30
Total Phosphorus	0.45	0.38	0.41	0.46	0.82	1.22	0.94	1.0
Ortho Phosphorus	0.11	0.09	0.09	0.09	0.26	0.36	0.19	N/A
Ammonia	13.2	7.8	8.2	7.5	9.7	12.3	10.2	N/A
Nitrate & Nitrite	6.5	8.8	4.4	8.0	6.2	3.7	3.5	N/A
NH_4 NO_3 NO_2	19.6	16.6	12.6	15.5	15.9	16.0	13.7	N/A

Note: Final Effluent Filtration commenced in 2004

While several parameters are slightly higher in 2007, the focus was on controlling the FGR biomass accumulation which sacrificed the effluent quality minimally.

Effluent Quality Table

Test Data	S.S. mg/l	BOD mg/l	Ortho P Mg/l	Total P mg/l	NH4 mg/l	NOx mg/l	Oxic MLSS mg/l
January 4, 2007	4.4	4.8	0.06	0.49	6.2	8.7	6381
January 11, 2007	3.9	7.2	0.06	0.34	5.7	8.9	5699
January 18, 2007	3.7	5.2	0.06	0.29	4.1	8.7	5233
January 25, 2007	3.1	5.7	0.05	0.28	8.2	5.2	3611
February 2, 2007	16.4	8.4	0.71	1.55	1.7	1.6	490
February 8, 2007	11.2	12.0	0.51	1.34	29.0	0.4	1204
February 15, 2007	20.5	7.8	0.13	0.54	22.0	0.0	3032
February 22, 2007	15.4	7.2	0.17	0.62	14.9	4.4	5844
March 1, 2007	12.6	9.9	0.15	0.60	5.7	7.5	5877
March 8, 2007	3.7	6.5	0.06	0.26	9.6	7.5	5803
March 15, 2007	4.9	6.6	0.05	0.22	15.6	4.1	3261
March 24, 2007	5.3	5.4	0.06	0.25	19.4	0.2	3783
March 29, 2007	9.2	12.6	0.08	0.46	10.0	9.7	6151
April 5, 2007	6.3	6.3	0.04	0.23	6.8	10.2	5897
April 12, 2007	8.0	9.6	0.08	0.27	11.4	6.7	5523
April 19, 2007	10.4	7.8	0.07	0.34	23.2	0.8	3647
April 26, 2007	21.0	11.4	0.08	0.50	24.0	6.3	6486
May 3, 2007	10.3	6.6	0.05	0.32	10.4	11.0	4598
May 10, 2007	7.7	6.9	0.07	0.46	4.2	9.6	3695
May 17, 2007	9.8	7.2	0.05	0.31	24.0	4.1	2155
May 24, 2007	10.7	12.9	0.04	0.44	7.2	8.2	5086
May 31, 2007	6.7	8.1	0.03	0.29	7.4	11.3	3162
June 8, 2007	5.5	8.1	0.03	0.26	20.6	6.6	1972
June 13, 2007	3.4	9.6	0.02	0.28	5.0	12.3	3594
June 21, 2007	5.7	7.8	0.09	0.33	7.2	7.7	2382
June 28, 2007	14.1	5.4	0.75	1.51	16.1	2.6	1311
July 4, 2007	12.6	11.1	0.05	0.49	7.0	6.7	4797
July 12, 2007	4.9	7.2	0.05	0.31	12.0	3.1	3646
July 19, 2007	7.2	8.7	0.08	0.40	10.6	7.4	3956
July 26, 2007	4.1	5.7	0.06	0.28	12.0	5.4	3587
August 2, 2007	5.7	7.8	0.10	0.41	10.6	4.4	4407
August 9, 2007	7.6	7.2	0.24	0.65	20.6	2.7	3371
August 16, 2007	11.6	5.4	0.09	0.51	20.6	3.2	4706
August 23, 2007	7.9	5.7	0.04	0.27	21.6	1.6	4170
August 30, 2007	10.2	11.4	0.03	0.31	12.0	5.5	5337
September 6, 2007	6.9	7.5	0.03	0.19	16.1	4.4	4751
September 13, 2007	7.3	N/A	0.05	0.37	9.0	6.8	5565
September 20, 2007	1.2	N/A	0.03	0.26	9.7	10.2	4874
September 27, 2007	9.6	N/A	0.12	0.30	6.4	8.9	3460
October 4, 2007	8.8	N/A	0.1	0.40	9.7	5.7	3980
October 11, 2007	8.4	N/A	0.07	0.46	10.6	8.9	3682
October 18, 2007	9.3	8.3	0.39	1.06	30.1	6.4	2972
October 25, 2007	9.6	6.2	0.06	0.57	9.0	10.1	3747
November 1, 2007	11.0	6.3	0.07	0.37	12.5	5.3	3872
November 8, 2007	14.2	8.2	0.18	0.78	14.8	7.2	4284
November 19, 2007	14.4	4.4	0.03	0.43	9.3	10.6	5154
November 22, 2007	11	4.3	0.04	0.27	9.7	10.4	4992
November 29, 2007	5.6	4.4	0.02	0.31	10.2	10.4	4601
December 6, 2007	4.5	6.0	0.03	0.22	19.0	5.3	3218
December 13, 2007	5.9	6.3	0.03	0.24	25.5	3.8	2249
December 20, 2007	15.3	4.8	0.03	0.50	24.4	6.0	5755
December 27, 2007	4.8	0.5	0.03	0.27	11.5	11.5	5605
Average	**8.7**	**7.3**	**0.11**	**0.45**	**13.2**	**6.5**	**4166**
Maximum	**21.0**	**12.9**	**0.75**	**1.55**	**30.1**	**12.3**	**6486**
Minimum	**1.2**	**0.5**	**0.02**	**0.19**	**1.7**	**0.0**	**490**

4.6 Fecal Coliform

There were 25 fecal coliform tests conducted in 2007. Following the programming change in January 2007, 22 of the 23 the tests were lower than the 200 MPN.

One bank of UV bulbs was replaced in the summer of 2007 as part of the normal maintenance.

4.7 Toxicity

The annual toxicity test was completed on January 10, 2007 by Cantest Ltd. and once again there were no mortalities.

4.8 Biosolids

The Class A biosolids are being utilized by Blackburn Excavating Ltd., 2270 Trans Canada Hwy S.W., Salmon Arm, B.C., to produce biosolids growing medium (topsoil) in accordance with Organic Matter Recycling Regulation (OMRR). CARO Environmental Services conducted tests on the biosolids for nutrients and metals on September 5, 2007. Fecal Coliform tests on the Auto Thermophilic Aerobic Digester (ATAD) biosolids were also conducted on this date and once again the fecal coliform levels were well below OMRR limits.

Approximately 7,115 m^3 of ATAD biosolids (average 3.6% solids) was dewatered in 2007 producing 985 wet tonnes (average 26.0% solids).

4.9 Operating Certificate

The Municipal Liquid Waste Management Plan was completed in 2004 and received Ministerial Approval in early 2005 and a new Operation Certificate for effluent discharge is in progress of being updated.

4.10 Wastewater Collection System upgrading

4.10.1 WPCC Capital Projects - 2007

Projects completed in 2007 include:

- Replacement of level indicator in Waste Biological Sludge Tank
- Replacement of obsolete on-line MLSS probe
- Purchase and implementation of maintenance software
- FGR Pilot Study

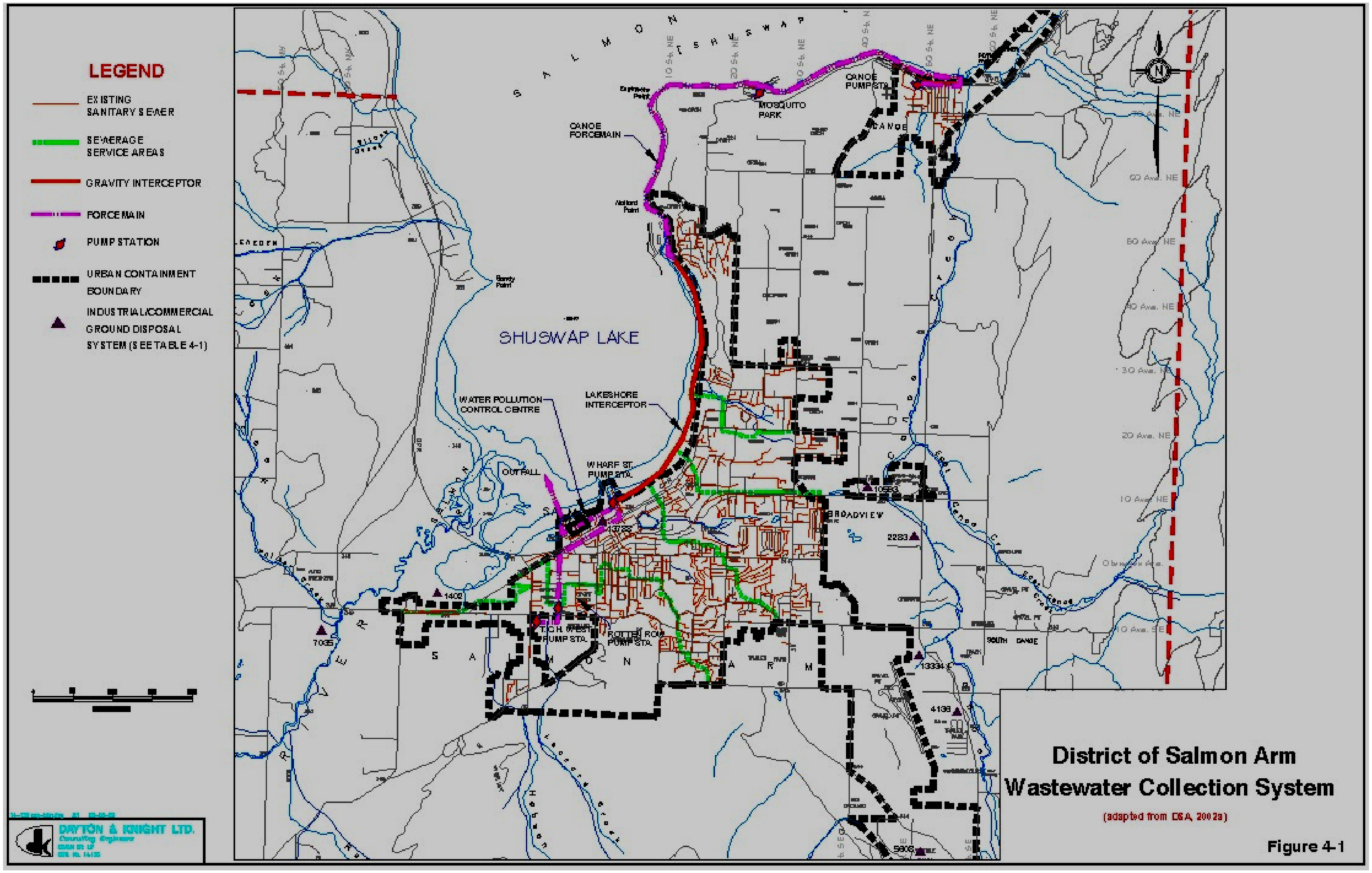
4.10.2 WPCC Capital Projects Budgeted for 2008

Optimizing the current systems and equipment will continue in 2008.

Use of the facility for 2 research programs in conjunction with process engineers Dayton & Knight Ltd, UBC Department of Environmental Engineers and Ostara Nutrient Recovery Technologies Inc. The first project consists of analyzing the odor constituents produced by the ATAD at various temperatures and retention times. This project was the Masters Thesis of UBC Engineering student, Bonita Parsons and will be completed in early 2008. The second project is to determine the economic viability of phosphorus recovery/recycling. This project should be completed by the summer of 2008. Both these projects will directly benefit the City, first by potentially improving the odor removal and second with possibility of beneficial removal of phosphorous from the environment.

- A grant application under Green Municipal Fund - New Energy Project was filed to assist the City in financing a water reclamation facility for effluent water recycling to be used for some in-house services at the plant as well as irrigation of lands in the treatment plant compound. The financial return on capital costs is estimated to be 3 years. This project is anticipated to be completed in 2008.
- Stage IIIB will be completed in 2008 with landscaping, architectural building aesthetics and laboratory and administration expansion.
- Completion of hand railing installation Biofilter Tower
- Replacement of obsolete laboratory instruments
- Replacement of Hypochlorite Metering Pumps
- Replacement of inefficient lighting utilizing BC Hydro's Power Smart Product Incentive Program

APPENDIX


LEGEND
EXISTING SANITARY SEWER
SEWERAGE SERVICE AREAS
GRAVITY INTERCEPTOR
FORCEMAIN
PUMP STATION
URBAN CONTAINMENT BOUNDARY
INDUSTRIAL/COMMERCIAL GROUND DISPOSAL SYSTEM (SEE TABLE 4-1)
SHUSWAP LAKE
CANOE FORCEMAIN
MOSQUITO PARK
CANOE PUMP STN.
CANOE
WATER POLLUTION CONTROL CENTRE
LAKESHORE INTERCEPTOR
OUTFALL
WHARF ST. PUMP STN.
BROADVIEW
T.C.H. WEST PUMP STA.
ROTTEN ROW PUMP STA.
SALMON ARM
1402
7035
10583
2263
13334
4136
5808
DAYTON & KNIGHT LTD.
District of Salmon Arm
Wastewater Collection System
(adapted from DSA, 2002a)
Figure 4-1