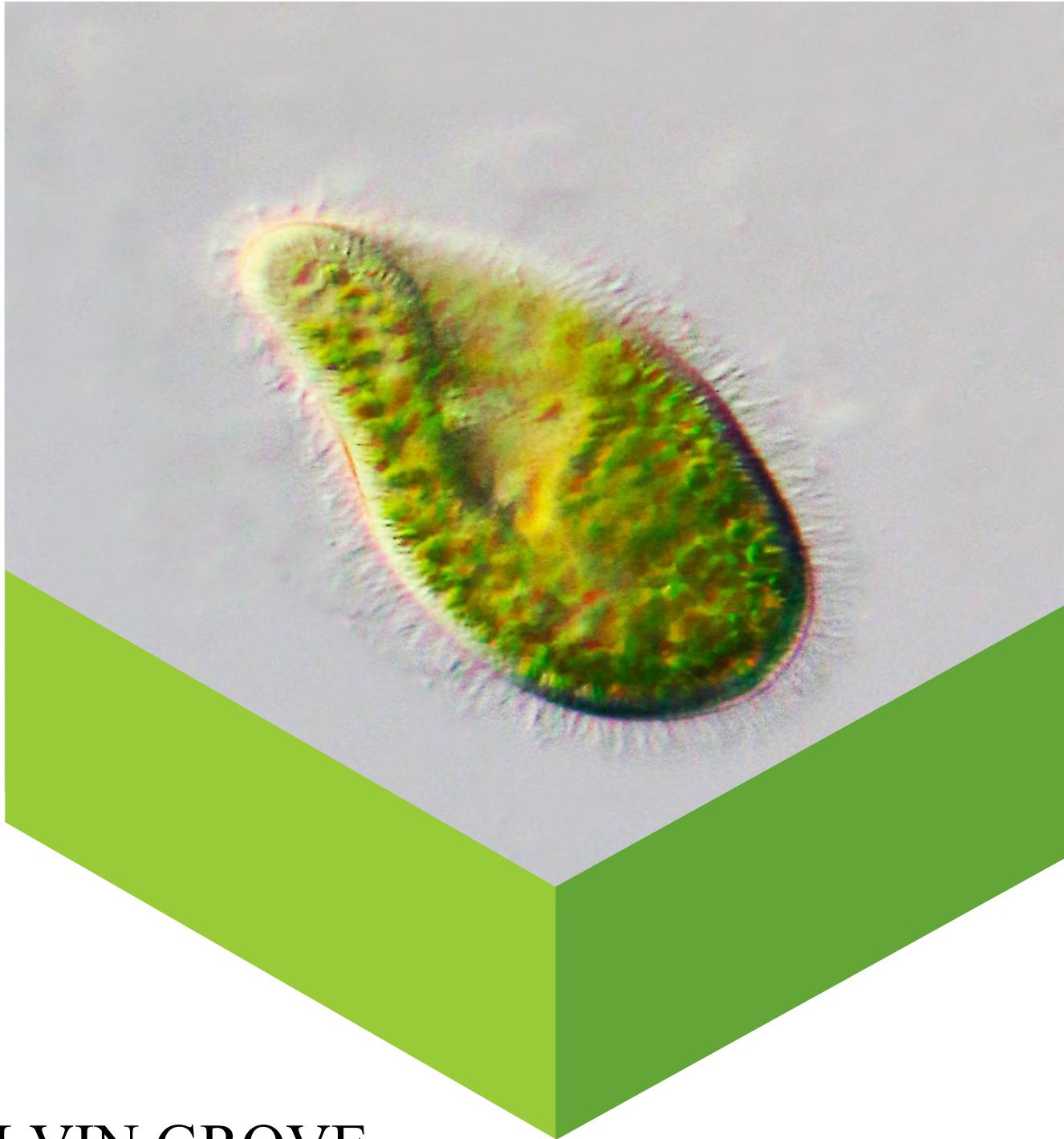


— THE VILLAGE OF LIONS BAY



KELVIN GROVE

Wastewater Treatment Plant

2022 ANNUAL REPORT

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Introduction

The upper and lower Kelvin Grove neighbourhoods in the Village of Lions Bay are serviced by a sanitary sewer network that culminates in a wastewater treatment plant (WWTP) that was constructed in 2019 on the waterfront of Howe Sound, at the Kelvin Grove Beach Park. Eighty-six residential lots are connected to the WWTP through a network of 2,173 meters of 200mm PVC sanitary sewer pipes, manholes, and property connections or service laterals. A map of this sanitary sewer system is shown in Appendix 1.

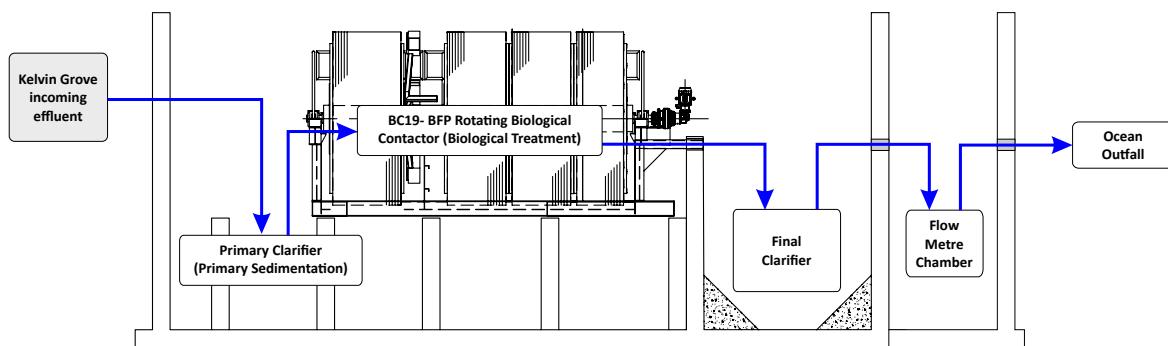
TREATMENT AND MICROBIOLOGY

The Kelvin Grove WWTP is a fixed film rotating biological contactor treatment process that consists of three distinct process phases:

- ◆ Primary Clarification;
- ◆ Biological Treatment; and
- ◆ Final Clarification.

Upon passing through each of these phases, the treated wastewater then passes through a flow meter and is released into Howe Sound via an ocean outfall pipe 85 meters beyond the high tide mark and at a depth of 60 metres.

Figure 1 - Treatment Process



The wastewater treatment process is dependent upon the presence and activity of the microorganisms within the wastewater and treatment plant. This microbial ecology is a complex combination of interrelationships among bacteria, protozoa, and metazoa with the organic contents of the wastewater. Microorganisms use this organic content as a carbon source for respiration, energy generation, and biomass production. Once the organic content of wastewater is depleted, microorganisms form floc and settle out of the wastewater stream as sludge.

PRIMARY CLARIFICATION

Wastewater enters the primary clarifier where suspended solids are removed by gravity sedimentation under quiescent conditions. The settled solids form a sludge blanket at the bottom of the clarifier. The primary clarifier also provides for effective removal of grit, debris, and fats,

oils, or grease (dubbed ‘FOG’) prior to the supernatant’s entry into the biological treatment phase.

Continual input of raw wastewater into the primary clarifier and gravity settlement results in a thickening of the sludge blanket over time. Sludge blanket depth is a crucial component to the proper functioning of the treatment system, so much so that at excessive sludge blanket depths (greater than 30 cm) the sludge may turn septic, which depletes oxygen levels that ultimately inhibits healthy biomass growth which thereby decreases treatment efficiency.

BIOLOGICAL TREATMENT

From the primary clarifier, the supernatant with its colloidal and dissolved organic matter is further cleansed by biological treatment which is accomplished by a rotating biological contactor (RBC) treatment system. The Kelvin Grove WWTP utilizes the BC19-BFP™ system which consists of multiple large-diameter corrugated discs constructed of high-density polyethylene (HDPE). These disks are bundled closely together and are mounted in series along a horizontal shaft which is rotated by an electric motor at a rate of 1.5 to 1.6 revolutions per minute. The rotating discs alternately expose the media packs to wastewater and air. Microfauna within the wastewater affix themselves to the discs creating a biofilm over the entire surface area of the media. The corrugations on the media disks are designed to give extra surface area per unit volume to each disc thereby increasing the biofilms’ ability to metabolize and treat the organic materials contained in the wastewater. This permits high degrees of treatment to be achieved for relatively short wastewater retention times.

From start to finish, the wastewater flows through the RBC’s stages or bioreactors by simple displacement and gravity. As wastewater passes through the system, it undergoes a progressively increasing degree of treatment by specific biological cultures in each stage, which are adapted to the changing wastewater.

When the supernatant from the primary clarifier first enters the RBC module, it encounters the first set of disks. This is the stage where the highest biological activity occurs and where biofilm accumulations are the greatest since the organic loading is highest. As the biofilm thickens, it

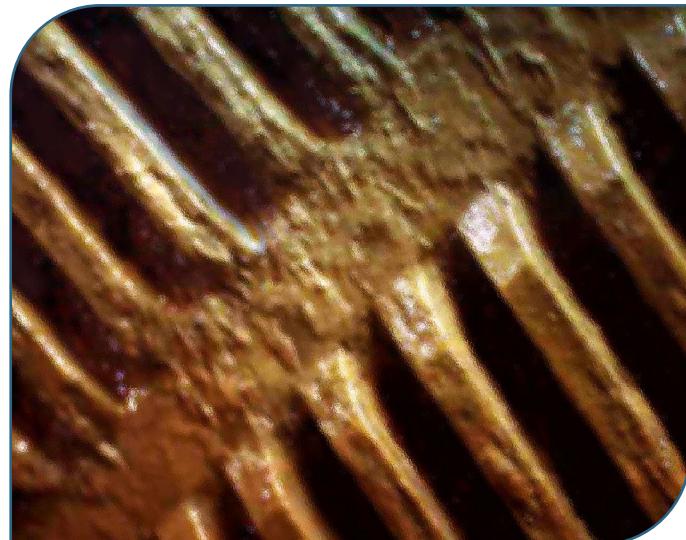
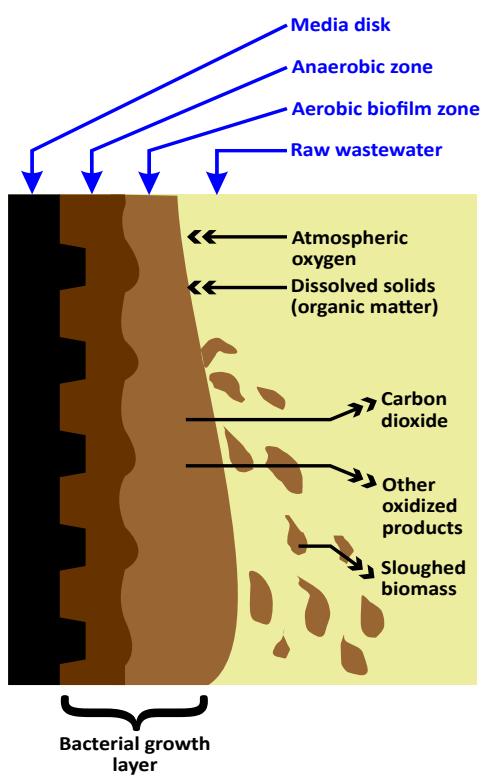


Photo: Initial biofilm growth on RBC media.

develops into two layers: an active (aerobic) and an inactive (anaerobic) layer. By and large organics within the wastewater are transformed into biomass in the aerobic layer.

Biofilm growth increases on the media disks until it reaches a tipping point with the continual drag caused by the media packs rotation generating shearing forces that causes excess biomass to slough off into the supernatant [Figure 2]. Rotation of the media also provides turbulence at the interface between biomass and wastewater so that dissolved oxygen and wastewater nutrients to the biomass through the mechanism of mixing and that of diffusion. This continual rotation also serves to keep the sloughed material in suspension through the progressive stages and into the secondary clarifier.

Figure 2- Cross Section at RBC



Microfauna in the Initial stages are almost entirely constituted by species of ciliates and filamentous and non-filamentous bacteria. As the wastewater passes through subsequent stages, it undergoes a progressively increasing degree of treatment by specific microfauna in each stage. The decreasing concentration of organic matter leads to the appearance of higher life forms including nitrifying bacteria, along with various types of protozoans, rotifers, and other predators.

In a well-functioning unit with the appropriate feed rate, nutrient loading, microfauna, and media rotation rates, the RBC will emit an earthy, humus-like ("musty") smell inside the unit. A substantial sour or "sewage" smell is indicative of suboptimal conditions.

SECONDARY CLARIFICATION

Once through the fourth stage of the RBC, the treated wastewater enters the secondary clarifier. The large aggregates of biomass sloughed off the media packs retain their high density and settle rapidly in the secondary clarifier. At this point in the process the effluent is relatively clear and colourless and free of suspended matter. Sludge from the primary and secondary clarifiers is removed periodically throughout the year and transferred to the Iona Island wastewater treatment plant in Richmond where it undergoes further treatment.

KELVIN GROVE WWTP OPERATING PERMIT

The authority to discharge wastewater into the waters of Howe Sound is governed by the provincial *Environmental Management Act*. The Kelvin Grove WWTP operates under permit number 5188 (the “Permit”) which regulates the quantity and quality of the plant’s discharge.

Table 1. Permit Discharge Parameters

Parameter	Permit Value
Volume (m ³ /day)	340
BOD ₅ (mg/L)	45
TSS (mg/L)	60

Water Quality

Reporting requirements consist of quarterly sampling of treated wastewater for five-day biochemical oxygen demand (BOD₅) and total suspended solids (TSS) as well as the submission of an annual report to the Ministry of the Environment each January.

Discharge Volumes

Daily flows have been increasing year over year; however, the number of homes connected to the system has remained constant at 86 – in 2023 there are 3 new lots being developed that will eventually connect to the system. Table 2 presents the year-over-year metrics for the last 4 years and clearly indicates flows are increasing:

Table 2: Year over year metrics for the Kelvin Grove Wastewater Treatment Plant

	2019	2020	2021*	2022
Average Daily Flow (L/s)	72,215	81,312	100,529	116,569
Total Annual Flow (L)	26,360,580	29,762,090	30,560,696	42,430,917
Max Daily Flow (L/Day)	204,571	202,999	525,035	455,018
Min Daily Flow (L/Day)	5,845	8,158	1,894	0

* flow results for January and February are averages¹

In 2022, the maximum daily discharge was 455,018 L/day which equates to 455 m³/day and occurred during a major storm event beginning in December as the next table shows:

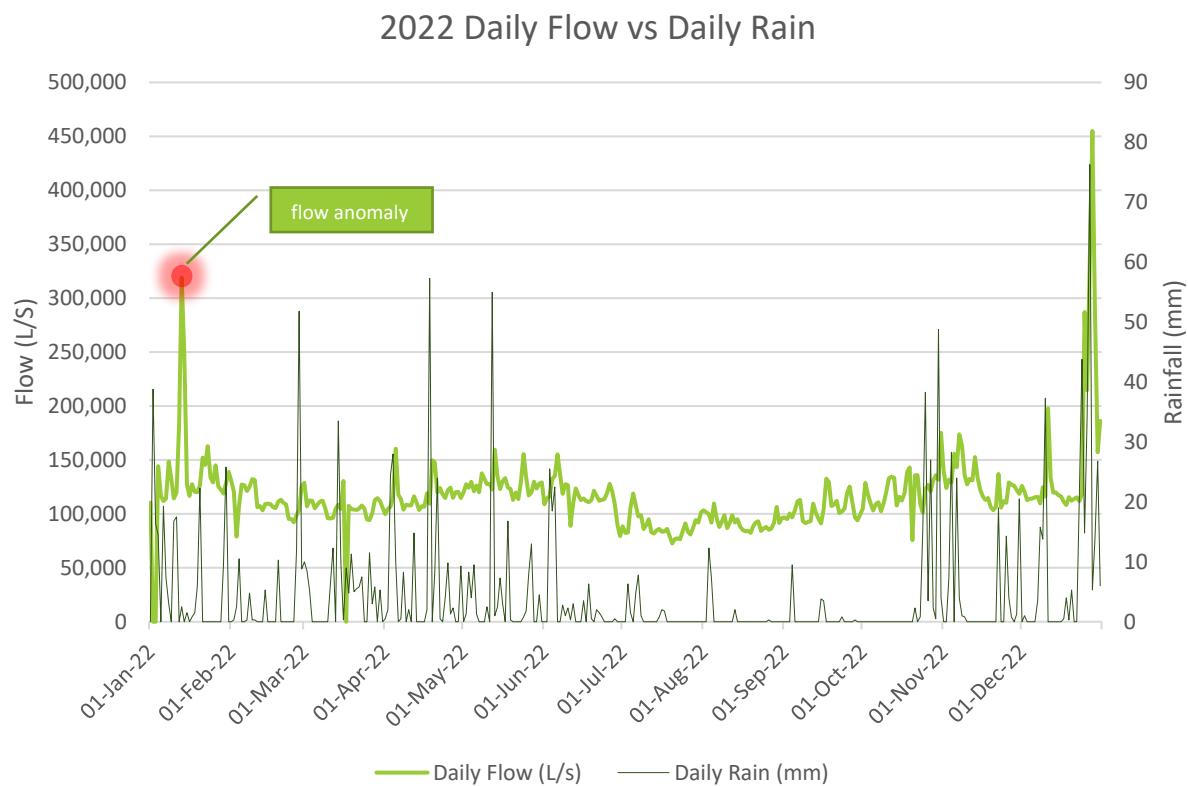
¹ Though the new RBC plant was commissioned in early January of 2021, SCADA functionality was not enabled until March of 2021, therefore, the data results referred to in this report only contain real-time flows for 10 of the 12 months in 2021. Estimated flows during the first two months of the year were anticipated to be between 65m³/day to 85m³/day in accordance with our reporting during the replacement of the old plant.

Table 3: Winter Storm Event Leading to Discharge Exceedance

Date	Daily Flow (L*)	Daily Rainfall (mm)
2022-12-22	115,253.65	0.00
2022-12-23	111,701.17	20.50
2022-12-24	118,088.05	43.80
2022-12-25	287,022.28	14.80
2022-12-26	214,704.23	34.00
2022-12-27	337,537.34	76.30
2022-12-28	455,018.03	5.30
2022-12-29	287,321.81	13.80
2022-12-30	157,157.72	26.80
2022-12-31	186,158.53	6.00

*Note: 1 m³ is equal to 1,000 L

As you can see from Table 3, rainfall lags slightly behind discharge flows and as rainfall totals increase, discharge volumes increase clearly implying inflow and inundation within the system. This would explain the year-over-year increases in flow totals. There is one anomaly on within the data and that occurred on January 13, 2022, where flows increased dramatically without a corresponding rainfall event. Staff are unsure as to the cause of this occurrence. Daily flow totals are listed in Appendix 2.



Effluent Parameters

In accordance with the Permit, the Municipality samples effluent discharge from the treatment plant on a quarterly basis. The sampling data is presented in Table 4 below and indicates that the values for Total Suspended Solids (TSS) and five-day Biological Oxygen Demand (BOD₅) were within the parameters set by Permit:

Table 4: 2022 Quarterly Sampling Results for TSS and BOD5

Client Sample ID	KG WWTP Plant (Plant Discharge)			
Date Sampled	14-Apr-2022	17-Jun-2022	23-Sep-2022	29-Dec-2022
Time Sampled	11:00	11:00	11:00	11:50
ALS Sample ID	VA22A7905-001	VA22B3737-001	VA22C2922-001	VA22D1065-001
Analyte Sub-Matrix	Water	Water	Water	Water
TSS (Max 60 mg/L)	26.7	17.6	11.9	8
BOD ₅ (Max 45 mg/L)	17	13.7	8.2	6.4

Routine Maintenance

In accordance with the Permit, regular inspection and maintenance activities are conducted to keep the facility in good working order. Biweekly inspections are performed to check for vandalism, damage to the media disks, misalignment or excessive shaft deflection, motor torque loading (excessive heat), and for clogging of weirs or orifice areas. At the time of inspection, greased fittings and bearings are lubricated.

Sludge removal for the new plant occurs regularly and is based upon test results and visual inspection of the sludge level in the primary clarifier. Municipal staff's experience with the new system continues to grow and currently, sludge removal occurs on a quarterly basis. During sludge removal, any fog or other materials present on the surface of the effluent in the primary clarifier is removed via suction truck.

In August of 2022, the Kelvin Grove sewer system was subject to smoke testing and the results identified several system leaks on private and public lands. Letters were sent to homeowners advising them of leaks on the private side of the sewer laterals and municipal staff are working on addressing defects on the public side of the sewer laterals.

Upcoming Work Program

In addition to regular operations and maintenance of the plant, staff have submitted a budget request to CCTV the sewer system in 2023. This request will be reviewed by Council during the 2023 budget process.

Facility Classification and Operator Certification

The Kelvin Grove WWTP has been evaluated as a Small Wastewater System (Lagoon) by the Environmental Operators Certification Program Society (EOCP). In 2022, the Municipality's certified operator resigned and an operator in training is preparing to write the EOCP exam and obtain certification in 2023 which will bring us back into compliance.

Appendix 1 – Sanitary Sewer System Diagram



Appendix 2 – Daily Flow Monitoring Logs

Date	Daily Flow (L/day)	Max Flow (L/s)	Min Flow (L/s)	Max Temp (°C)	Min Temp (°C)	Daily Rain (mm)
01-Jan-22	110,490	3.01	0.03	9.73	9.51	0.00
02-Jan-22	-	0.00	0.00	0.00	0.00	38.80
03-Jan-22	-	0.00	0.00	0.00	0.00	16.30
04-Jan-22	144,211	2.77	0.09	9.84	9.56	14.50
05-Jan-22	116,647	1.98	0.05	9.91	9.77	0.00
06-Jan-22	111,892	1.91	0.01	9.93	9.56	19.30
07-Jan-22	114,174	2.49	0.05	9.66	9.43	7.30
08-Jan-22	148,614	2.60	0.12	9.73	9.41	3.00
09-Jan-22	132,673	2.29	0.05	9.66	9.39	0.00
10-Jan-22	114,347	1.96	0.05	10.07	9.65	16.80
11-Jan-22	119,763	2.87	0.05	10.16	9.97	17.50
12-Jan-22	182,825	4.01	0.16	10.25	9.91	0.00
13-Jan-22	318,862	6.90	0.27	9.94	8.47	2.50
14-Jan-22	249,857	9.84	0.29	8.83	8.37	0.00
15-Jan-22	127,295	2.05	0.12	9.60	8.82	1.50
16-Jan-22	116,611	1.99	0.07	10.20	9.59	0.00
17-Jan-22	127,524	3.31	0.06	10.70	10.19	0.80
18-Jan-22	120,458	2.05	0.07	10.97	10.67	1.50
19-Jan-22	120,085	1.92	0.08	11.14	10.96	6.00
20-Jan-22	126,361	2.79	0.08	11.13	10.98	22.30
21-Jan-22	152,077	3.19	0.19	11.24	11.01	0.00
22-Jan-22	145,504	2.98	0.13	11.13	10.89	0.00
23-Jan-22	162,766	3.23	0.20	10.89	10.47	0.00
24-Jan-22	133,786	2.82	0.10	10.61	10.37	0.00
25-Jan-22	129,176	2.49	0.10	10.74	10.49	0.00
26-Jan-22	145,042	3.68	0.10	10.67	10.42	0.00
27-Jan-22	125,441	2.31	0.10	10.74	10.42	0.00
28-Jan-22	122,499	2.43	0.08	10.61	10.42	0.00
29-Jan-22	118,881	2.20	0.08	10.56	10.37	9.30
30-Jan-22	128,063	2.13	0.09	10.56	10.37	25.80
31-Jan-22	138,893	3.51	0.10	10.76	10.49	0.00
01-Feb-22	130,570	2.43	0.10	10.81	10.63	0.00
02-Feb-22	120,651	2.19	0.10	10.76	10.42	0.30
03-Feb-22	79,046	2.08	0.01	10.45	9.77	2.50
04-Feb-22	108,257	2.52	0.06	10.20	9.77	10.50
05-Feb-22	127,158	2.64	0.09	10.68	10.17	0.00

Date	Daily Flow (L/day)	Max Flow (L/s)	Min Flow (L/s)	Max Temp (°C)	Min Temp (°C)	Daily Rain (mm)
06-Feb-22	126,642	2.26	0.10	10.81	10.65	0.00
07-Feb-22	121,254	2.39	0.08	10.92	10.73	0.30
08-Feb-22	124,958	2.06	0.09	11.14	10.88	4.80
09-Feb-22	132,187	3.17	0.09	11.22	11.07	0.30
10-Feb-22	131,290	2.20	0.16	11.22	10.96	0.30
11-Feb-22	106,332	7.76	0.06	11.38	10.96	0.00
12-Feb-22	107,265	1.79	0.05	11.64	11.37	0.00
13-Feb-22	103,313	1.79	0.05	11.64	11.27	0.00
14-Feb-22	109,048	1.92	0.05	11.64	11.40	5.30
15-Feb-22	109,593	1.91	0.07	11.87	11.52	0.00
16-Feb-22	108,867	1.92	0.06	11.96	11.86	0.00
17-Feb-22	106,320	1.82	0.06	12.09	11.91	0.00
18-Feb-22	105,432	1.79	0.06	12.16	11.96	0.00
19-Feb-22	111,520	1.91	0.07	12.27	12.14	10.30
20-Feb-22	113,031	2.04	0.00	12.22	12.04	0.00
21-Feb-22	110,207	1.93	0.06	12.16	11.91	0.00
22-Feb-22	108,688	1.88	0.07	12.03	11.57	0.00
23-Feb-22	95,312	1.73	0.05	11.66	10.82	0.00
24-Feb-22	95,244	1.85	0.00	10.94	10.55	0.00
25-Feb-22	92,193	1.84	0.05	10.74	10.55	0.00
26-Feb-22	98,731	1.83	0.06	10.83	10.62	12.00
27-Feb-22	103,590	2.84	0.05	10.81	10.60	51.80
28-Feb-22	125,989	3.72	0.06	11.12	10.76	8.80
01-Mar-22	128,707	2.57	0.11	11.12	10.96	10.00
02-Mar-22	106,992	2.43	0.04	11.40	10.96	8.50
03-Mar-22	112,522	2.40	0.05	11.53	11.37	5.30
04-Mar-22	112,104	3.43	0.04	11.71	11.52	0.00
05-Mar-22	105,257	1.81	0.05	11.84	11.68	0.00
06-Mar-22	108,422	3.72	0.04	11.87	11.63	0.00
07-Mar-22	111,416	2.60	0.05	12.04	11.79	0.00
08-Mar-22	112,272	2.16	0.05	12.09	11.88	0.00
09-Mar-22	105,427	1.88	0.05	12.17	12.01	0.00
10-Mar-22	96,045	1.68	0.05	12.22	11.79	0.00
11-Mar-22	95,741	1.68	0.05	11.91	11.57	6.50
12-Mar-22	96,347	1.67	0.05	11.71	11.52	12.30
13-Mar-22	104,713	1.93	0.03	11.64	11.47	0.00
14-Mar-22	108,380	1.98	0.05	11.91	11.57	33.50
15-Mar-22	104,709	2.02	0.04	12.02	11.88	9.80

Date	Daily Flow (L/day)	Max Flow (L/s)	Min Flow (L/s)	Max Temp (°C)	Min Temp (°C)	Daily Rain (mm)
16-Mar-22	130,386	3.23	0.09	12.02	11.70	0.30
17-Mar-22	-	0.00	0.00	0.00	0.00	9.00
18-Mar-22	107,472	2.12	0.08	11.84	11.57	4.80
19-Mar-22	104,342	1.79	0.07	11.73	11.57	11.30
20-Mar-22	104,054	1.78	0.06	11.84	11.68	5.00
21-Mar-22	103,559	2.17	0.05	11.82	11.57	5.50
22-Mar-22	104,941	1.90	0.07	11.84	11.57	5.80
23-Mar-22	107,767	2.15	0.06	12.16	11.70	7.50
24-Mar-22	104,977	2.71	0.00	12.43	12.14	0.00
25-Mar-22	94,893	1.55	0.06	12.43	12.04	0.00
26-Mar-22	94,321	1.68	0.00	12.30	12.09	11.50
27-Mar-22	100,429	1.90	0.06	12.41	12.27	3.00
28-Mar-22	112,684	2.08	0.07	12.69	12.40	5.80
29-Mar-22	114,536	2.37	0.08	12.88	12.66	0.00
30-Mar-22	111,823	2.63	0.07	12.94	12.74	5.30
31-Mar-22	105,721	2.00	0.07	12.99	12.78	0.00
01-Apr-22	99,746	1.72	0.07	12.99	12.74	0.50
02-Apr-22	104,456	2.73	0.08	12.94	12.78	2.00
03-Apr-22	106,684	2.35	0.06	12.94	12.78	24.50
04-Apr-22	115,577	2.94	0.06	13.07	12.91	28.00
05-Apr-22	160,390	3.51	0.14	13.10	11.81	9.80
06-Apr-22	117,647	2.63	0.09	12.03	11.81	0.00
07-Apr-22	113,899	2.29	0.03	12.27	12.01	0.50
08-Apr-22	103,933	1.81	0.07	12.67	12.22	8.30
09-Apr-22	108,556	2.07	0.06	12.88	12.53	0.00
10-Apr-22	107,906	2.20	0.00	12.61	12.30	2.00
11-Apr-22	107,984	2.74	0.00	12.61	12.32	0.00
12-Apr-22	116,266	2.43	0.00	12.88	12.51	14.80
13-Apr-22	110,588	2.20	0.00	12.97	12.80	0.00
14-Apr-22	103,586	1.94	0.00	12.94	12.77	0.00
15-Apr-22	107,098	2.02	0.00	12.99	12.84	0.00
16-Apr-22	106,754	2.30	0.00	13.07	12.91	0.00
17-Apr-22	119,016	2.63	0.00	13.12	12.89	2.00
18-Apr-22	109,350	2.20	0.00	13.35	13.09	57.30
19-Apr-22	149,752	3.82	0.07	13.39	13.09	0.00
20-Apr-22	147,858	3.07	0.14	13.10	12.34	8.30
21-Apr-22	119,904	2.61	0.00	12.81	12.39	24.00
22-Apr-22	123,854	2.61	0.00	12.99	12.80	0.50

Date	Daily Flow (L/day)	Max Flow (L/s)	Min Flow (L/s)	Max Temp (°C)	Min Temp (°C)	Daily Rain (mm)
23-Apr-22	118,048	2.28	0.07	13.23	12.96	0.00
24-Apr-22	114,737	2.17	0.00	13.35	13.11	4.00
25-Apr-22	122,170	2.51	0.00	13.64	13.34	9.80
26-Apr-22	124,436	2.49	0.00	13.77	13.63	1.30
27-Apr-22	114,826	2.21	0.00	13.82	13.68	2.30
28-Apr-22	120,183	2.35	0.00	13.75	13.56	0.00
29-Apr-22	120,312	2.79	0.00	13.79	13.61	0.00
30-Apr-22	114,749	2.08	0.00	13.90	13.68	9.30
01-May-22	120,245	2.35	0.00	14.20	13.87	0.00
02-May-22	127,414	3.13	0.00	14.26	14.13	1.30
03-May-22	124,280	2.99	0.00	14.54	14.19	8.30
04-May-22	129,641	2.53	0.00	14.60	14.41	4.00
05-May-22	120,923	2.00	0.00	14.51	14.33	9.50
06-May-22	126,340	2.07	0.00	14.41	14.26	1.30
07-May-22	120,113	1.97	0.00	14.31	14.13	0.00
08-May-22	137,530	2.66	0.00	14.31	13.99	0.00
09-May-22	132,494	2.35	0.00	14.34	14.13	0.00
10-May-22	127,596	2.63	0.00	14.47	14.28	2.50
11-May-22	127,758	2.37	0.00	14.52	14.38	0.00
12-May-22	122,578	1.99	0.00	14.67	14.41	55.00
13-May-22	159,593	3.74	0.12	14.65	14.08	1.00
14-May-22	134,357	2.34	0.16	14.08	13.63	2.50
15-May-22	123,087	2.41	0.09	0.00	13.74	7.30
16-May-22	130,267	2.66	0.13	14.51	14.08	3.00
17-May-22	133,074	2.80	0.00	14.69	14.46	0.00
18-May-22	124,356	2.08	0.00	14.72	14.51	16.80
19-May-22	123,234	2.08	0.00	14.69	14.33	0.30
20-May-22	112,969	1.85	0.00	14.47	14.33	0.00
21-May-22	119,737	2.70	0.00	14.74	14.46	0.00
22-May-22	113,615	1.88	0.00	14.90	14.71	0.00
23-May-22	129,292	3.18	0.00	15.03	14.84	0.00
24-May-22	155,369	3.81	0.00	14.99	14.71	0.80
25-May-22	133,786	3.29	0.00	14.88	14.71	1.80
26-May-22	117,050	2.80	0.00	15.32	14.84	8.00
27-May-22	119,740	2.94	0.00	15.59	15.29	13.00
28-May-22	129,890	2.50	0.00	15.68	15.54	0.00
29-May-22	123,458	2.66	0.00	15.77	15.59	0.00
30-May-22	128,063	2.82	0.00	15.98	15.74	4.50

Date	Daily Flow (L/day)	Max Flow (L/s)	Min Flow (L/s)	Max Temp (°C)	Min Temp (°C)	Daily Rain (mm)
31-May-22	129,183	2.81	0.00	16.06	15.95	0.00
01-Jun-22	108,938	1.89	0.00	16.19	15.98	0.00
02-Jun-22	114,452	2.07	0.00	16.27	16.19	0.00
03-Jun-22	116,238	2.16	0.00	16.50	16.26	25.50
04-Jun-22	132,396	3.66	0.00	16.65	16.49	18.50
05-Jun-22	134,997	2.72	0.15	16.58	16.19	22.50
06-Jun-22	155,247	3.19	0.00	16.31	15.88	0.00
07-Jun-22	136,395	2.75	0.00	16.01	15.83	0.00
08-Jun-22	118,554	2.16	0.00	16.07	15.88	2.80
09-Jun-22	127,546	2.58	0.00	16.19	16.06	1.00
10-Jun-22	126,587	3.14	0.00	16.27	16.11	2.30
11-Jun-22	88,969	1.88	0.00	16.19	15.93	0.30
12-Jun-22	109,925	1.80	0.02	16.40	16.13	3.00
13-Jun-22	123,599	3.02	0.15	16.49	16.32	0.00
14-Jun-22	117,653	2.58	0.05	16.53	16.28	0.00
15-Jun-22	112,826	2.59	0.05	16.61	16.32	0.00
16-Jun-22	114,295	2.43	0.07	16.78	16.59	3.50
17-Jun-22	111,860	2.43	0.05	16.78	16.68	0.00
18-Jun-22	110,932	1.93	0.06	16.92	16.76	6.30
19-Jun-22	112,788	2.28	0.06	17.09	16.89	0.50
20-Jun-22	121,471	2.15	0.07	17.09	16.96	0.00
21-Jun-22	116,794	1.90	0.08	17.19	17.06	2.00
22-Jun-22	112,234	1.91	0.06	17.33	17.16	1.50
23-Jun-22	112,963	1.91	0.06	17.41	17.29	0.80
24-Jun-22	113,614	1.90	0.06	17.43	17.22	0.00
25-Jun-22	119,267	2.77	0.06	17.52	17.32	0.00
26-Jun-22	127,797	2.06	0.09	17.51	17.32	0.00
27-Jun-22	120,752	2.67	0.02	17.82	17.48	0.00
28-Jun-22	109,046	2.01	0.02	18.07	17.74	0.50
29-Jun-22	89,547	1.91	0.00	18.22	18.04	0.00
30-Jun-22	79,475	1.43	0.00	18.22	18.04	0.00
01-Jul-22	88,527	1.68	0.00	18.31	18.12	0.00
02-Jul-22	82,342	1.75	0.02	18.38	18.25	0.00
03-Jul-22	82,682	1.50	0.00	18.44	18.30	6.30
04-Jul-22	105,663	2.17	0.00	18.51	18.43	1.50
05-Jul-22	118,815	1.93	0.04	18.44	18.30	0.00
06-Jul-22	108,021	1.91	0.06	18.49	18.30	4.80
07-Jul-22	97,648	1.80	0.03	18.62	18.43	7.80

Date	Daily Flow (L/day)	Max Flow (L/s)	Min Flow (L/s)	Max Temp (°C)	Min Temp (°C)	Daily Rain (mm)
08-Jul-22	98,860	1.93	0.02	18.69	18.48	1.00
09-Jul-22	85,903	1.49	0.02	18.83	18.61	0.00
10-Jul-22	89,406	1.55	0.01	18.89	18.74	0.00
11-Jul-22	95,009	1.63	0.02	19.08	18.82	0.00
12-Jul-22	83,017	1.61	0.00	19.28	19.07	0.00
13-Jul-22	81,867	1.62	0.00	19.34	19.18	0.00
14-Jul-22	84,713	1.63	0.00	19.39	19.25	0.00
15-Jul-22	86,091	1.60	0.02	19.48	19.28	0.80
16-Jul-22	83,372	1.42	0.01	19.52	19.41	2.00
17-Jul-22	83,651	1.50	0.02	19.47	19.33	1.80
18-Jul-22	86,037	1.82	0.00	19.39	19.20	0.00
19-Jul-22	79,280	1.69	0.00	19.34	19.20	0.00
20-Jul-22	72,632	1.44	0.01	19.47	19.27	0.00
21-Jul-22	76,802	8.60	0.01	19.70	19.43	0.00
22-Jul-22	77,405	1.40	0.00	19.77	19.64	0.00
23-Jul-22	76,493	1.40	0.00	19.86	19.71	0.00
24-Jul-22	84,335	1.58	0.02	19.83	19.64	0.00
25-Jul-22	91,194	1.60	0.02	19.86	19.69	0.00
26-Jul-22	83,411	1.52	0.00	19.93	19.82	0.00
27-Jul-22	80,875	1.64	0.01	20.17	19.90	0.00
28-Jul-22	87,404	1.61	0.01	20.42	20.16	0.00
29-Jul-22	94,187	1.73	0.00	20.44	20.32	0.00
30-Jul-22	92,076	1.95	0.03	20.58	20.41	0.00
31-Jul-22	101,523	1.96	0.03	20.55	20.37	0.00
01-Aug-22	103,244	2.08	0.03	20.56	20.36	0.00
02-Aug-22	101,564	1.98	0.04	20.60	20.44	0.00
03-Aug-22	99,847	2.33	0.00	20.68	20.54	12.30
04-Aug-22	91,893	1.87	0.03	20.63	20.47	7.30
05-Aug-22	109,707	2.26	0.04	20.60	20.21	0.00
06-Aug-22	95,737	1.58	0.04	20.37	20.21	0.00
07-Aug-22	87,913	1.50	0.00	20.65	20.36	0.00
08-Aug-22	92,707	2.36	0.00	20.81	20.61	0.00
09-Aug-22	98,816	2.34	0.00	20.86	20.73	0.00
10-Aug-22	86,846	1.50	0.00	20.94	20.75	0.00
11-Aug-22	91,500	2.03	0.01	21.04	20.91	0.00
12-Aug-22	98,872	1.84	0.04	21.07	20.88	0.00
13-Aug-22	92,072	1.60	0.00	21.04	20.88	2.00
14-Aug-22	95,013	1.61	0.00	21.07	20.93	0.00

Date	Daily Flow (L/day)	Max Flow (L/s)	Min Flow (L/s)	Max Temp (°C)	Min Temp (°C)	Daily Rain (mm)
15-Aug-22	88,267	1.69	0.02	21.14	21.03	0.00
16-Aug-22	85,146	1.85	0.02	21.22	21.06	0.00
17-Aug-22	83,706	1.48	0.00	21.27	21.11	0.00
18-Aug-22	84,301	1.56	0.00	21.45	21.24	0.00
19-Aug-22	82,382	1.45	0.00	21.52	21.39	0.00
20-Aug-22	88,452	1.35	0.00	21.58	21.49	0.00
21-Aug-22	92,001	1.36	0.22	21.58	21.37	0.00
22-Aug-22	93,125	1.36	0.59	21.50	21.39	0.00
23-Aug-22	84,147	1.60	0.03	21.52	21.39	0.00
24-Aug-22	86,515	1.58	0.00	21.63	21.44	0.00
25-Aug-22	87,888	1.59	0.03	21.68	21.57	0.00
26-Aug-22	85,251	1.44	0.00	21.79	21.63	0.30
27-Aug-22	86,614	1.35	0.13	21.79	21.63	0.00
28-Aug-22	91,523	1.39	0.14	21.67	21.21	0.00
29-Aug-22	106,388	1.85	0.09	21.40	21.13	0.00
30-Aug-22	91,571	1.61	0.11	21.38	21.13	0.00
31-Aug-22	96,148	2.35	0.15	21.45	21.31	0.00
01-Sep-22	96,788	1.61	0.14	21.52	21.39	0.00
02-Sep-22	95,179	2.31	0.14	21.52	21.37	0.00
03-Sep-22	100,325	1.70	0.16	21.45	21.26	0.00
04-Sep-22	96,749	1.61	0.00	21.38	21.19	9.50
05-Sep-22	103,655	2.21	0.09	21.38	21.11	0.00
06-Sep-22	111,537	2.21	0.00	21.20	20.98	0.00
07-Sep-22	112,930	1.81	0.23	21.19	21.06	0.00
08-Sep-22	93,395	1.69	0.13	21.24	21.04	0.00
09-Sep-22	91,508	2.45	0.13	21.20	21.03	0.00
10-Sep-22	92,522	10.05	0.00	21.20	21.03	0.00
11-Sep-22	93,162	1.62	0.01	21.20	21.06	0.00
12-Sep-22	109,525	1.85	0.20	21.20	20.95	0.00
13-Sep-22	101,215	1.72	0.16	21.11	20.93	0.00
14-Sep-22	95,645	1.50	0.15	21.11	20.93	0.00
15-Sep-22	91,210	2.14	0.00	21.11	20.93	3.80
16-Sep-22	103,848	9.96	0.00	21.04	20.83	3.50
17-Sep-22	132,665	11.07	0.18	20.91	20.65	0.00
18-Sep-22	129,440	10.40	0.36	20.77	20.36	0.00
19-Sep-22	107,363	2.76	0.14	20.49	20.28	0.00
20-Sep-22	108,441	1.90	0.17	20.52	20.27	0.00
21-Sep-22	111,985	1.69	0.27	20.46	20.23	0.00

Date	Daily Flow (L/day)	Max Flow (L/s)	Min Flow (L/s)	Max Temp (°C)	Min Temp (°C)	Daily Rain (mm)
22-Sep-22	100,850	1.80	0.20	20.42	20.18	0.00
23-Sep-22	102,066	2.18	0.11	20.34	20.09	0.80
24-Sep-22	104,932	4.20	0.10	20.34	20.21	0.00
25-Sep-22	119,544	2.17	0.27	20.28	19.95	0.00
26-Sep-22	125,207	2.15	0.27	20.16	19.92	0.00
27-Sep-22	110,360	3.66	0.22	20.34	20.10	0.00
28-Sep-22	96,762	3.58	0.13	20.37	20.23	0.30
29-Sep-22	93,995	1.49	0.00	20.37	20.23	0.00
01-Oct-22	104,751	1.81	0.00	20.24	20.10	0.00
02-Oct-22	128,635	6.35	0.00	20.29	20.07	0.00
03-Oct-22	118,138	1.94	0.00	20.21	20.02	0.00
04-Oct-22	109,531	2.82	0.00	20.19	20.02	0.00
05-Oct-22	103,229	1.91	0.00	20.29	20.16	0.00
06-Oct-22	108,899	1.75	0.00	20.31	20.16	0.00
07-Oct-22	110,702	1.77	0.00	20.24	20.10	0.00
08-Oct-22	102,341	1.77	0.01	20.21	20.02	0.00
09-Oct-22	109,745	1.90	0.00	20.11	19.85	0.00
10-Oct-22	120,440	1.95	0.07	19.99	19.82	0.00
11-Oct-22	132,976	2.28	0.01	19.92	19.82	0.00
12-Oct-22	134,469	2.91	0.00	19.92	19.56	0.00
13-Oct-22	133,420	9.23	0.00	19.56	19.31	0.00
14-Oct-22	107,695	9.51	0.00	19.47	19.24	0.00
15-Oct-22	115,892	1.80	0.00	19.47	19.25	0.00
16-Oct-22	112,362	1.91	0.00	19.43	19.31	0.00
17-Oct-22	119,185	1.88	0.00	19.43	19.31	0.00
18-Oct-22	138,744	2.19	0.06	19.43	19.20	0.00
19-Oct-22	143,034	2.17	0.02	19.39	19.10	0.00
20-Oct-22	75,590	2.00	0.00	19.26	18.81	0.00
21-Oct-22	135,675	2.16	0.00	19.00	18.79	2.30
22-Oct-22	135,952	2.06	0.00	19.08	18.74	0.00
23-Oct-22	109,231	1.88	0.00	18.79	18.42	0.80
24-Oct-22	101,011	2.22	0.00	18.48	18.22	15.50
25-Oct-22	123,034	1.92	0.00	18.38	18.16	38.30
26-Oct-22	126,833	2.27	0.00	18.26	17.91	3.50
27-Oct-22	120,977	2.02	0.00	17.99	17.65	27.00
28-Oct-22	130,861	4.24	0.00	17.71	17.47	2.30
29-Oct-22	135,838	2.09	0.00	17.61	17.44	0.50
30-Oct-22	131,629	2.09	0.00	17.61	17.44	48.80

Date	Daily Flow (L/day)	Max Flow (L/s)	Min Flow (L/s)	Max Temp (°C)	Min Temp (°C)	Daily Rain (mm)
31-Oct-22	175,088	3.93	0.00	17.66	17.34	4.00
01-Nov-22	140,274	2.07	0.00	17.34	17.01	0.00
02-Nov-22	123,951	1.94	0.00	17.02	16.67	0.00
03-Nov-22	131,741	2.10	0.00	16.76	16.54	7.30
04-Nov-22	129,082	2.03	0.00	16.63	16.39	28.30
05-Nov-22	155,810	2.58	0.00	16.42	16.01	0.00
06-Nov-22	143,265	3.01	0.00	16.06	15.76	24.00
07-Nov-22	173,825	3.73	0.00	15.93	15.59	4.00
08-Nov-22	163,427	3.37	0.00	15.59	15.11	1.00
09-Nov-22	136,310	9.40	0.00	15.16	14.71	0.80
10-Nov-22	127,386	2.00	0.00	14.85	14.64	0.00
11-Nov-22	132,553	1.98	0.00	14.76	14.59	0.00
12-Nov-22	130,975	2.56	0.00	14.88	14.69	0.00
13-Nov-22	152,747	9.49	0.00	14.98	14.84	0.00
14-Nov-22	134,071	2.55	0.00	14.98	14.77	0.00
15-Nov-22	122,310	2.18	0.02	14.90	14.69	0.00
16-Nov-22	116,325	1.91	0.00	14.90	14.71	0.00
17-Nov-22	113,002	1.74	0.00	14.85	14.61	0.00
18-Nov-22	114,712	1.84	0.00	14.69	14.56	0.00
19-Nov-22	106,617	1.78	0.00	14.76	14.46	0.00
20-Nov-22	103,382	9.40	0.00	14.62	14.38	0.00
21-Nov-22	106,449	1.74	0.00	14.52	14.33	0.00
22-Nov-22	136,992	9.45	0.00	14.62	14.38	19.00
23-Nov-22	105,768	1.78	0.00	14.72	14.56	0.00
24-Nov-22	111,739	3.91	0.02	14.69	14.59	0.00
25-Nov-22	110,279	1.77	0.23	14.69	14.56	14.30
26-Nov-22	129,061	2.55	0.00	14.68	14.46	4.00
27-Nov-22	127,251	2.02	0.21	14.54	14.33	0.80
28-Nov-22	126,220	2.37	0.03	14.38	14.08	0.00
29-Nov-22	122,084	1.96	0.01	14.11	13.76	1.30
30-Nov-22	118,531	1.81	0.00	13.77	13.22	20.50
01-Dec-22	125,961	2.04	0.00	13.23	13.04	0.00
02-Dec-22	120,346	1.80	0.32	13.12	12.68	1.00
03-Dec-22	112,772	2.25	0.01	12.74	12.30	0.00
04-Dec-22	113,991	1.99	0.13	12.48	12.30	0.00
05-Dec-22	114,332	1.80	0.00	12.59	12.44	0.00
06-Dec-22	115,537	1.81	0.13	12.72	12.51	0.00
07-Dec-22	115,820	1.80	0.04	12.69	12.55	3.50

Date	Daily Flow (L/day)	Max Flow (L/s)	Min Flow (L/s)	Max Temp (°C)	Min Temp (°C)	Daily Rain (mm)
08-Dec-22	109,696	1.74	0.24	12.67	12.53	15.80
09-Dec-22	124,726	1.81	0.41	12.76	12.60	13.80
10-Dec-22	115,988	1.79	0.04	12.81	12.60	37.30
11-Dec-22	197,743	4.51	0.51	12.69	12.17	0.00
12-Dec-22	133,625	2.45	0.25	12.18	11.97	0.00
13-Dec-22	119,745	1.90	0.20	12.36	12.09	0.00
14-Dec-22	119,871	1.92	0.01	12.41	12.27	0.00
15-Dec-22	117,262	4.10	0.00	12.51	12.40	0.00
16-Dec-22	116,308	1.80	0.13	12.51	12.35	0.00
17-Dec-22	111,215	1.68	0.17	12.51	12.35	0.50
18-Dec-22	108,265	2.20	0.06	12.56	12.40	4.00
19-Dec-22	115,539	1.83	0.03	12.48	12.09	0.30
20-Dec-22	112,262	1.71	0.25	12.15	11.54	5.30
21-Dec-22	113,788	2.14	0.26	11.57	11.27	0.00
22-Dec-22	115,254	1.92	0.13	11.38	11.00	0.00
23-Dec-22	111,701	1.71	0.24	11.12	10.72	20.50
24-Dec-22	118,088	2.28	0.07	11.01	10.77	43.80
25-Dec-22	287,022	7.04	0.35	11.14	9.03	14.80
26-Dec-22	214,704	4.12	0.64	10.34	9.34	34.00
27-Dec-22	337,537	6.11	1.38	10.56	9.57	76.30
28-Dec-22	455,018	9.06	1.44	9.99	8.91	5.30
29-Dec-22	287,322	5.31	1.00	9.69	8.91	13.80
30-Dec-22	157,158	2.95	0.57	10.07	9.66	26.80
31-Dec-22	186,159	3.72	0.54	10.58	10.06	6.00