Pritchard Wastewater Master Plan

Thompson Nicola Regional District

The Region of BC's Best

April 2018

Project No. 379-491

ENGINEERING ■ PLANNING ■ URBAN DESIGN ■ LAND SURVEYING

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1	R Wall	Jan 19, 2018	First Draft
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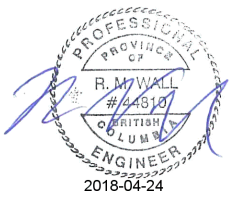
Report Submission

Report Prepared By:



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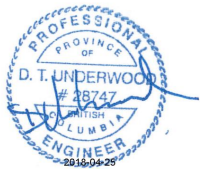

2018-04-25

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Project Engineer

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List of Acronyms

GSC	Geodetic Survey of Canada
IHA	Interior Health Authority
TNRD	Thompson Nicola Regional District
TRUE	TRUE Consulting

Units of Measure

ft	feet
lgpm	Imperial gallons per minute
km	kilometre
L/d	Litres per day
L/m	Litres per minute
L/s	Litres per second
lpcd	Litres per capita per day
m	metre
mg/L	milligrams per Litre
mm	millimetre
NTU	Nephelometric Turbidity Units
psi	pounds per square inch
USgpm	US gallons per minute

Referenced Reports

1 Pritchard Developments Ltd - Water System Assessment Study. TRUE Consulting Group. November 1999.

2 Draft Report - Pritchard Water System - Water Treatment Feasibility Study. CH2M Hill May 2007

3 Golder Associates. Reconnaissance of Pritchard Sewage Basins. 2004.

Executive Summary

The Thompson Nicola Regional District has commissioned a master plan assessment of its water and sewer infrastructure. The master plans will enable better planning for the future of the communities and sets out priorities for improvements to the systems to ensure safe, clean, reliable and affordable water and wastewater services.

The master plans list recommended upgrades with estimated costs to enable the TNRD to prepare a financial plan with the general objective of making improvements for compliance with regulatory requirements, and capacity for future growth.

The analysis of the Pritchard Community Sewer System has identified a need for the following key improvements;

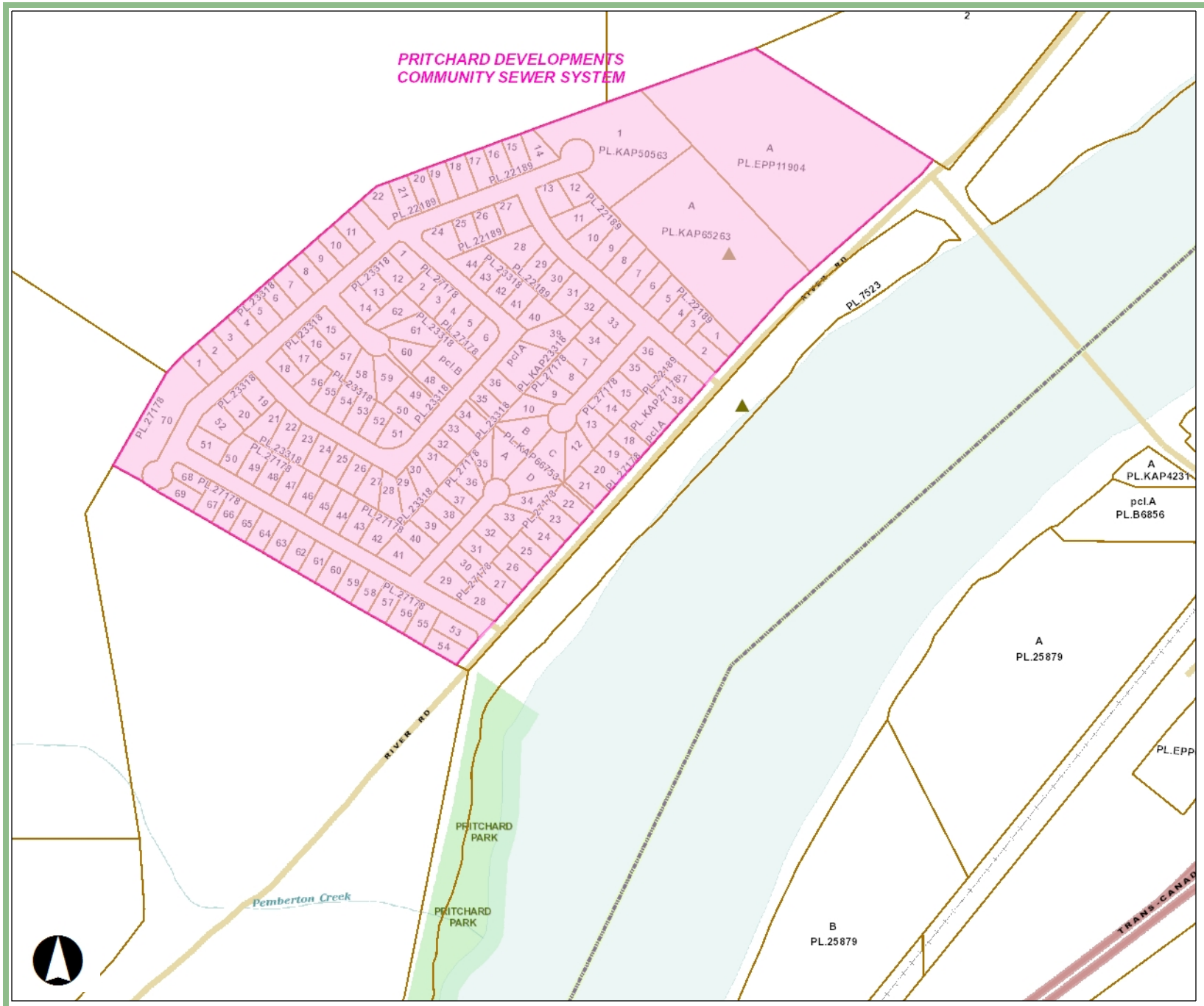
- Replace Trickling Filter Cladding
- Replace UV Disinfection System
- Rapid Infiltration Basin seepage bed repairs (assessed under a separate study).

1.0 Background

Constructed	1998
Customers	169 (approximately)
Location	30 km east of Kamloops
Discharge Location	South Thompson River
Treatment Process	Secondary treatment and infiltration

Pritchard is located approximately 30 km east of Kamloops on the north side of the South Thompson River (See Figure 1-1). The original Pritchard Developments Ltd. Subdivision development was constructed in the period 1971 to 1973 and comprises 169 single family lots averaging 1000 m^2 in area. The subdivision is serviced by a community water system originally constructed by the developer. Sewer service was originally by septic fields, but local ground conditions and the small lot sizes lead to numerous failures.

As a result, a community sewer and treatment system were installed by 1998. The original design capacity of the treatment facility was 273 m^3/day.



Legend

- TNRD Sewer System
- Emergency Services
- Police Station
- Ambulance Station
- Fire Station
- Hospital
- Local Authority Office
- Facility
- Other
- Cemetery
- Community Hall
- Education
- Emergency Response
- Government Building
- Health
- Landmark
- Recreation
- Transportation
- Utility
- Parcel
- TNRD Boundary (Outline)
- Administrative Boundary (Outline)
- First Nations Reserve (Outline)

0.5 0 0.25 0.5

Kilometers

1: 10,000

Projection: WGS_1984_Web_Mercator_Auxiliary_Sphere

June 30, 2017

Pritchard Community Sewer System

Figure 1-1: Location Plan

1.1 Influent Flows

Daily flows appear to be stable throughout the year and there has been no apparent trend from one year to the next in the period from 2012 to 2017. The TNRD report issues with infiltration in the spring, which have been gradually addressed by raising manhole covers. In addition, residents of trailers must run taps to prevents pipes freezing, which increases winter flows.

TABLE 1-1: PRITCHARD WWTP – ANNUAL FLOW SUMMARY

Year	WWTP Effluent Flow		
	m^3/annum	m^3/day	l/cap/day[1]
2012	31,201	85.5	200
2013	31,220	85.5	200
2014	33,184	90.9	212
2015	29,414	80.6	188
2016	30,150	82.6	193
2017	32,725	89.7	210

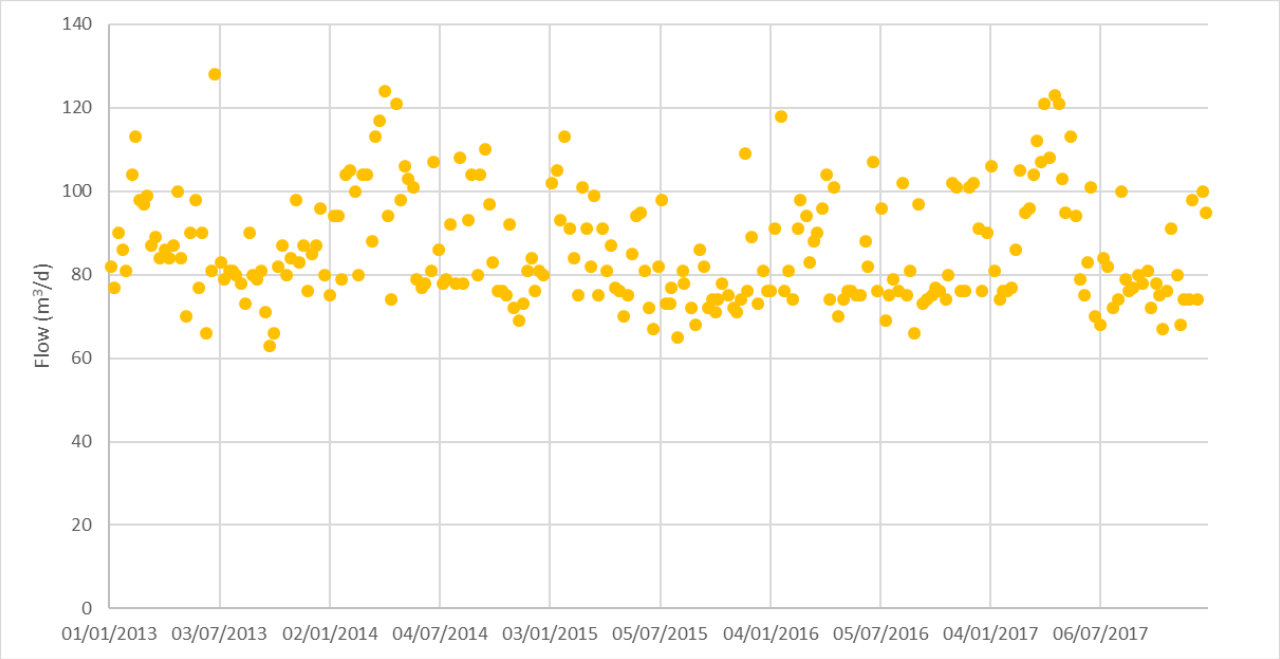


FIGURE 1-2: FLOW TREND - PRITCHARD COMMUNITY SEWER SYSTEM

The Pritchard Developments Ltd. sewer system currently services a total of 169 single family lots averaging approximately 1000m^2 in size. The planned Osprey development to the North East of the community comprises 65 lots ranging from 333m^2 to 650m^2 in size. The new lots will host

[1] The TNRD estimate the population of Pritchard to be 428 people.

manufactured homes. At an assumed average daily flow of 0.5 m^3/lot/day (based on current community flows), the average daily flow from the lots will be 33m^3/d. It should be noted that this flow per lot is relatively low by municipal standards.

In addition, the waste flow from a future water treatment plant is expected to be between 3 and 5% of raw water flow. Pritchard average water consumption is currently 150 m^3/d. Allowing for the additional flow from the Osprey this would result in a waste flow of the order of 10m^3/d.

Therefore, the total future flow based on expected medium term demands would be in the range 130 - 170 m^3/d.

1.2 Sludge Production

The plant currently averages one to two 12m^3 loads of sludge per month. The rate of sludge disposal varies reasonably evenly through the year and represents approximately 0.5% of the total annual flow as a result of efforts taken to consolidate sludge by settling. Sludge quantities have reduced recently as a result of the construction of a new headworks building.

TABLE 1-2: SLUDGE DISPOSAL BY MONTH (M^3)

	2012	2013	2014	2015	2016	2017
January		12	12	12	12	
February	24	12		24	12	24
March	12	12		12		12
April		21	12	12	36	24
May	24	12		12		
June	22		12		24	12
July	12	12	24	12		12
August	24	24	12	24	12	12
September	12	12	12	12	12	
October	12	24	36	12	12	24
November	12	12	12	12		12
December	12	12	24	12	12	
Total	**166**	**165**	**156**	**156**	**132**	**132**

1.3 Effluent Quality Analysis

Pritchard WWTP effluent quality testing shows that, under the present loading, the plant consistently meets permit requirements (Refer to Table 1-3).

TABLE 1-3: EFFLUENT ANALYSIS – EFFLUENT SAMPLE PORT – RELATIVE TO PERMIT

Date	BOD, 5-day	Total Suspended Solids	Phosphorus, Total (as P)	Total Nitrogen	Fecal Coliforms
Permit Limit	**10**	**10**	**1**	**NA**	**200**
20-Jan-16	<9	2	0.076	22.9	<1
25-Feb-16	<10	<2	0.141	22.1	130
15-Mar-16	<10	4	0.135	22.6	2
05-Apr-16	<7	3	0.093	21.3	13
26-May-16	<8	<2	0.064	30.7	<1
23-Jun-16	<6	<2	0.015	28.8	<1
27-Jul-16	<7	4	0.163	23.8	<1
01-Sep-16	<7	5	0.281	21.5	1
29-Sep-16	<6	2	0.16	10.2	<1
27-Oct-16	11	<2	0.089	22.7	<1
23-Nov-16	<6	6	0.167	23.2	<1
15-Dec-16	8	7	0.231	19.9	<1
26-Jul-17	<7.4	5.8	0.242	22.7	<1
23-Aug-17		<2.0	0.0549	24.9	<1

The sample analysis from the monitoring well downstream of the infiltration basins indicates a further improvement in effluent quality, primarily in terms of the total nitrogen concentration (Refer to Table 1-4). The average total nitrogen values fall from 23mg/L to 4 mg/L. The average values for other parameters remain similar.

TABLE 1-4: EFFLUENT ANALYSIS - UPPER FLOW THROUGH PORT

Date	BOD, 5-day	Total Suspended Solids	Phosphorus, Total (as P)	Total Nitrogen	Fecal Coliforms
20-Jan-16	<9	<2	0.054	12.1	52
25-Feb-16	<10	<2	0.05	4.37	2
15-Mar-16	<10	<2	0.05	4.93	<1
05-Apr-16	8	4	0.033	3.87	<1
26-May-16	<8	<2	0.069	3.04	<1
23-Jun-16	<6	<2	0.097	1.21	1
27-Jul-16	<7	<2	0.154	2.05	<1
01-Sep-16	<7	<2	0.217	2.4	35
29-Sep-16	<6	<2	0.211	2.08	2
27-Oct-16	<8	<2	0.144	2.07	<1
23-Nov-16	<6	<2	0.468	4.74	<1
15-Dec-16	<6	<2	0.187	7.55	<1
26-Jul-17	<7.4	<2.0	0.105	2.44	<1
23-Aug-17		<2.0	0.138	1.87	<1

Sampling undertaken in the South Thompson River shows little or no measurable impact on the receiving environment from the discharge.

TABLE 1-5: WATER ANALYSIS – SOUTH THOMPSON RIVER

Date	Sample Location	Total Dissolved Phosphorus	Total Nitrogen	Fecal Coliforms	E. coli
25-Feb-16	TRDA	0.017	0.023	<1	<1
25-Feb-16	TRUS	0.008	0.269	<1	<1
25-Feb-16	TRDS	0.009	0.32	<1	<1
26-May-16	TRDA	<0.002	0.154	260	170
26-May-16	TRUS	0.008	0.204	4	2
26-May-16	TRDS	0.007	0.19	2	2
01-Sep-16	TRDA	<0.002	1.24	70	88
01-Sep-16	TRUS	<0.002	1.16	69	69
01-Sep-16	TRDS	0.003	0.281	100	74
23-Nov-16	TRDA	0.004	0.138	3	3
23-Nov-16	TRUS	0.003	0.17	5	5
23-Nov-16	TRDS	<0.002	0.214	6	5
23-Aug-17	TRDA	<0.0020	0.174	38	38
23-Aug-17	TRUS	<0.0020	0.159	46	46
23-Aug-17	TRDS	<0.0020	0.297	330	330

TRDA = South Thompson River Discharge Area, TRUS = South Thompson River Upstream, TRDS = South Thompson River Downstream

1.4 Regulatory Agency Certificates and Approvals

The principal regulatory agency certificates, licenses and approvals which combine to provide approval for the construction and operation of the water system are summarized following.

1.4.1 BC Ministry of Environment

The system operation is authorized by MOE Permit Number 14686 dated October 8, 1996, rather than being registered under the Municipal Wastewater Regulation. The authorized works consist of a trickling filter system, a phosphorus removal unit, a sand filter, an ultra-violet disinfection unit, rapid infiltration basins (R.I.B.) and related appurtenances.

The maximum permitted rate of discharge is 230 m^3/d.

The permit conditions require that the concentration of the contaminants discharged to the rapid infiltration basins shall not exceed;

Biochemical Oxygen Demand	10 mg/l
Total Suspended Solids	10 mg/l
Phosphorus (total)	1 mg/l
Fecal Coliform (MPN)	200/100 ml

The permit requires grab samples of the effluent prior to discharge to the rapid infiltration basins and from the sample port in the constructed flow-through channel once a week. These sampling requirements have since been relaxed to once per month. The samples must be analyzed for biochemical oxygen demand, total suspended solids, phosphorus (total), fecal coliform, nitrogen (NO_2, NO_3, NH_4 and total). A further three locations on the South Thompson River are to be sampled monthly for fecal coliforms, E.coli, enterococci, chloride, phosphorus (ortho and dissolved) and nitrogen (NO_2, NO_3, NH_4 and total). These sampling requirements have been relaxed to once per quarter.

If the plant is upgraded in the future, the Ministry of Environment can be expected to request that the TNRD apply for registration under the Municipal Wastewater Regulation.

Reliability Criteria

The current Municipal Wastewater Regulation requires that particular treatment processes be duplicated, depending on the consequences of failure. This treatment plant would most likely be classified as reliability Category II. Under Category II, permanent or unacceptable damage to the receiving environment would be caused by long term effluent degradation but would not be caused by short term degradation. Table 1-6 shows that the Regulation is being complied with.

TABLE 1-6: RELIABILITY REQUIREMENTS CATEGORY II PLANT

Components	Minimum Redundancy Requirement	Backup Power Source	Compliant
Primary Sedimentation	2 minimum. Plant capable of 50% of design max flow with largest unit out of service.	Required	Yes
Trickling Filters[1]	Multiple Units. Plant capable of 75% of design max flow with largest unit out of service.	Optional	Yes
Flocculation	No backup required	Optional	Yes
Final Sedimentation	Multiple Units. Plant capable of 50% of design max flow with largest unit out of service.	Optional	Yes
Effluent Filters	2 minimum. Plant capable of 75% of design max flow with largest unit out of service.	Required	Yes

1.4.2 Environment Canada

The federal Wastewater Systems Effluent Regulation (WSER) applies to wastewater systems where the annual average flow is greater than 100 m^3/d, or the system is designed for more than 100m^3/d. The average system flow is currently less than 100 m^3/d and an Identification Report has not been submitted to Environment Canada. The Osprey Development and wastes from a future water treatment plant are expected to increase the flow above 100 m^3/d. However, the realization of these flows may be a number of years into the future.

In the future, when the system is registered under the WSER, quarterly reporting will be required where the system flow is between 17,500 and 50,000 m^3/annum. The plant flow is currently around 30,000 m^3/annum. As a result, the TNRD would be required to submit quarterly reports to Environment Canada which would include the following information for each month:

- Number of days effluent was deposited
- Volume of effluent deposited
- Average CBOD
- Average SS concentration
- Acute lethality (once for the quarter)

CBOD and TSS testing will be a weekly composite sample. Acute lethality sampling is a quarterly grab sample.

The existing plant performance does not raise any concerns with meeting WSER effluent quality criteria.

2.0 Capacity and Condition of Sewer System

2.1 Sewer Network

Description

The sewer network was constructed in 1998. The sewers comprise of approximately 2,800m of 200Ø DR35 PVC gravity sewers which generally follow the drainage channels in the road dedication. The network is designed to gravitate to a lift station on River Road. The sewer is constructed at grades ranging from 3.0% to 0.40%, complete with 1050mm dia. precast concrete manholes at all changes in grade, direction, and at a maximum separation of 140 metres.

Services have been provided to 170 lots consisting of 100mm dia. DR 28 PVC constructed at a minimum grade of 2% from property line.

In 2015 the TNRD extended its water distribution and wastewater collection systems approximately 150m east along River Road to service a proposed 65 unit strata development. This gravity main was laid as high and as flat as possible to avoid installing a second lift station. The means that the sewer is particularly shallow as it crosses River Road. It is laid inside a casing and is protected against freezing by a layer of insulation. Another minor advantage of the shallow sewer is that the groundwater table can be very high in summer.

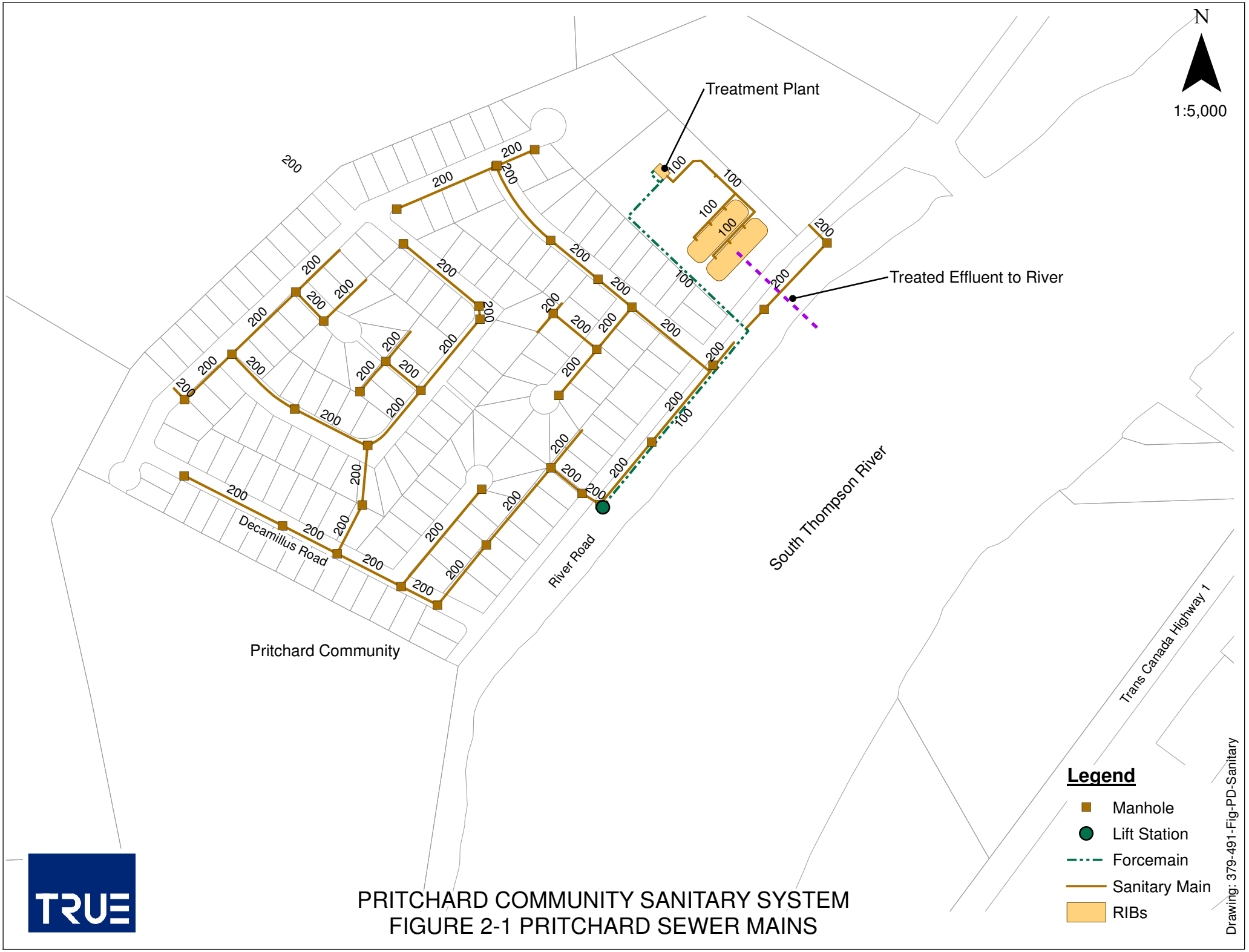
There are a number of instances of residents installing culverts and leveling of the drainage channels. They tend to use undersized culverts and there are local drainage issues as a result of blockages or lack of capacity. Surface flows can be directed to nearby manholes by default or through intentional action when local flooding occurs.

Assessment

Because the sewers commonly follow the drainage channels, many of the manhole lids are by necessity located inside the drainage channels. Many were set below the water level when the channel is full and as a result, there has been a problem with inflow to the network in spring when drainage flows are most significant. The TNRD are progressively addressing the affected manholes by adding grade rings to raise the manhole covers to a better height.

Pick holes are being fitted with bolts to enable a specific lifter to be used and to partly stop up the holes. Rubber gaskets and sealing grease are also available to help to seal manhole covers, but have not been used in Pritchard to date.

Preservation of the local surface water drainage channels should be enforced to minimise flows of surface water into the sewer system.



PRITCHARD COMMUNITY SANITARY SYSTEM
FIGURE 2-1 PRITCHARD SEWER MAINS

2.2 Lift Station

Description

The sewage lift station is a 1830mm diameter packaged Flygt FRP station supplied with duty standby 5hp 3 phase Flygt CP 3102MT submersible pumps with impeller 432. The station is equipped with a Flygt flushing valve to minimise sedimentation in the pump well. Level control is by a Milltronics Multiranger Ultrasonic unit. Pumped flow is calculated to be 13 L/s.

The lift station is constructed on a raised bench at elevation 347.0m as protection against river flooding. The top of the chamber is also approximately 0.6 metres above ground as further protection.

The lift station chamber is equipped with an odour control system. This system includes a chamber-mounted Dayton air blower (Model 4C 108) and a Trican charcoal filter (CY-1000). The blower is equipped with a speed control which can be adjusted as required.

There is an on-site 20 kW / 600V natural gas fueled standby generator which was installed as part of the original system in 1998.

A 100Ø C900 CL100 PVC sanitary forcemain connects the lift station to the wastewater treatment plant.

FIGURE 2-2: PRITCHARD LIFT STATION – RIVER ROAD

Assessment

FRP lift stations are non-corrodible and long lasting, apart from the metal fittings which tend to require occasional replacement depending on the nature of the atmosphere in the chamber. This chamber was in good condition. Some corrosion of the aluminum ladder was noted. An FRP ladder would be preferable.

The paint on the standby generator is deteriorating but it is understood that the unit is in otherwise acceptable condition.

3.0 Treatment / Disinfection

3.1 General

The Pritchard Sewage Treatment Plant includes a series of treatment process designed to progressively clean the wastewater. The operating manual states that the design capacity of the treatment facility is 273 m^3/day.

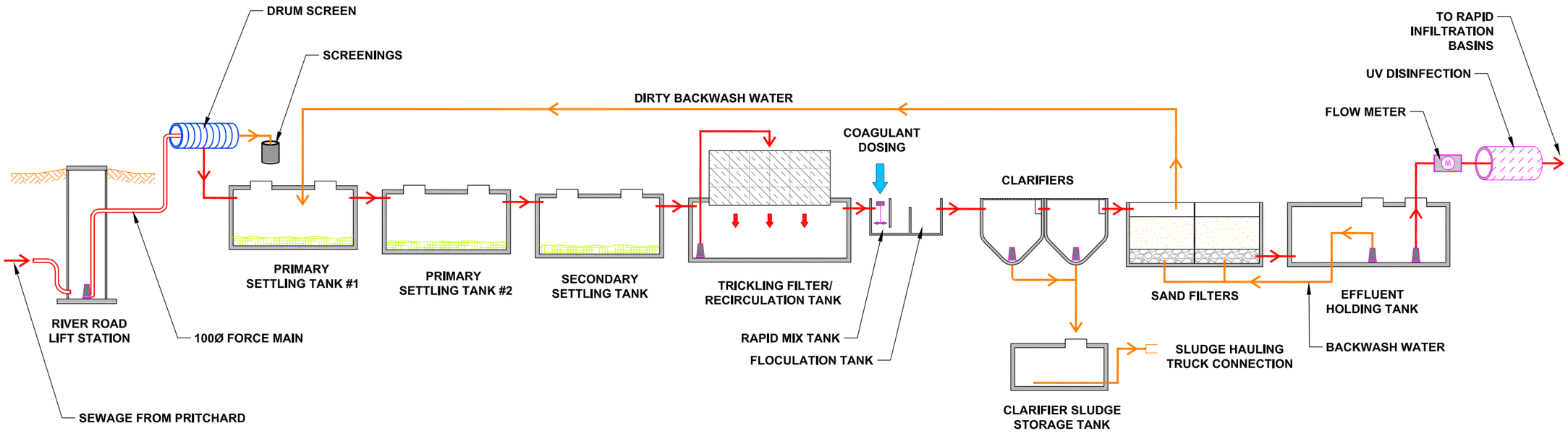


FIGURE 3 - 1
WASTEWATER TREATMENT PROCESS FLOW DIAGRAM

NOT TO SCALE

CONSULTANT SEAL

TRUE CONSULTING

THOMPSON-NICOLA REGIONAL DISTRICT TNRD

PRITCHARD WWTP UPGRADES

WASTEWATER TREATMENT PROCESS FLOW DIAGRAM

SCALE	AS SHOWN
DESIGN BY	RW
DRAWN BY	DF
DATE	DECEMBER 2017
PROJECT REFERENCE No.	379-491
DRAWING No.	379-491 Fig 3-1
SHEET	1 OF 1
ISSUE/REV.	0

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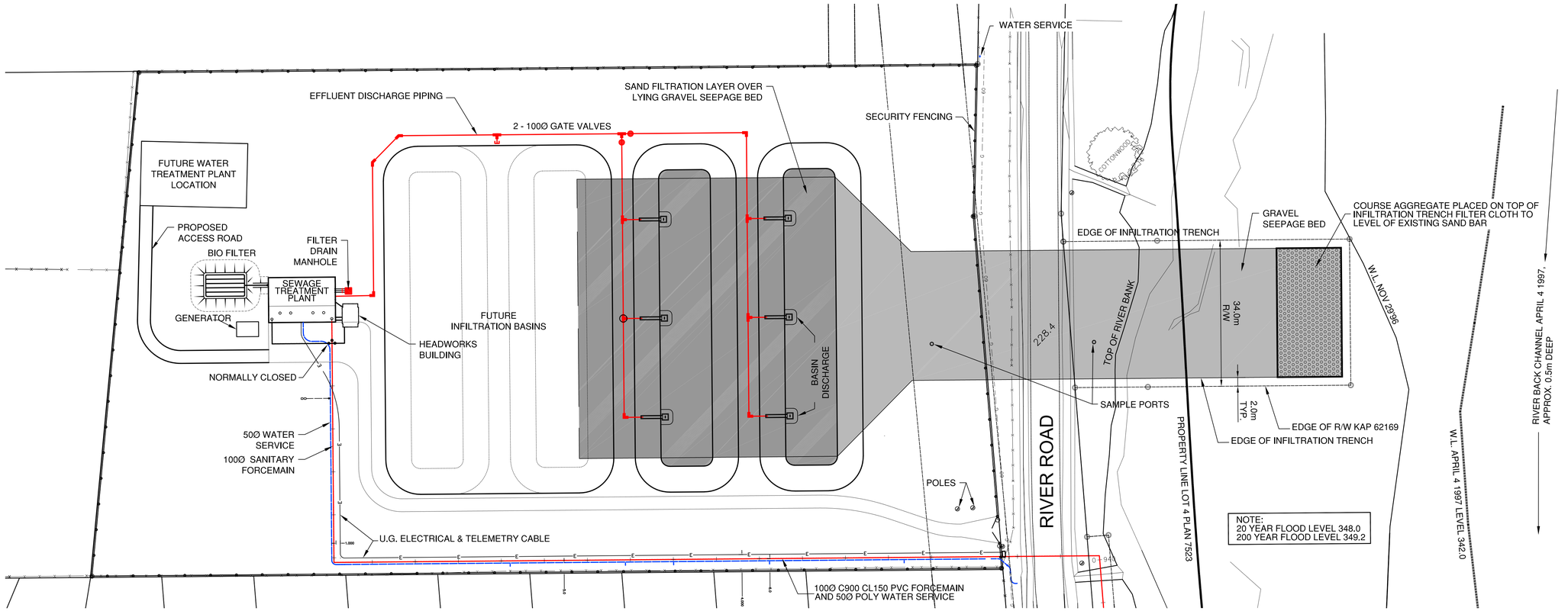


TNRD MASTER PLAN
PRITCHARD SEWAGE TREATMENT PLANT
SITE PLAN

TRUE CONSULTING

DESIGN BY: RW
SCALE: 1:500 (11x17)
DWG NO.: Fig. 3-2
379-491
REV:
DRAWN BY: MK
DATE: Dec 2017

FILE:r:\clients\300-399\379\379-491\03 drawings\cad\02 design drawings\dn-379-491-pritchard-paull-civil.dwg

3.2 Headworks

Description

The wastewater treatment plant headworks structure was constructed in 2016 and consists of:

- 6.1 m x 4.0m x 3.1 m cast-in-place concrete sludge holding tank / building foundation
- 4.3m x 4.0m x 2.8m precast concrete screening building
- One internally-fed rotary drum screen complete with conveyor and compactor

The station is designed to screen the wastewater as it is pumped to the plant by the lift station. Screenings are compressed to remove excess water and minimise the quantity for disposal. Screenings are disposed of to a small garbage bin. The screened wastewater flows by gravity to the primary settling tanks. The purpose of the screening facility is to remove inorganic solids prior to the primary storage tanks, which was prone to accumulating mats of non-biodegradable solids. It also protects the pumps and trickling filter nozzles from these solids.

The rotary drum screen is an IPEC Model IFM 1839P unit with an IPEC Model PLB 630 conveyor / compactor.

A Rosemount 8750WA electromagnetic flow meter records wastewater flow into the WWTP.

A Rosemount pH analyser records the wastewater pH with the objective of detecting sewage discharges that may cause a treatment process upset.

All electrical equipment in the room is explosion rated due to the possibility of an explosive atmosphere in the headworks building. This is a requirement of NFPA820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities.

The alum is injected prior to the secondary clarifier to promote coagulation and flocculation. Prior to the headworks screen upgrade, sludge from the clarifier and filters was recycled back to the primary tanks. It was believed that the alum contained within the recycled sludge was reacting with the primary influent and causing the sludge to become excessively thick and difficult to handle.

To keep the secondary clarifier and filter sludge separate from the primary sludge, the headworks building foundation has been constructed as a tank for sludge settling and storage. Clarifier and filter sludge are pumped directly to the new tank. The storage tank has sloping walls to concentrate and bring sludge to a sludge withdrawal pipe, which a vacuum truck connects to. Supernatant overflows back to Primary Settling Tank #1.

FIGURE 3-3: INTERNALLY-FED ROTARY DRUM SCREEN

Assessment

The system is operating without any serious issues and is in new condition.

A standby generator was installed at the WWTP in late 2017 as a second phase of the headworks upgrade. The lift station was equipped with standby power and the WWTP was not. The system relied on a quick response by the operator to bypass the screen building and, if necessary, turn off the lift station in the event of a power failure. This was a temporary arrangement until the WWTP generator was installed in December 2017. The generator is now fully functional and operates automatically.

3.3 Settling Tanks

Description

There are three simple settling tanks arranged in series. Primary Tank #1 and Primary Tank #2 are intended as both equalization tanks and primary settling basins. Screened flow is discharged to a grit chamber at the southwest corner of Primary Tank #1. The tank designated as the 'secondary' settling tank is positioned after the other two tanks.

Primary tank #1 Volume $73m^3$

Primary tank #2 Volume $73m^3$

Secondary Tank Volume $59m^3$

The three tanks have a combined storage of almost two days at typical flows. This storage is sufficient for treatment typical of a basic septic tank system.

Facilities have been provided to bypass the tanks for maintenance. Normally all of the tanks operate to achieve optimum performance.

The operator can bypass Primary Tank #1 with valves located 3 metres away from the tankage, and direct the flow into Primary Tank #2.

Sludge removal from the new sludge tank under the screen building is undertaken by tanker truck with a $12m^3$ load taken each time, which includes the clarifier sludge. This happens approximately monthly.

Assessment

The settling tanks were not inspected internally, but are reported by the operator to be in acceptable condition.

The Primary Tanks have manholes on the top of the slab to access the tank. The manholes are located in the center of the tanks, so it is difficult to access the corners and sides of the tanks where the majority of the heavy solids accumulate.

Achieving effective sludge removal was very difficult prior to the installation of the headworks screen due to large amounts of floating material and the consolidated alum sludge. This situation has now improved.

3.4 Trickling Filter

Description

The trickling filter consists of a bed of plastic media which supports biomass growth. Wastewater is applied at a controlled rate using an evenly spaced array of fixed nozzles. As the wastewater trickles down through the media, organic matter is bio-degraded by microorganisms living on the media. The treated wastewater is then collected by a recirculation tank.

The Pritchard trickling filter is a 9.2m x 2.5m x 3m (LxWxH) unit consisting of 69m^3 (6,695m^2) of Marley Marpac MXF3000 media with a steel cladding designed to retain fluid within the perimeter of the system.

There is an 80m^3 recirculation tank beneath the tricking filters, which the fluid drains into. This tank has three recirculation pumps which are 5hp (3.7kW) 3 phase Flygt CP 3102LT submersible pumps (3102.180.1233-441). Two of the submersible pumps (Recirculation Pump #1 and #2) are designed to recirculate the wastewater through the Trickling Filter tower spray nozzles, and one submersible pump (Air Injector Supply Pump #3) is designed to pump flow through Mazzei air injectors located at the bottom of the Recirculation Tank. The Air Injector Supply Pump #3 can be used to recirculate wastewater through the Trickling Filter if the valve to the air injectors is closed and the valve to the recirculation spray nozzles is open.

The biodegraded wastewater flows from the recirculation tank to a flash mix chamber where coagulant (alum) is dosed to precipitate phosphorus and generally improve solids removal in the clarifier. The original design included polymer dosing to the effluent flow following the alum. There is currently no polymer dosing. Flocculation occurs in a mechanically stirred tank prior to entry into the clarifier.

The clarifier is an upflow clarifier constructed using the same Marley MXF 3000 plastic media acting as a tube settler. Effluent passes upward through this media to reach the effluent trough. The clarifier is constructed with a double hopper bottom. The upflow clarifier is equipped with two 0.5hp desludge pumps (Barnes Model 2SE-51).

Clarifier supernatant is polished in two parallel Sanitherm sand filters which provide a final barrier to suspended solids prior to discharge to the rapid infiltration basins. The sand filters are each 1.2m x 1.2m horizontally with 0.9 m depth of silica sand. Each filter has a flow-through capacity of 3.15 L/s, providing 100% standby capacity for redundancy.

Back wash water is supplied from the effluent pump well by a single 5hp (3.7kW) 3 phase Flygt CP 3102LT submersible pump (impeller 441).

The treated effluent lift station is a concrete tank with duty standby 2.2hp (1.6kW) 3 phase Flygt CP3085MT submersible pumps. Level control is by an ultrasonic level transmitter. The effluent pumps transfer effluent to the UV disinfection units and out to the rapid infiltration basins.

FIGURE 3-4: TRICKLING FILTER CLADDING

FIGURE 3-5: TRICKLING FILTER SPRAY SYSTEM

Assessment

The trickling filters and recirculation tank were not inspected internally, but are understood to be in acceptable condition. However, the trickling filter exterior cladding has deteriorated to the point where it now requires replacement. The function of the cladding is to prevent splashing of the effluent outside the structure. It is not a structural element required to support the media.

There are non-corrodible alternatives for the replacement cladding such as FRP and plastic sheets. It would be feasible to wet apply FRP to the exterior of the filter cladding while leaving the existing cladding in place, or, preferably to remove the cladding and replace it with new cladding. It is not practical to replace the cladding on the rear wall without dismantling the filters, as there is no practical access.

3.5 Disinfection System

Description

The sand filters discharge effluent to the Effluent Holding Tank, where the effluent pump directs effluent through flow meter and a pressurised ultraviolet (UV) disinfection unit. The operating UV disinfection unit is the original Waterguard reactor (model WG-12-L-G) dating from 1998. The TNRD installed a replacement UV unit (Spectral Innovations) more recently[2], but electrical and mechanical failures have prevented the use of this unit.

FIGURE 3-6: UV DISINFECTION SYSTEMS

Assessment

The Waterguard unit is achieving disinfection targets and is in acceptable condition. Unfortunately, it has reached an age where it is increasingly difficult to source replacement lamps.

Because the newer Spectral Innovations unit is not reliable, a new UV unit should be purchased to replace both systems.

[2] Thought to have occurred in 2007 - 2008

3.6 Odour Control

Description

There is an activated carbon odour control system fitted to the lift station.

The WWTP has a biofilter which is no longer in use as the bed has become compacted and no longer passes the required air flows. It has not been reinstated as the plant is relatively odourless and there have been no complaints from local residents.

Assessment

Activated carbon media is a replacement item. The current media appeared to be effective as there was no apparent odour at the lift station. Because the wastewater is relatively fresh and aerobic, odour is not as serious an issue as at many other lift stations.

The biological filter is expected to remain out of commission at this stage. Being an active biological process, biofilter media will eventually break down and will require replacement. The time for this to occur varies significantly. It appears that the media has become compacted resulting in a high head loss. Improvements such as moisture sensors and an improved media design would be recommended if the biofilter is reinstated. Moisture control is essential for effective biological activity and is especially difficult to manage in the dry Pritchard climate.

4.0 Controls and Electrical

Description

The control system comprises:

- Pump control panel at the lift station with an ultrasonic level sensor and backup floats for pump starting and high and low level alarms.
- Buried telemetry cable linking the lift station with WWTP.
- WWTP PLC control panel with pump and motor controls for the various components.
- Dialer and modem for transmission by telephone of alarm conditions to the water system operator. Alarm conditions that can be forwarded to the operator by telephone include low well level, low/high reservoir level and low temperature in the pumphouse, phase loss, etc.
- SCADA system with remote access.

The WWTP has a 600V three phase electrical service. There is a standby generator at the lift station site and at the WWTP (WWTP unit installed in December 2017).

Explosion proof electrical equipment has been used in the headworks building in accordance with NFPA820.

The system control philosophy is described in the WWTP Operating Manual.

Assessment

No changes are proposed for the electrical and control system.

5.0 Effluent Disposal

Description

Effluent is pumped to two rapid infiltration basins which are 12m x 70m at the base and 24m x 80m at the top of the embankment.

The upper layer of the base of the basins is a 1m thick sand layer. A 1m thick gravel seepage bed is located under the beds and extends to the South Thompson River. The gravel layer is 30m wide and has been augmented by a piped conduit under River Road. The piped conduit was installed after effluent surfaced at times in the winter of 2010 and ran across the River Road. The TNRD have also built up low areas of the RIB berms to increase storage.

The infiltration bed is shown in plan view on Figure 3-2 and in section on Figure 5-1.

Assessment

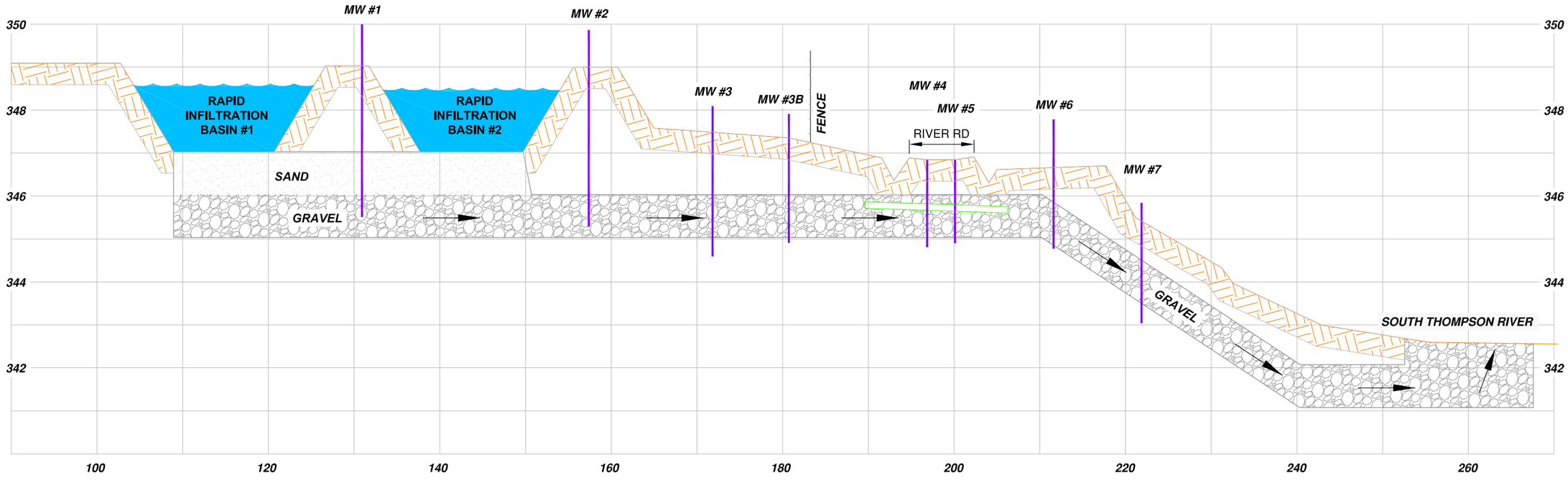
The rapid infiltration basin infiltration rate is at least equal to the inflow rate during the summer months when the river levels are high. As a result, the basin water levels are low. In contrast, water levels in the basins rise during the winter period when the river level is low and do not fall again until the river rises again. There have been a number of studies of this issue in past years.

Golder Associates reviewed the issue in 2004 (Golder Associates. Reconnaissance of Pritchard Sewage Basins. 2004. They made the following observations;

- Clogging of filter sand would cause continuous high water levels in the basins, rather than seasonal variation. *100mm was scraped from the surface of each bed with little effect, which confirms this conclusion.*
- Clogging of filter cloth was not indicated due to the seasonal variation and the observed flow restrictions (indicated by increased pressure) in the upper portions of the seepage bed
- The observed conditions appear to be consistent with frost penetration into the gravel seepage bed in the winter months.

Golder took measurements in January 2010 when the basins were full and the river level is assumed to be below the exfiltration zone. In this case the last monitoring well (MW-7) showed an elevated water column approaching the exfiltration area, consistent with their hypothesis. There was no data point at well MW-6 to show how the grade line passes back up the gravel layer.

The TNRD have proposed that another possible cause of the issue is clogging of the exfiltration zone with river silts, which accumulate each year.



MW = MONITORING WALL

FIGURE 5-1
RAPID INFILTRATION SYSTEM PROFILE

HORZ - 1:500
VERT - 1:100

CONSULTANT SEAL

TRUE CONSULTING

THOMPSON-NICOLA REGIONAL DISTRICT TNRD

PRITCHARD WWTP UPGRADES

RAPID INFILTRATION SYSTEM PROFILE

SCALE	AS SHOWN
DESIGN BY	RW
DRAWN BY	DF
DATE	DECEMBER 2017
PROJECT REFERENCE No.	379-491
DRAWING No.	379-491
SHEET	1 OF 1
ISSUE/REV.	0

Fig. 5-1

FILE: r:\clients\300-399\379\379-491\03 drawings\cad\02 design drawings\dn-379-491-pritchard wwtp.dwg

The river exfiltration area was scarified in the fall of 2012 and a hydraulic survey was undertaken using piezometers between May 2nd and July 26th 2013. The study period started with the river level high enough to cover the exfiltration area and finished with the river level near the annual peak. Over this period the water column of the hydraulic profile remained high through the gravel layer until Monitoring Well #3, then dropped to near the bottom of the gravel layer by River Road. By September of 2013 both Rapid Infiltration Basins had drained completely as a result of the scarification in the previous fall. The observations from May to July 2013 indicated that the most significant head losses were the area between MW-3 and MW-4. TRUE investigated the area between MW-3 and MW-4 further by installing another test hole prior to the July 3rd reading. This indicated that the slope of the grade line is constant between MW-3 and MW-4. TRUE did not measure the water column in freezing conditions, as the mean daily temperature was in the low teens by May 2013. This means that the impact of frost penetration in the exfiltration area was not measured in this study.

The TNRD propose to dig test pits in the gravel layer to check for blockage by migrating silts and undertake further piezometer monitoring. The TNRD also propose to install a clay cap over the seepage bed on the upgradient side of River Road to safeguard against future surfacing of the effluent, which affects the use of the road.

A new engineering study is currently underway, investigating the winter infiltration issue. This master plan may be updated with the findings of that study at a later date. The study is expected to recommend measures to improve winter exfiltration. These may include infrastructure to protect the exfiltration zone from siltation and/or from freezing.

6.0 Rights of Way

In accordance with the terms of reference for this assessment study, the status of rights of way covering components of the water system not located in public road rights of way has been reviewed. Components of the water system not located in public road rights of way are listed following:

Sewer System and Pump Station

The sewers are generally located inside the MOTI road dedication and have dedicated right of ways where needed. The lift station and force main are in a dedicated right of way (KAP 62169).

Wastewater Treatment Plant

The wastewater treatment plant is located on TNRD property.

Discharge to the South Thompson River

The discharge area is located inside a 34m wide by 100m long right of way as it crosses the MOTI road dedication and enters the river channel.

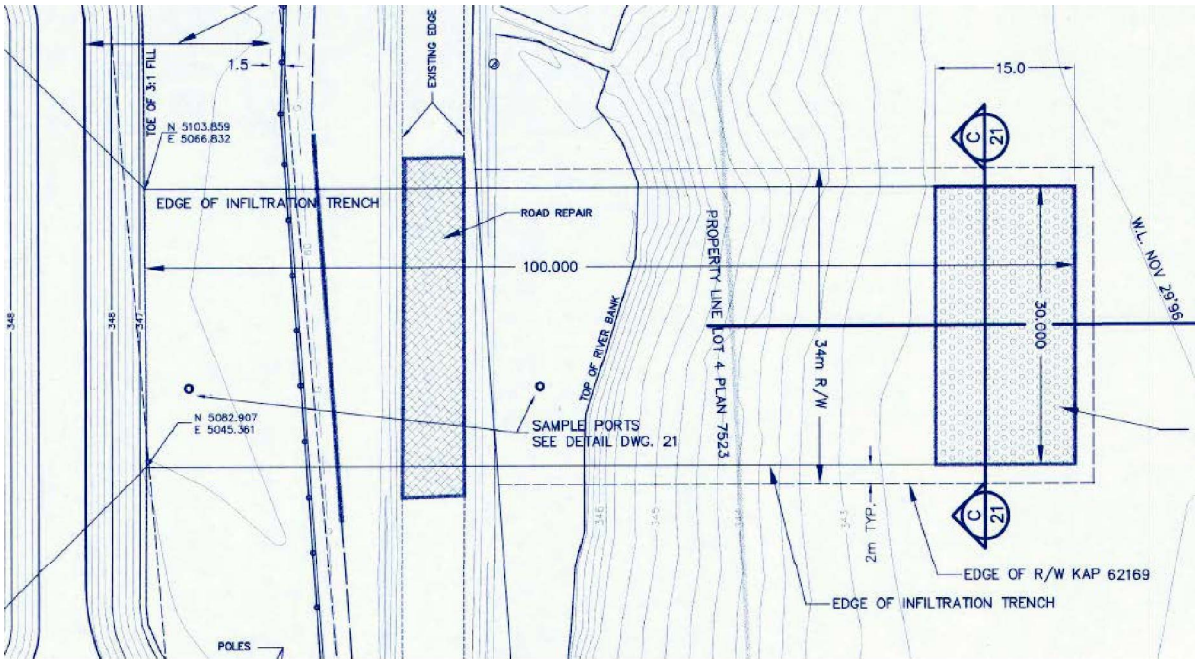


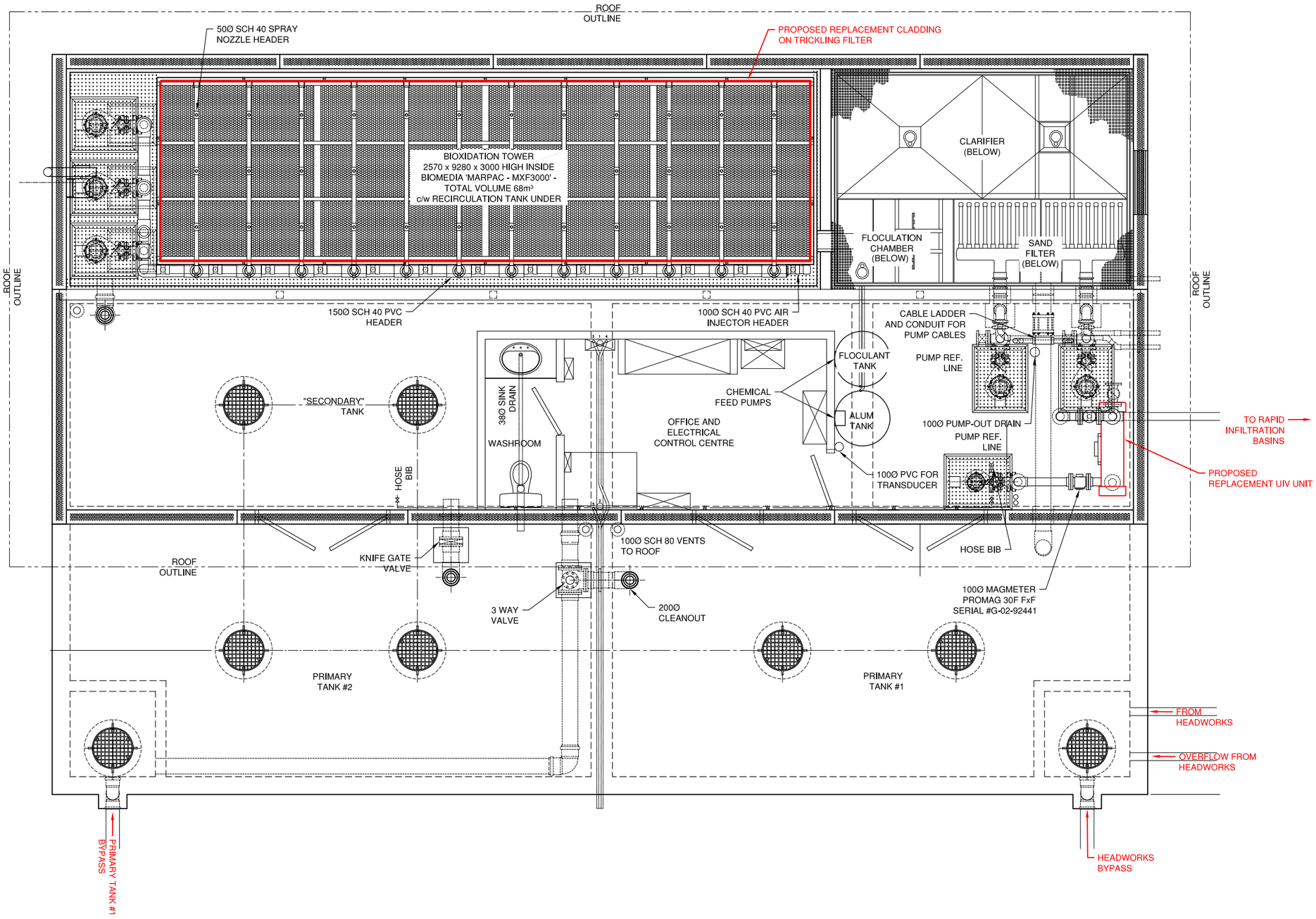
FIGURE 6-1: EFFLUENT DISPOSAL AREA RIGHT OF WAY

7.0 Improvement Plan

7.1 General

In Section 7 of this report, improvements to the water system are described based on an assessment of regulatory standards and operating condition. Aside from infrastructure improvements the TNRD are working on the development of a variety of other tasks that will enhance the management of the wastewater systems. These include;

- GIS data collection (completed)
- Asset management plan (completed)
- Long term life cycle financial planning (in progress)



TNRD MASTER PLAN
PRITCHARD SEWAGE TREATMENT PLANT
PROPOSED IMPROVEMENTS

TRUE CONSULTING

DESIGN BY: RW
SCALE: 1:60 (11x17)
DWG NO.: **Fig. 7-1** 379-491
REV:
DRAWN BY: MK
DATE: Dec 2017

FILE:n:\clients\300-399\379\379-491\03 drawings\cad\02 design drawings\dn-379-491-pritchard structural.dwg

7.2 Treatment

Costs for the replacement of the trickling filter cladding are primarily for labour. The costs are highly dependant on methodology and the effect of risk pricing. As a result, there is considerable uncertainty regarding costs and a collaborative approach to procurement should be considered. The work should be undertaken in stages so as to avoid a deterioration of effluent quality, which would require regulatory authorisation.

TABLE 7-1: ESTIMATED TRICKLING FILTER RE-CLADDING COST

Description	Unit Price	Number	Subtotal
Dismantle ex filter in sections and replace cladding	$80	180h	$14,400
Materials - Polypropylene sheet and metal frame	$75	72	$10,000
Engineering and Contingencies	$	50%	$12,200
TOTAL			**$37,000**

A single new closed vessel UV disinfection unit similar to the existing system has been assumed. The purchase cost of an open channel system would be less than a closed vessel unit but the installed cost would be higher, particularly given the space constraints in the existing building.

TABLE 7-2: ESTIMATED UV DISINFECTION REPLACEMENT COST

Description	Unit Price	Number	Subtotal
UV Disinfection Unit	$38,000		$38,000
Pipe components	$5,000		$5,000
Installation	$80	100h	8,000
Commissioning and Start-up Services	$5,500		$5,500
Engineering and Contingencies	$	50%	$28,250
TOTAL			**$85,000**

8.0 Cost Summary

Table 8-1 shows the major system upgrades described in this master plan along with expected costs for the work. The costs include design and construction costs in 2018 dollars.

TABLE 8-1: RECOMMENDED UPGRADES AND ESTIMATED COSTS

Schedule	Description	Estimated Cost
2018	UV disinfection replacement	$85,000
2019	Trickling Filter Cladding	$37,000

Cost estimates are developed to the Class 'C' level, per Engineers and Geoscientists British Columbia (EGBC) Budget Guidelines for Consulting Engineering Services, Class 'C' estimates are defined as follows:

Class C estimate (±25-40%): An estimate prepared with limited site information and based on probable conditions affecting the project. It represents the summation of all identifiable project elemental costs and is used for program planning, to establish a more specific definition of client needs and to obtain preliminary project approval.

APPENDIX A

Effluent Monitoring Results

Pritchard WWTP
Quarterly Effluent Testing

Date	Lab ID	Sample Location	BOD, 5-day	Total Suspended Solids	Phosphorus, Total	Phosphorus, Total Dissolved	Phosphorus, Ortho	Chloride	Ammonia, Total	Nitrogen, Total Kjeldahl	Nitrite	Nitrate	Nitrogen, Total	Coliforms, Fecal	Coliforms, Total	Background Colonies	E. coli
Unit			mg/L	mg/L	mg/L as P	mg/L as P	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L as N	mg/L as N	CFU/ 100mL	CFU/ 100mL	CFU/ 100mL	CFU/ 100mL
Permit Limit (to RI Basins)		**ESP**	**10**	**10**	**1**									**200**			
20-Jan-16	6011017-01	ESP	<9	2	0.076				3.74	12.1	0.66	16.8	22.9	<1			
20-Jan-16	6011017-02	UFP	<9	<2	0.054				6.25	7.33	<0.010	4.78	12.1	52			
25-Feb-16	6021645-01	ESP	<10	<2	0.141				1.69	3.79	0.269	18	22	130			
25-Feb-16	6021645-02	UFP	<10	<2	0.05				2.31	2.46	0.427	1.49	4.37	2			
25-Feb-16	6021645-03	TRDA				0.017	<0.01	13.6	0.047	0.37	<0.010	0.023	0.023	<1	12	20	<1
25-Feb-16	6021645-04	TRUS				0.008	<0.01	1.32	0.044	0.17	<0.010	0.101	0.269	<1	<410	120000	<1
25-Feb-16	6021645-05	TRDS				0.009	<0.01	14.8	0.024	0.32	<0.010	0.014	0.32	<1	<10	<10	<1
15-Mar-16	6031110-01	ESP	<10	4	0.135				1.62	2.58	0.053	20	22.6	2			
15-Mar-16	6031110-02	UFP	<10	<2	0.05				1.19	1.64	1.75	1.54	4.93	<1			
05-Apr-16	6040362-01	ESP	<7	3	0.093				3.21	3.32	0.041	17.9	21.3	13			
05-Apr-16	6040362-02	UFP	8	4	0.033				0.028	0.7	0.012	2.95	3.87	<1			
26-May-16	6052139-01	ESP	<8	<2	0.064				10.5	12.7	0.403	17.6	30.7	<1			
26-May-16	6052139-02	UFP	<8	<2	0.069				0.358	0.93	0.061	2.05	3.04	<1			
26-May-16	6052139-03	TRDA				<0.002	<0.01	0.66	<0.020	0.12	<0.010	0.039	0.154	260	>700	5200	170
26-May-16	6052139-04	TRUS				0.008	<0.01	0.63	<0.020	0.14	<0.010	0.06	0.204	4	48	1900	2
26-May-16	6052139-05	TRDS				0.007	<0.002	0.6	<0.020	0.19	<0.010	0.053	0.19	2	>18	680	2
23-Jun-16	6082050-01	ESP	<6	<2	0.015				8.82	9.28	0.01	17.4	28.8	<1			
23-Jun-16	6082050-02	UFP	<6	<2	0.097				0.444	0.7	<0.010	0.512	1.21	1			
27-Jul-16	6072089-01	ESP	<7	4	0.163				4.11	8.11	<0.010	17.7	23.8	<1			
27-Jul-16	6072089-02	UFP	<7	<2	0.154				1.01	1.77	0.018	0.255	2.05	<1			
01-Sep-16	6090143-01	ESP	<7	5	0.281				5.12	7.06	0.132	14.2	21.5	1			
01-Sep-16	6090143-02	UFP	<7	<2	0.217				1.93	2.08	0.027	0.314	2.4	35			
01-Sep-16	6090143-03	TRDA				<0.002	<0.01	0.94	<0.020	1.24	<0.010	<0.010	1.24	70	270	14000	88
01-Sep-16	6090143-04	TRUS				<0.002	<0.01	1.42	0.025	1.15	<0.010	0.011	1.16	69	>220	21000	69
01-Sep-16	6090143-05	TRDS				0.003	<0.01	1.07	<0.020	0.28	<0.010	<0.010	0.281	100	>150	27000	74
29-Sep-16	6092238-01	ESP	<6	2	0.16				6.92	8.92	<0.010	1.29	10.2	<1			
29-Sep-16	6092238-02	UFP	<6	<2	0.211				1.91	2.05	<0.010	0.026	2.08	2			
27-Oct-16	6101989-01	ESP	11	<2	0.089				3.44	5.35	<0.10	17.4	22.7	<1			
27-Oct-16	6101989-02	UFP	<8	<2	0.144				1.87	1.87	<0.010	0.2	2.07	<1			
23-Nov-16	6111748-01	ESP	<6	6	0.167				3.77	6.19	0.14	16.8	23.2	<1			
23-Nov-16	6111748-02	UFP	<6	<2	0.468				3.83	4.74	<0.010	<0.010	4.74	<1			
23-Nov-16	6111748-03	TRDA				0.004	<0.01	0.43	0.02	0.11	<0.010	0.0211	0.138	3	13	1100	3
23-Nov-16	6111748-04	TRUS				0.003	<0.01	0.45	<0.020	0.14	<0.010	0.028	0.17	5	54	1300	5
23-Nov-16	6111748-05	TRDS				<0.002	<0.01	0.44	0.023	0.19	<0.010	0.026	0.214	6	84	2200	5
15-Dec-16	6121129-01	ESP	8	7	0.231				2.62	4.23	0.216	15.5	19.9	<1			
15-Dec-16	6121129-02	UFP	<6	<2	0.187				2.66	3.31	<0.010	4.24	7.55	<1			
26-Jul-17	7072330-01	ESP	<7.4	5.8	0.242				8	9.79	0.342	12.6	22.7	<1			
26-Jul-17	7072330-02	UFP	<7.4	<2.0	0.105				0.991	1.74	<0.010	0.697	2.44	<1			
23-Aug-17	7082198-01	ESP		<2.0	0.0549			30.2	11.1	11.6	0.316	13.1	24.9	<1			
23-Aug-17	7082198-02	UFP		<2.0	0.138				0.876	1.2	<0.050	0.67	1.87	<1			
23-Aug-17	7082198-03	TRDA				<0.0020	<0.0050	0.67	0.055	0.174	<0.010	<0.010	0.174	38	100	> 200	38
23-Aug-17	7082198-04	TRUS				<0.0020	<0.0050	0.59	0.024	0.159	<0.010	<0.010	0.159	46	100	> 200	46
23-Aug-17	7082198-05	TRDS				<0.0020	<0.0050	1.35	0.057	0.297	<0.010	<0.010	0.297	330	400	11000	330

ESP	Effluent Sample Port
UFP	Upper Flow Through Port
TRDA	Thompson River Discharge Area
TRUS	Thompson River Upstream
TRDS	Thompson River Downstream

APPENDIX B

Permit to Operate

PROVINCE OF
BRITISH COLUMBIA

Environmental Protection
1259 Dalhousie Drive
Kamloops
British Columbia V2C 5Z5
Telephone: (604) 371-6200

MINISTRY OF ENVIRONMENT,
LANDS AND PARKS

PERMIT
PE 14686

Under the Provisions of the Waste Management Act

Thompson Nicola Regional District

is authorized to discharge effluent to the ground from a sewage treatment plant located in Pritchard, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the Waste Management Act and may result in prosecution.

This Permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the Permittee.

Date Issued: October 8, 1996
Amendment Date:

Donald K. May, P.Eng.,
Asst. Regional Waste Manager

DK-1337

1. AUTHORIZED DISCHARGE

1.1 This subsection identifies the discharge of effluent from a residential subdivision as approximately shown on the site plan on page 6.

1.1.1 The maximum authorized rate of discharge is: **230 m^3/d**. The authorized discharge period is 24 hours/day, 7 days/week.

1.1.2 The concentration of the contaminants discharged to the R.I. basins shall not exceed:

Biochemical Oxygen Demand	- **10 mg/l**
Total Suspended Solids	- **10 mg/l**
Phosphorus (total)	- **1 mg/l**
Fecal Coliform (MPN)	- **200/100 ml**

1.1.3 The authorized works shall consist of: A trickling filter system, a phosphorus removal unit, a sand filter, an ultra-violet disinfection unit, rapid infiltration (R.I.) basins and related appurtenances.

1.1.4 The location of the point of discharge shall be: Lot 1, Plan 50563, Kamloops Division Yale District, West of the Sixth Meridian.

2. GENERAL REQUIREMENTS

2.1 Maintenance of Works, Bypasses and Emergency Procedures

The Permittee shall inspect the pollution control works regularly and maintain them in good working order. In the event of an emergency or condition which prevents continuing operation of the approved method of pollution control, the Permittee shall immediately notify the Regional Waste Manager and take appropriate remedial action.

The bypass of the designated pollution control works without the written approval of the Regional Waste Manager is prohibited.

2.2 Process Modifications

The Permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge.

Donald K. May, P.Eng.,
Asst. Regional Waste Manager

Date Issued: October 8, 1996
Amendment Date:

2.3 Rapid Infiltration Basins Operation

2.3.1 There shall be no overflow from the R.I. basins to the receiving environment.

2.3.2 Surface drainage shall be diverted away from the R.I. basins.

2.3.3 Residue removed routinely from the R.I. basins shall be disposed of in a manner approved by the Regional Waste Manager.

2.4 Sample Port

The Permittee shall provide a sampling port completed to intercept the constructed flow-path between the R.I. basins and the river. The precise location and structural design of the port require the approval of the Regional Waste Manager.

2.5 Disinfection

Effluent discharged to the R.I. basins shall be disinfected by ultra-violet irradiation or other methods approved by the Regional Waste Manager. The use of **chlorine** as a disinfectant is prohibited.

2.6 Flood Protection

The works shall be protected from 20-year return period flooding of the South Thompson River and inundation by upland runoff.

2.7 Plans

Plans and specifications of the works authorized in Section 1 shall be submitted to the Regional Waste Manager and his consent obtained before construction commences. The works shall be constructed in accordance with such plans.

As-built drawings of the pollution control works sealed by a professional engineer shall be submitted to the Regional Waste Manager for approval before discharge begins.

Approval of the submitted plans and specifications is for the purpose of administration of the Permit and **only** implies that the works specified therein meets the guidelines and standard of the Environmental Protection Program.

Donald K. May, P.Eng.,
Asst. Regional Waste Manager

2.8 Plant Classification and Operator Certification

The Permittee shall have the works authorized by this Permit classified (and the classification shall be maintained) by the *Environmental Operators Certification Program Society (Society).* The works shall be operated and maintained by person/s certified within and according to the program provided by the Society.

Certification must be completed to the satisfaction of the Regional Waste Manager. In addition, the Regional Waste Manager shall be notified of the classification level of the facility, the certification levels of the operators, and changes of operators and/or operator certification levels within 30 days of any change.

2.9 River Bank Remediation

In the event that the river bank has been damaged by the construction of the granular flow-through channel the Permittee shall carry out appropriate remediation work to the satisfaction of the Regional Waste Manager, when so directed in writing.

2.10 Operations and Maintenance Manual

An Operations and Maintenance Manual for the works authorized in section 1.1.3 shall be written by the design engineers and submitted to the Regional Waste Manager for approval before discharge begins.

3. MONITORING AND REPORTING REQUIREMENTS

The Permittee shall undertake the following monitoring program which represents the maximum required of the Permittee. The Regional Waste Manager may reduce the annual program based upon the results submitted as well as any other information obtained from the Environmental Protection staff in connection with this discharge.

The Regional Waste Manager will advise the Permittee in writing, of any changes to the monitoring program at least one month prior to the implementation of the modified program.

Donald K. May, P.Eng.,
Asst. Regional Waste Manager

3.1 Discharge Monitoring

3.1.1 Flow Measurement

The Permittee shall provide and maintain a suitable flow-measuring device and record **once a week** the effluent volume discharged to the R.I. basins over the previous 24 hours.

3.1.2 Effluent Sampling

The Permittee shall provide suitable sampling facilities, acceptable to the Regional Waste Manager and obtain grab samples of the effluent prior to discharge to the R.I. basins and from the sample port in the constructed flow-through channel **once a week**.

The samples shall be analyzed for:

Biochemical Oxygen Demand
Total Suspended Solids
Phosphorus (total)
Fecal Coliform
Nitrogen (NO_2, NO_3, NH_4 and total)

3.2 Receiving Environment Monitoring

The Permittee shall provide three suitable sampling locations on the South Thompson River acceptable to the Regional Waste Manager and sample the water **monthly** for:

Fecal Coliform
E. coli
Enterococci
Chloride
Phosphorus (ortho and dissolved)
Nitrogen (NO_2, NO_3, NH_4 and total)

The river sampling locations shall be identified on the as-built drawings.

The above environment monitoring shall commence no later than **one month** before discharge begins.

Donald K. May, P.Eng.,
Asst. Regional Waste Manager

3.3 Monitoring Procedures

3.3.1 Sampling and Flow Measurement Procedures

Sampling and flow measurement of the effluent shall be carried out in accordance with the procedures described in " *Field Criteria for Sampling Effluents and Receiving Waters,"* April 1989, 17 pp., or by suitable alternative procedures as authorized by the Regional Waste Manager.

Copies of the above manual may be purchased from the Environmental Protection Division, Ministry of Environment, Lands and Parks, 777 Broughton Street, Victoria, British Columbia V8V 1X5, and are also available for inspection at all Environmental Protection Program Offices.

3.3.2 Chemical Analyses

Analyses are to be carried out in accordance with procedures described in the latest version of " *British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials, March 1994 Permittee Edition,*" or by suitable alternative procedures as authorized by the Regional Waste Manager.

Copies of the above manual may be purchased from the Queen's Printer Publications Centre, 2nd Floor, 563 Superior Street, Victoria, British Columbia V8V 4R6 (1-800-663-6105), and are also available for inspection at all Environmental Protection Program Offices.

3.4 Reporting

The Permitee shall maintain data of analyses and flow measurements for inspection by Environmental Protection staff and submit the data, suitably tabulated, to the Regional Waste Manager **six months** after discharge begins and **annually** thereafter.

Donald K. May, P.Eng.,
Asst. Regional Waste Manager

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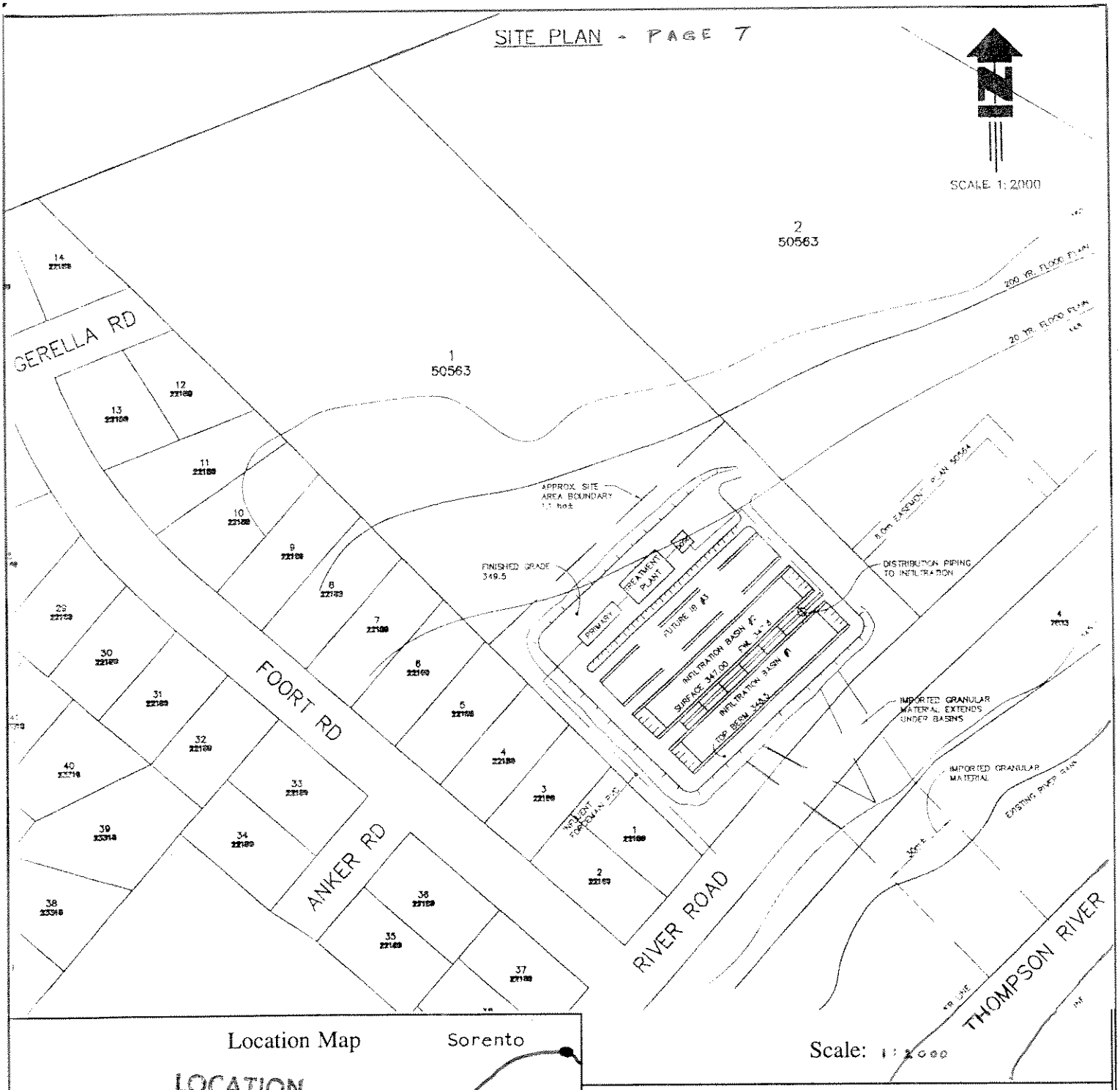

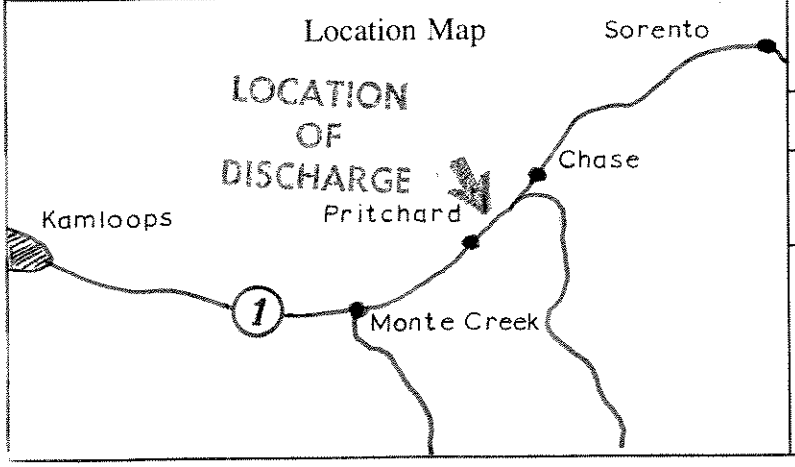

Scale: 1:2000

Permit No.: **PE 14686**

Date: October 8, 1996

Asst. Regional Waste Manager