Lyall Harbour – Boot Cove Water System

2018 Annual Report

CRD | Drinking Water

Introduction

This report provides a summary of the Lyall Harbour – Boot Cove Water Service for the year 2018. This report includes a description of the service, summary of the water supply, demand and production, drinking water quality, operations highlights, capital project updates and financial report.

Service Description

The community of Lyall Harbour Boot Cove is primarily a rural residential development with some community and commercial properties located on Saturna Island in the Southern Gulf Islands Electoral Area which was originally serviced by a private water utility and in 1978 the service converted to the Capital Regional District. The Lyall Harbour Boot Cove water service is made up of 174 parcels (Figure 1) encompassing a total area of approximately 100 hectares. Of the 174 parcels, 149 properties are connected to the water system.

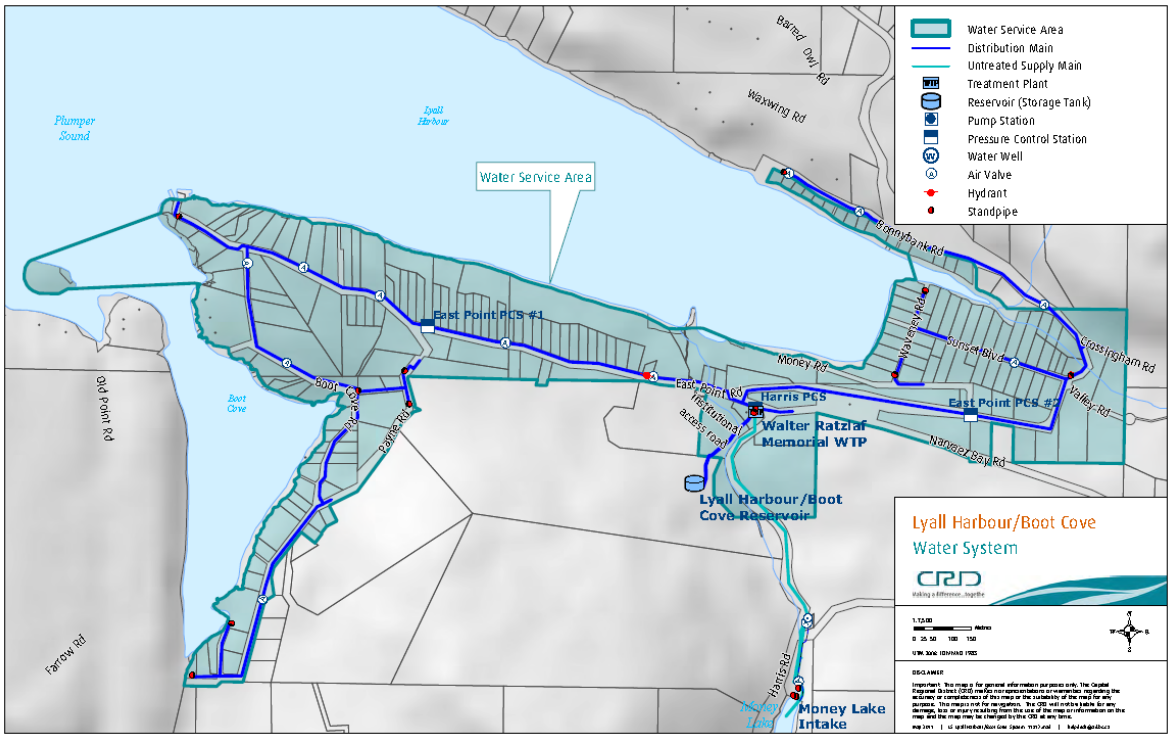

Figure 1: Map of Lyall Harbour/Boot Cove Water System

The Lyall Harbour Boot Cove water system is primarily comprised of:

- Raw water is obtained from:
  - Money Lake, a small, impounded, surface water body that lies within a 94 hectare (230 acre) watershed on private land.
  - Ground water spring (seepage pit) located near the base of Money Lake Dam.
- One earthen dam structure, Money Lake Dam No. 1.
- Treatment equipment including ozonation (currently offline), two stages of filtration (granular and adsorption), ultraviolet light disinfection and chlorine disinfection.
- One steel storage tank (total volume 136 cubic metres or 36,000 USGAL).
- Supervisory Control and Data Acquisition (SCADA) system.
- Distribution system and supply pipe network (8,390 metres of water mains).
- Other water system assets: 149 service connections and meters, three pressure reducing valve stations, 50 gate valves, 12 standpipes and a small auxiliary generator.

Water Supply

Referring to Figure 2 below, Money Lake surface water supply monthly water levels are highlighted for 2018. Water supply levels for the year are within historical limits. It is important to note that water supply levels in Money Lake, prior to 2008, were historically lower during the summer period. An upgrade to mitigate the low water levels involved the installation of a groundwater seepage spring recirculation pumping system. Excess water from the seepage spring is pumped back to Money Lake in order to keep the Lake as full as possible. The groundwater seepage spring water level is not monitored; however the seepage spring weekly flow rate is monitored to confirm production rate. The seepage spring typically provides 100% of the winter water system demand for the community.

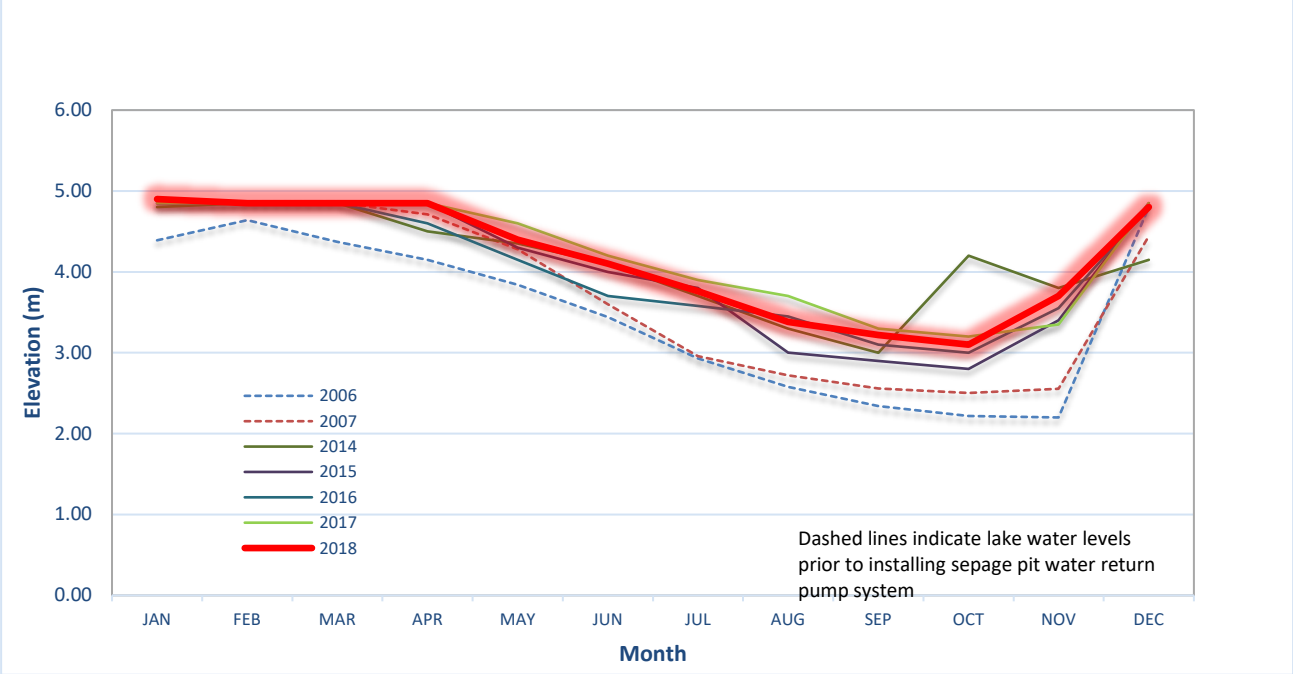

Figure 2: Lyall Harbour/Boot Cove - Money Lake Monthly Water Level

Water Production and Demand

Referring to Figure 3, 26,535 cubic meters of water was extracted (water production) from the seepage spring and Money Lake Reservoir in 2018; virtually no change from the previous year and 11% increase from the 5 five year average. Water demand (customer water billing) for the service totaled 17,052 cubic meters of water; a 2% increase from the previous year and virtually equal to the five year average.

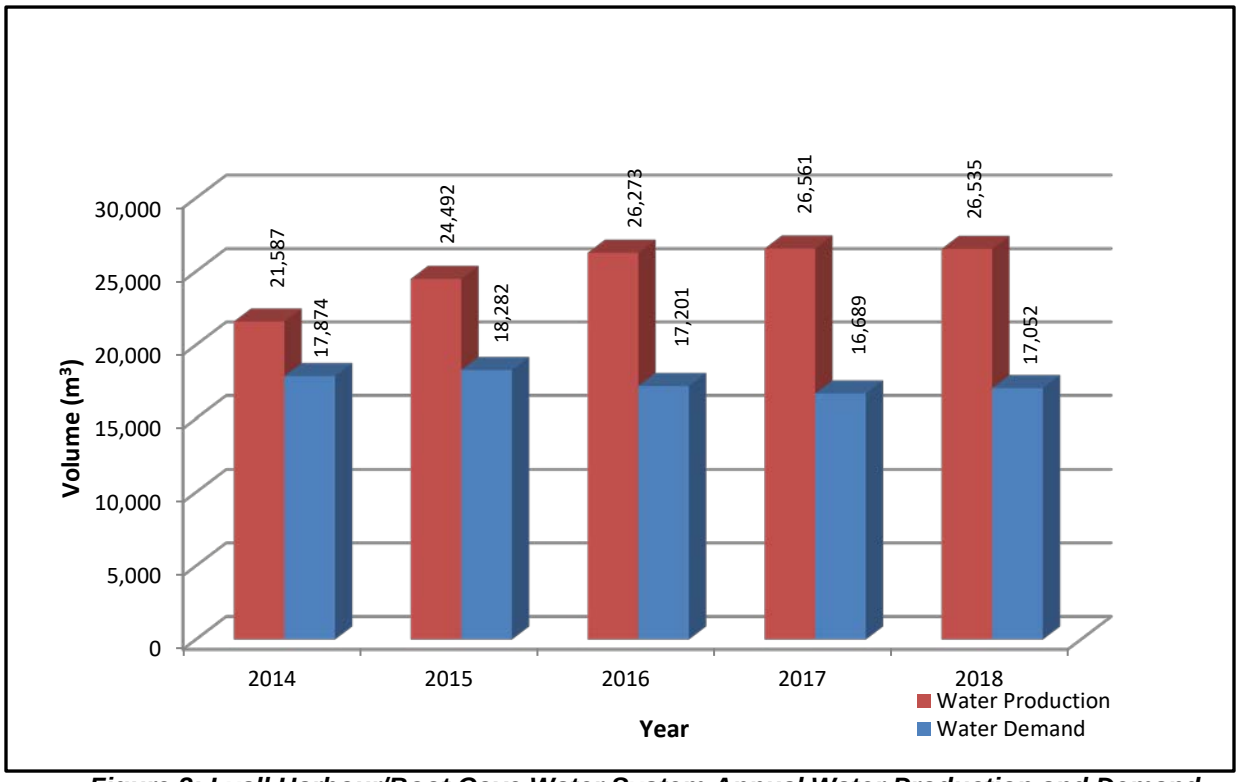

Figure 3: Lyall Harbour/Boot Cove Water System Annual Water Production and Demand.

The difference between annual water production and annual customer demand is referred to as non-revenue water and can include water system leaks, water system maintenance and operational use (e.g. water main flushing, filter system backwashing), potential unauthorized use and fire-fighting use. As previously noted, operational water use increased beginning in 2013 when the new water treatment plant became operational.

The 2018 non-revenue water represents about 36% of the total water production for the service area. However, almost 20% of the non-revenue water can be attributed to operational use which includes a significant volume of water flushed from the system in order to keep chlorine residuals at acceptable levels at the extremities of the water system and filtration system backwashing activities. Therefore, the non-revenue water associated with system losses is approximately 16% which is considered typical for most water systems the size of Lyall Harbour/Boot Cove.

Figure 4 below illustrates the monthly water production for 2018 along with the historical water production information. The monthly water production trends are typical for small water systems such as the Lyall Harbour/Boot Cove water system. Water production during the last quarter of 2017 and the first half of 2018 is higher than average and is the result of:

- Water system leaks that were identified and subsequently repaired.

- An increase in water system flushing activities at the extremities in order to maintain minimum free chlorine residuals.

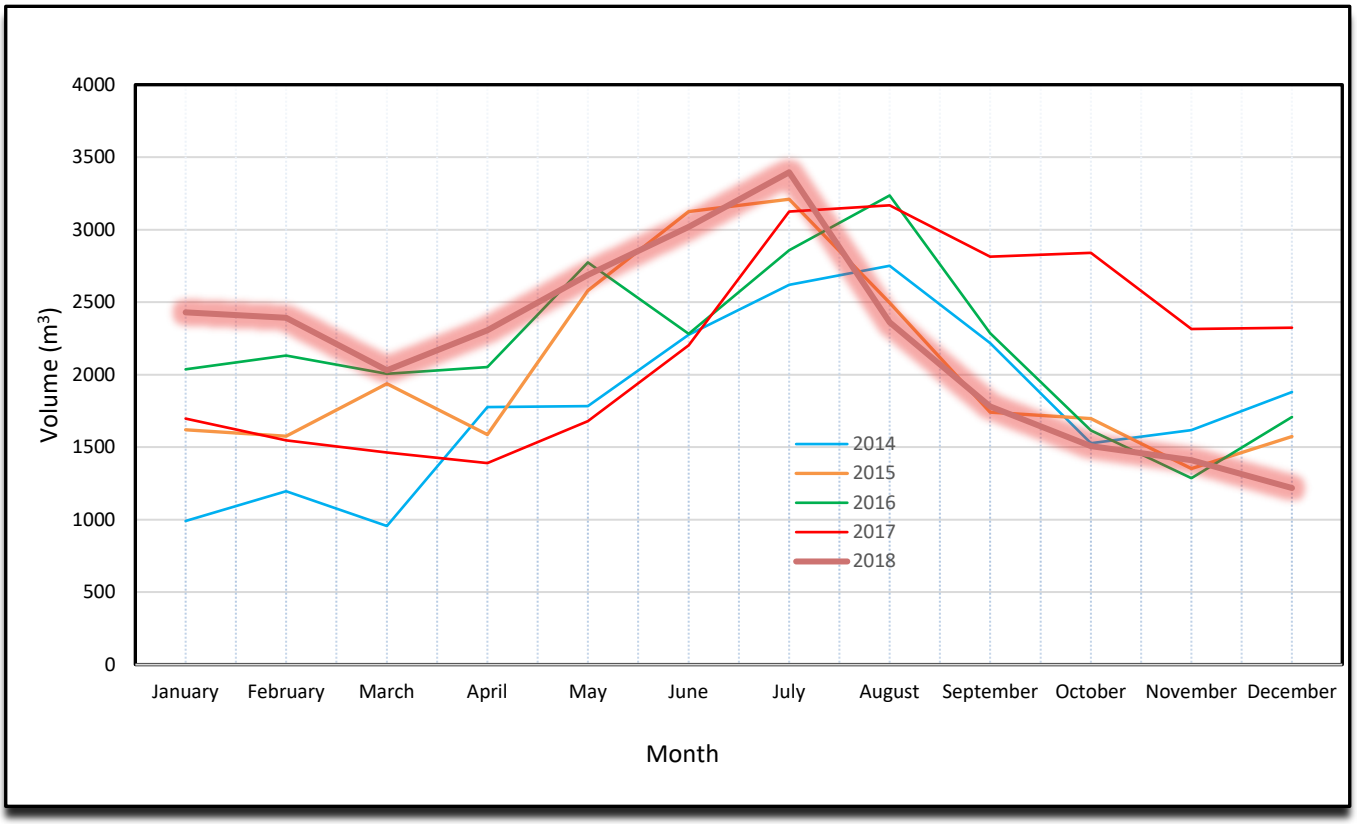

Figure 4: Lyall Harbour/Boot Cove Water Service Monthly Water Production.

Drinking Water Quality

The Lyall Harbour / Boot Cove Water System uses predominantly seepage water collected from below the Money Lake dam as the primary raw water source. During the summer months this source is supplemented with flows from Money Lake. During late summer and early fall 2018, almost all source water was supplied by Money Lake only as the seepage water collection system ran almost completely dry.

The Lyall Harbour / Boot Cove Water System had a challenging year in 2018 with several parameter exceedances associated with the potential for public health risks. Both disinfection by-products Trihalomethanes – THM and Haloacetic Acids – HAA were in exceedance of the maximum acceptable concentration (MAC) in the Guidelines for Canadian Drinking Water Quality (GCDWQ). The health risk from these disinfection by-products over the MAC is from chronic exposure over many years. The high organic content entering the plant was insufficiently reduced with the existing treatment system and therefore the primary cause for the elevated THM concentrations. CRD staff are developing strategies to increase the efficiency of the treatment system in terms of organic compound removal. Regular flushing of the dead end pipe sections during the low flow periods could also reduce the risk of disinfection by-product exceedances.

Between February 17 and March 1, 2018, the entire water system was under a Boil Water Advisory due to a system depressurization as a result of a pipe break in the water treatment plant.

In August and especially September, iron and manganese concentrations in the raw water were very high caused by natural lake turnover effects in Money Lake. This led to high concentrations of iron in the treated water entering the distribution system with the result of yellow-brown discoloured drinking water at the customer taps. On September 25, 2018, a Public Service Announcement was issued to notify the customers of the potential for discoloured water. Iron exceedances are an aesthetic issue, not a health related issue.

On October 16, 2018, a Boil Water Advisory was issued for the entire water system as turbidity levels at the post-filtration stage in the treatment plant exceeded 1 NTU. The existing treatment plant was unable to reduce the raw water turbidity sufficiently to ensure adequate water disinfection. This situation lasted well into 2019 and led to a number of improvements and modifications to the existing treatment system.

The Lyall Harbour Boot Cove Water System was operated in 2018 without the ozone treatment stage except for a short period in December in an attempt to improve the treated water turbidity. The ozone treatment system was taken offline due to worker health and safety concerns with the existing design.

The data below provides a summary of the water quality characteristics in 2018:

Raw Water:

- The raw water exhibited overall low concentrations of total coliform bacteria, with higher concentrations during the summer and fall months when lake water was the primary water source. Consistently throughout the year, the raw water entering the treatment plant contained either none or only very low concentrations of *E. coli* bacteria.
- The raw water turbidity ranged from 0.9 to 13 NTU. The median annual raw water turbidity was slightly lower than last year with 1.68 NTU.
- In one parasite sample from May 23, 2018, a low concentration of *Cryptosporidium* oocysts was detected (2/100L).
- The raw water had naturally high concentrations of iron and manganese especially during the late summer/fall season. Elevated iron and manganese concentrations in Money Lake can be compounded by the ground passage of the seepage water.
- The raw water was slightly hard (median hardness 40.4 mg/L $CaCO_3$).
- The natural total organic carbon in the source water is relatively high (median 5.42 mg/L).

Treated Water:

- Outside the periods with a Boil Water Advisory, the treated water was bacteriologically safe to drink. Only 2 samples tested positive for total coliform bacteria during the course of the year. In each case, immediately collected resamples did not confirm any actual water contamination. No sample tested positive for *E.coli* bacteria.
- The treated water turbidity (cloudiness) was usually under the *GCDWQ* turbidity limit of 1.0 NTU with a few short-term peaks slightly exceeding this limit between January and April. These short term spikes are likely related to rain and runoff events that impacted the seepage water quality.

Between June 19 and July 2nd, the treated water turbidity was consistently at or slightly over 1 NTU. From October 14 until the end of the year the treated water turbidity was consistently well over 1 NTU which was the reason for the Boil Water Advisory during that period.

- The treated water total organic carbon (TOC) was high with an annual mean of 4.67 mg/L. There is currently no guideline in the GCDWQ for TOC levels, however TOC levels > 2 mg/L indicate a potential for disinfection by-product exceedances. TOC levels > 4 mg/L are usually a precursor for high disinfection by-product concentrations.
- Only one out of four tests was below the maximum acceptable concentration (MAC: 100 µg/L) for the disinfection by-product THM. Three other test results were well over the limit (150 - 280 µg/L). The annual average THM concentration was well above the limit (170 µg/L). Half of the HAA disinfection by-product results were above the MAC of 80 µg/L. The annual average HAA concentration was also above the limit (99 µg/L).
- The pH of the treated water was consistently below the aesthetic objective range of pH 7 to 10.5 as per GCDWQ (annual median pH 6.90).
- The treated water had iron concentrations in exceedance of the aesthetic objective from middle of August to November 2018. The highest iron concentration was recorded on August 25 with 1,650 µg/L compared to an aesthetic objective of <300 µg/L in the GCDWQ. Elevated iron concentrations are not a health concern but can lead to discolouration of the drinking water which can be a nuisance for the customers.

Water quality data collected from this drinking water system can be reviewed on the CRD website:

https://www.crd.bc.ca/about/data/drinking-water-quality-reports

Operational Highlights

The following is a summary of the major operational issues that were addressed by CRD Integrated Water Services staff:

- Water tank repairs as a result of tree damage due to storm event.
- Emergency water treatment plant system leak repair.
- Emergency response related to issuing of Boil Water Advisories.
- Emergency water leak detection response.
- Water treatment plant filter media replacement.
- Water treatment plant chlorine residual analyzer piping modifications.
- December 20th storm event emergency response.

Capital Project Updates

The Capital Projects that were completed in 2018 included:

1. Dam Safety Improvements – Toe Berm Phase 1 – the 2012 Dam safety review recommended a number of improvements, which have been spread out over several years. This project included the design of phase 1 which is the installation of a gravel toe berm on the downstream side of the dam. Construction is planned to commence in 2019

2. Cover Recirculation Pipe – The existing recirculation pipe was covered to protect from UV exposure due to sunlight.
3. Building and Site Improvements – The upper treatment building's roof was replaced and the erosion control was improved at the inlet culvert to catchment manhole.

Financial Report

Please refer to the attached 2018 Financial Summary Statement of Operations. Revenue includes parcel taxes (*Transfers from Government*), fixed user fees (*User Charges*), interest on savings (*Interest Earnings),* a transfer from the maintenance reserve account, and miscellaneous revenue such as late payment charges (*Other Revenue*).

Expenses includes all costs of providing the service. *General Government Services* includes budget preparation, financial management, utility billing and risk management services. *CRD Labour and Operating Costs* includes CRD staff time as well as the costs of equipment, tools and vehicles. *Debt servicing costs* are interest and principal payments on long term debt. *Other Expenses* includes all other costs to administer and operate the water system, including insurance, supplies, water testing and electricity.

The difference between *Revenue* and *Expenses* is reported as *Net Revenue (expenses)*. Any transfers to or from capital or reserve accounts for the service (*Transfers to Own Funds*) are deducted from this amount and it is then added to any surplus or deficit carry forward from the prior year, yielding an *Accumulated Surplus* (or deficit) that is carried forward to the following year.

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Attachment: 2018 Financial Summary Statement of Operations

CAPITAL REGIONAL DISTRICT

Lyall Harbour Boot Cove WATER
Statement of Operations (Unaudited)
For the Year Ended December 31, 2018

	2018	2017
Revenue		
Transfers from government	110,310	110,310
User Charges	94,490	85,791
Fees and Charges	349	2,174
Other revenue from own sources:		
Interest earnings	-	113
Other revenue	754	105
Reimbursement for insurance claim	116,270	-
Trf Operating reserve	8,630	-
Total revenue	330,803	198,493
Expenses		
General government services	7,890	7,430
CRD Labour and Operating costs	212,882	123,415
Debt Servicing Costs	40,019	40,005
Other expenses	91,282	22,793
Total expenses	352,074	193,643
Net revenue (expenses)	(21,271)	4,850
Transfers to own funds:		
Capital Reserve Fund	-	3,350
Maintenance Reserve Fund	1,800	1,500
Annual surplus (deficit)	(23,071)	(0)
Accumulated deficit, beginning of year	-	-
Accumulated deficit, end of year	$ (23,071)	(0)

CAPITAL REGIONAL DISTRICT

Lyall Harbour Boot Cove WATER
Statement of Reserve Balances (Unaudited)
For the Year Ended December 31, 2018

	Capital Reserve 2018	2017
Beginning Balance	43,753	98,662
Transfer from Operating Budget	-	3,350
Transfers from completed capital projects	4,039	17,500
Interest Income	609	742
Transfer to Capital Projects	(42,378)	(76,500)
Ending Balance	6,024	43,753

	Operating Reserve 2018	2017
Beginning Balance	6,646	5,003
Transfer from Operating Budget	1,800	1,500
Interest Income	184	144
Transfer to Operating Budget	(8,630)	-
Ending Balance	1	6,646