

Drinking Water Quality Management System

Operational Plan

Municipality of Trent Hills

For the drinking water systems;
Campbellford
Hastings
Warkworth

May 30, 2023

TABLE OF REVISIONS

Rev Level	Date	Section	Change	Approved by
01	July 20, 2009	all	Change approval date to be the same as the resolution date.	
02	Aug 24, 2009	6.1.5 6.2.1 10.0 13.0 16.0 18.0	Add UV dosage/ functions Corrected m to m ³ /day Added Utility Person/ Meter reader Corrected SOP-14 to SOP-13 Corrected SOP-15 to SOP-05 Corrected SOP-13 to SOP-18	
03	July 22, 2010	Schematic A 6.1.1 6.1.4 6.1.6 6.1.9 Schematic B 6.3.1 Schematic C 6.3.2 8.3 9.0 13.0	Replaced with cleared drawing as Appendix 2 Corrected 6,784L/S to 67.84L/s Updated fire hydrants to 215 Added winter sampling description Changes to connected system description updated Replaced with cleared drawing as Appendix 3 Added disinfection after chlorine Replaced with cleared drawing as Appendix 4 Corrected spacing Updated SOP for Backflow prevention Removed Utility Service Inc. 9.5 add ref to ORO & OIC Changed Chlorine supplier to Brenntag	
04	Feb 14, 2011	6.1.4 6.1.6 6.1.9 6.1.9 & 6.2.8 6.2.3 8.0 (8.1,8.2,8.3)	Updated fire hydrants to 221 Changed 12 C to 12 degrees Celsius Changed Chlorine to chlorine. Changed "and result in increased thm etc." to "which results in increased thm levels etc." Updated fire hydrants to 65 Reference document for backflow prevention was incorrect. Changed all references from SOP 18 to TBA	
05	July 27, 2012	1.0 3.0 4.0 6.3.4 8.3 9.0 10.0 13.0 20.0	Insert word 'drinking' Update job titles (throughout document) Change QMS Rep to Operations Manager position Add Warkworth booster pumping station description Remove Low pressure risk Update job title and Organization Chart Add general manager to personnel list Change supplier list to remove CIBA and ITT and add Northland and Xylene Inc. Change the responsibility of QMS rep.	
06	Jan 15, 2013	6.1.4 6.2.3 6.3.3 11.0 13.0 18.0	Updated fire hydrants to 223 Updated fire hydrants to 68 Updated fire hydrants to 46 Collective Agreement- Changed "maintained at the discretion of the Water & Wastewater Operations Manager" to "maintained by the Water & Wastewater Operations Manager" Added Flow Metrix Technical Services and Ken Harris Instrumentation and Control to list of essential suppliers. Procedure- Changed "SOP 13" to "SOP 18"	

Rev Level	Date	Section	Change	Approved by
07	Dec 17, 2013	3.0 4.0 6.1.4 9.1 9.4 10.0 11.0 13.0	Commitment and Endorsement of Operational Plan. Removed Water and Wastewater Operations Manager. Quality Management System Representative. Changed Water and Wastewater Operations Manager to Water Distribution/Water Treatment Plant Head Operator. Updated fire hydrants to 224 Removed Water and Wastewater Operations Manager position from organizational chart. Removed Water and Wastewater Operations Manager position Competencies>removed Water and Wastewater Operations Manager from list. Personnel Coverage> collective agreement>replaced Water and Wastewater Operations Manager with General Manager of Infrastructure Renewal and Public Works Administration. Essential Supplies and Services>changed SGS Lakefield to SGS, changed Dakins Engineering to Genivar. Added D&E Campbell, D&R Water Haulage, McCracken's Water Haulage, TAS Communications, Trent Security Systems, and Ultramar Ltd. to list of Essential Supplies and Services. Change Genivar to WSP Canada Inc. received notice of name change Dec 17 th .	

Rev Level	Date	Section	Change	Approved by
08	Aug 13, 2015	3.0 5.0 6.0 6.1.1 6.1.10 6.2.1 6.2.3 13.0	<p>Commitment and Endorsement of Operational Plan> CAO identified as owner representative rather than owner.</p> <p>Document and Record Control> replaced Certificates of Approval with Municipal Drinking Water License and Drinking Water Works Permit.</p> <p>Drinking Water System>Purpose>changed departments to department.</p> <p>Water Treatment Plant (Campbellford)>removed reference to polymer (coagulant aid).</p> <p>Critical Upstream/Downstream Process >changed 2 fuel stations to 1 fuel station.</p> <p>Water Treatment Plant (Hastings) >removed reference to polymer (coagulant aid).</p> <p>Water Distribution and Piping System (Hastings)>Changed 68 fire hydrants to 72.</p> <p>Essential Supplies and Services>removed entire column detailing Company to reduce duplication. Suppliers are listed in SOP 03 and on form.</p> <p>Removed UV from Hastings system and placed in Campbellford system.</p>	
09	Mar 21, 2017	6.1.4 6.2.3 6.3.3	<p>Water Distribution Piping System(Campbellford) >changed population to 3800 from 3500 to match drinking water system profile.</p> <p>>changed quantity of watermain from 38,703 m to 44 km based on cgis values.</p> <p>Water Distribution Piping System (Hastings) >changed population from 1250 to 1100 to match the drinking water system profile.</p> <p>>changed quantity of watermain from 12.4 km to 15 km based on cgis values.</p> <p>>changed number of hydrants to 76 from 72.</p> <p>Water Distribution Piping System (Warkworth) >changed population from 725 to 800 to match the drinking water system profile.</p> <p>>changed quantity of watermain to 7.6 km from 5.8 km based on cgis values.</p> <p>>changed number of hydrants to 47 from 46.</p>	

Rev Level	Date	Section	Change	Approved by
10	Mar 26, 2018	5.0 6.1.3 6.2.3 9.1 9.2 13.0 20.0	Document and Record Control>Records in the scope of this procedure> added, AWWA Standards referenced in Schedule B of the Municipal Drinking Water Licence. 228 fire hydrants from 224 fire hydrants 78 fire hydrants from 76 fire hydrants Water Treatment and Distribution Organizational Chart > removed Rate Payers and replaced with Municipal Council also identified Municipal Council as Owner. Identified CAO as Owner Representative in the chart. Identified General Manager of Infrastructure Renewal & Public Works Administration and the Water Distribution/Treatment Plant Head Operator as members of Top Management on the chart. Responsibility and Authorities-Owner>Identified Chief Administrative Officer as the Owner Representative. Essential Supplies & Services>added Distribution System Material Management Review>Responsibilities and authorities> removed by competent, independent auditors from end of first sentence. Replaced Top Management with Owner Representative at end of last sentence.	
11	Mar 18, 2019	6.1.1 6.1.4 6.3.3	Water Storage Tanks and Reservoirs > added a description of the new in ground reservoir storage and pumping cells at the Campbellford WTP Monitoring > remove temperature and conductivity Water Distribution and Piping > changed 47 hydrants to 50 hydrants	
12	March 5, 2020	8.1 8.2 8.3 Appendix 2	Removed Backflow prevention TBA Removed Backflow Prevention TBA Removed Commissioning of new watermain Removed Backflow prevention TBA Replaced Campbellford plant schematics with current version.	
13	Feb 23, 2021	1.0 Page 6 6.1.4 6.1.7 6.1.8 13.0	Quality Management System > added version 2.0 Water Storage Tanks and Reservoirs > replaced 40 Harris Street with 75 High Street. Removed raw water flow Spring runoff > removed reference to conductivity monitoring/alarm Upstream spill > removed reference to conductivity monitoring/alarm. Removed reference to conductivity monitoring/alarm Campbellford and Hastings do not require granular polymer, X removed.	

Rev Level	Date	Section	Change	Approved by
14	March 3, 2022	6.1.2 13.0	Water Booster Stations > replaced 40 Harris Street with 75 High Street. Essential Supplies and Service > added Mechanical/Millwright, and Backup Power Supply Maintenance & Repairs to list of essential supplies.	
15	Feb 6, 2023	6.0 6.1.4 6.2.3 6.3.3	Hastings Drinking Water System is now section 6.2, rather than a continuation of 6.1 Campbellford. Warkworth Drinking Water System is now section 6.3 rather than 6.2. Campbellford Water Distribution Piping System> updated hydrants to 238, and services to 1720. Hastings Water Distribution System Piping> updated hydrants to 80, and services to 309. Population to 1600 from 1100. Total km of pipe to 15.3. Warkworth Water Distribution Piping System> updated services to 309 and km of pipe to 7.9.	
16	May 25, 2023	6.0 6.1.4 7.0	Drinking Water System > added Municipality of Trent Hills as operating authority. Campbellford Water Distribution System Piping Updated number of fire hydrant to 243 from 238. Risk Assessment Procedure > added MECP recommended minimum CPPs such as disinfection, filtration, and coagulation are considered during procedure.	

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1.0 Quality Management System

Purpose

The purpose of this Operational Plan is to describe in detail the Quality Management System developed and implemented by the Municipality of Trent Hills for the operation of the drinking water systems in Campbellford, Hastings and Warkworth. The policy and procedures outlined in this Operational Plan are in accordance with the requirements of the Drinking Water Quality Management Standard (DWQMS) Version 2.0.

Scope

The Operational Plan covers all activities and employees associated with the operations and production of safe drinking water for the Municipality of Trent Hills. The Operational Plan has been developed to meet the requirements of the DWQMS and as a requirement under the Ontario Drinking Water Licensing Program directed by The Safe Drinking Water Act. For the purpose of the DWQMS the Municipality of Trent Hills for has been designated as the Owner of the Municipal Drinking Water System.

Related Documents

Drinking Water Quality Management Standard – Element 1
The Safe Drinking Water Act - 2002

2.0 Quality Management System Policy

The Public Works water division is committed to managing the drinking water systems of Campbellford, Hastings and Warkworth on behalf of the Municipality of Trent Hills by providing an efficient and effective system of water mains, treatment facilities and appurtenances all in accordance with the Ontario Drinking Water Protection Regulations and is committed to the continuous improvement of its Drinking Water Quality Management System for the production, treatment and distribution of a safe supply of potable water while striving for the adherence to Provincial regulations and maintaining consumer confidence in the Municipal water supply. Consumer confidence in the drinking water quality shall be achieved through a proactive approach to meet applicable drinking water legislation, regulations and standards. Drinking water quality is ensured by competent employees who are dedicated to providing reliable, safe drinking water to the communities of Campbellford, Hastings and Warkworth.

3.0 Commitment and Endorsement of Operational Plan

In accordance with section 3.0 of the Drinking Water Quality Management Standard, the Chief Administrative Officer (CAO), as the representative of the Owner of the drinking water system for the Municipality of Trent Hills and Top Management of the Water Division, support the implementation and maintenance of a Drinking Water Quality Management System (DWQMS), as documented in this Operational Plan. This commitment by the Owner and Top Management extends beyond agreement in principle to active participation in the development and/or review of policies that promote continual improvement. Endorsement by the Owner and Top Management acknowledges the need for and supports the provision of sufficient resources to maintain the DWQMS.

OWNER

Municipality of Trent Hills
CAO
(Owner Representative)

Date

Top Management

General Manager of Infrastructure
Renewal and Public Works Administration

Water Distribution/Treatment Plant Head Operator

4.0 Quality Management System Representative

The Water Distribution/Treatment Plant Head Operator for the Municipality of Trent Hills was appointed to the role of the Quality Management System Representative (QMS Representative). As the QMS Representative, the Water Distribution/Treatment Plant Head Operator has both the responsibility and authority to:

- Ensure that the processes required by the DWQMS are established, implemented and maintained;
- Ensure that the most current version of documents required by the DWQMS are in use at all time;
- Ensure that all personnel are aware of applicable current regulatory requirements within the operation of the drinking water system;
- Ensure the promotion of awareness and the effectiveness of the DWQMS throughout the operating authority;
- Report to Top Management on the performance of the QMS and any need for improvement.

5.0 Document and Record Control

Purpose

The purpose of this procedure is to describe the method used for the control of documents and records for the Water Division, Municipality of Trent Hills. Proper maintenance of documents and records is critical for conformance with the DWQMS and for compliance with drinking water legislation.

Scope

This procedure is applicable to all data and documentation used or generated during the operations and management of the water treatment and distribution systems.

General

Effective control of the issue and changes to data and documentation is essential to DWQMS. Therefore, the QMS Representative will implement and maintain a system that exercises these controls throughout the water treatment and distribution process. Current issues of documents will be made available at all locations where operations affecting the drinking water system are performed.

Documents in the scope of this procedure are:

- Operational Plan
- Drinking Water Policy
- Standard Operating Procedures relating to the DWQMS
- WTP Operator and Maintenance Manual
- WTP Emergency Response Plans
- WTP and Water Distribution Forms
- Training material for DWQMS
- Water Treatment Process Schematic

Records in the scope of this procedure are:

- Operator Certificates
- Municipal Drinking Water Licence and Drinking Water Works Permit (Licenses and Certificates)
- Laboratory testing results (Internal and External)
- Monitoring records
- Legislative Regulations
- AWWA Standards referenced in Schedule B of Municipal Drinking Water Licence.
- Associated meeting minutes
- Operator log book

Related Documents

Drinking Water Quality Management Standard - Element 5
SOP-09 Document and Record Control

Document Change Control Procedure

The document and records control procedure is outlined in detail in the SOP-09.

6.0 Drinking-Water System

Purpose

The purpose of this procedure is to describe the drinking water system owned by the Municipality of Trent Hills and operated by the Water Division of the Public Works department for the Town of Campbellford, and the Villages of Hastings and Warkworth. The Municipality of Trent Hills is the operating authority for the three drinking water systems. This outline documents a description of the drinking water system as prescribed by the DWQMS.

Scope

The Municipality of Trent Hills has ownership and full command and control of the municipal drinking water system, including the treatment plant, storage and pumping facilities, trunk and distribution water mains, appurtenances and individual water services up to the private property line. The Municipality also owns water meters within the buildings, used as consumption measurement devices for billing purposes.

Responsibilities and Authorities

It is the responsibility of the QMS Representative to ensure that this procedure is kept up-to-date. Any changes to the drinking water system must be changed in accordance with the document control procedures shown in paragraph 5 of this Operational Plan.

Related Documents

Drinking Water Quality Management Standard – Element 6
Operational Plan paragraph 5 Document and Records Control

Procedure

6.1 Campbellford

6.1.1 Water Treatment Plant

The water treatment plant (WTP) is located on the east shore of the Trent River at 58 Saskatoon Ave, Campbellford, Ontario. Originally the water system began with only 2 pumps feeding into the distribution system. Chlorination began around 1907. The conventional treatment plant was constructed in 1964 with upgrades completed in 1996 and 2004. Single intake draw water from the Trent River (surface water) into the low lift pumping area where the raw water is coarse screened and pumped into the plant for full treatment. The conventional treatment process includes coagulation, flocculation, sedimentation, filtration, chlorine and UV disinfection ([see Appendix 2](#)).

Poly aluminum chloride (PACL) is used as the primary coagulant. Chlorine is used for pre-chlorination and secondary disinfection. Chlorine is also used as a primary disinfection for adeno virus. Ultra Violet (UV) is the primary disinfection for all other pathogens. The other chemical used is sodium silicate (corrosion control). The current rated capacity of the plant is 6,800m³/day. The Permit to Take Water (PTTW) currently authorizes water taking at 5,862m³/d (67.84 L/s).

6.1.2 Water Storage Tanks and Reservoirs

In ground reservoir storage and pumping cells located approximately 100 meters north of the existing water treatment plant were brought on line in November 2018. Each of the 2 pumping cells (7.25 m x 6.3 m x 6.5 m deep) includes provisions to include 3 vertical turbine pumps (2 high lift pumps and one backwash pump).

The maximum level in the reservoir represents a depth of approximately 3.65 m in the storage cells and 5.15 m on the pumping wells of the reservoir. This equates to a total storage volume of approximately 1,900 m³ in the reservoir, approximately 1,800 m³ of which would be usable based on maintaining minimum pump submergence in the pumping cells.

Each of the reservoir storage cells (7.25 m x 28.20 m x 3.9 m internal depth) are equipped with an internal baffle wall running north south. The baffle walls are intended to promote a serpentine flow through the reservoir to minimize short circuiting of the treated water flow.

Treated water is stored at an elevated storage tank located at 75 High Street in Campbellford. Sodium hypochlorite is used at this location to maintain free chlorine residual levels in the distribution system. Storage is used to supplement supply during times of high water demand and in emergency situations such as firefighting. The water storage capacity in the storage tank is 5230 m³ (5.2ML).

6.1.3 Water Booster Stations

There are three individual pressure zones in Campbellford. A booster pumping station is located at 75 High Street to maintain adequate system pressure in the adjacent subdivision. A pressure reducing valve chamber is located at the southern boundary of Campbellford that reduced pressure on the remaining 7.5 km of piping to the Warkworth Penitentiary. This pressure-reducing valve ensures an end pressure of approximately 70 psi. The majority of the town is supplied from the WTP's high lift pumping area or from the reservoir if the pumps are cycled off. Post-chlorination is done before the water leaves the plant

6.1.4 Water Distribution Piping System

The water distribution system serves a population of 3,800 in the core area. An additional population of 600 is also served at the Warkworth Penitentiary. The system consists of a total of 44 km of piping made up of ductile iron, cast iron, PVC and asbestos cement. 1,720 individual water services and 243 fire hydrants.

6.1.5 Monitoring

The following parameters are monitored on a continuous basis at the WTP:

- Flow
- pH
- Turbidity
- Chlorine dosage and residuals
- Pressure
- CT (concentration over time) & log removal
- Water storage level
- UV dosage and functions

6.1.6 Raw Water Supply

The Campbellford WTP draws its water from the Trent River through a 450 mm x 450 mm square opening extending 2.0 m through the canal wall. The invert of the intake is 2.75 m below the top of the canal wall. Pre-chlorination for zebra mussel control is initiated when the water temperature reaches 12 degrees Celcius. Raw water chlorine is sampled from the raw water wet well. The chlorine analyzer is located in the lab. When water temperature is below 12 degrees C pre-chlorination takes place at the low lift header. Chlorine is then sampled from the inlet chamber. Raw water quality has been characterized as having a moderate colour, low to moderate alkalinity and hardness, and moderate levels of organic carbons and nitrogen. The quality of the Trent River changes due to seasonal fluctuations in temperature and upstream activities including, but not limited to, the spring run-off, rainfall events, storm water runoff, agricultural activities and spills. Inputs from upstream sources can increase the amount of nutrients that enter the water course. Increased nutrient loading can result in increased algae growth and the potential for the creation of taste and odour concerns at the water treatment plant. Storm-water runoff can also cause rapid fluctuations in turbidity levels entering the plant.

6.1.7 General Characteristics of Raw water

A brief description of the water characteristics as outlined below in the table:

Parameter	Units	Common Low Value	Normal Value	Common High Value
Turbidity	NTU	0.6	0.6	3.5
Colour	TCU	0	13	90
Temperature	°C	0	---	24

Parameter	Units	Common Low Value	Normal Value	Common High Value
Hardness	mg/L CaCO ₃	85.5	105	122
Dissolved Organic Carbon	µg/L	4.0	5.0	5.6
Alkalinity	µg/L	83	90	93
Sulphate	µg/L	8.7	8.5	11.2
Sodium	µg/L	5.6	6.0	9.58
Geosmin	ng/L	3	8	15
MIB	ng/L	3	6	15
E.coli	count/100 ml		15	200

6.1.8 Connections to other Drinking Water system

There are no connections to other drinking water systems in Campbellford. However, the Campbellford WTP supplies water to Ferris Provincial Park, south of Campbellford and to the Warkworth Penitentiary, these are considered to be customers rather than connections. A double back-flow prevention device has been installed prior to the system entering the Ferris park.

6.1.9 Historical, seasonal or common event-driven fluctuations

Type of Fluctuation	Description	Operational Challenges/ Threats
Historical Variation	Introduction of zebra mussels into source water have decreased the level of turbidity. The penetration of sunlight further into the water column allows deep-water algae to proliferate.	Algae and zebra mussel decay can cause geosmin and 2MIB formation. These are known to cause taste and odour complaints.. This has been addressed by the use of GAC
Seasonal Variation	Spring Run off	The treatment of the drinking water would need to be altered to adjust for the increased turbidity. Increases in coagulant and chlorine levels.
Seasonal Variation	Increase water temperature	Higher summer water temperature can result in elevated algae growth in the river. This increase of blooms being drawn into the intake can cause elevated turbidity and TOC levels resulting in heavier usage of chlorine which results in increased THM levels etc.

Type of Fluctuation	Description	Operational Challenges/ Threats
Seasonal Fluctuation	During the summer months there is a water use increase at the Warkworth Penitentiary.	Water use by-law is in effect but not enforced. Small increase of only 5%
Event Driven Fluctuation	Frazil ice can occur on very cold and clear winter nights before the river freezes over. Low water temp can affect the performance of the coagulation/flocculation process.	The ice can clog the intake pipes during the night. To prevent the clogging of the intake pipes it may be necessary to reduce plant flow setting. 6" flush line to remove frazil ice from intake
Event Driven Fluctuation	Upstream spill.	This would be apparent through a visual inspection or through a notification. It is unlikely that the fuel would contaminate the intakes due to the depth of the intake.
Event Driven Fluctuation	Flooding, heavy rainfall or spring runoff will all cause increases in turbidity.	The treatment of the drinking water would need to be altered to adjust for the increased turbidity. Increases in coagulant and chlorine levels.

6.1.10 Critical Upstream/Downstream processes

There is a fuel station located immediately upstream of the system intake. The raw water intake is 2.75m below the wall level and fuel is less dense than water, therefore the fuel will float on the water surface.

6.2 Hastings

6.2.1 Water Treatment Plant

The WTP is located on the north shore of the Trent River at 188 Front St West, Hastings, Ontario. Originally, the water system began with only 2 pumps feeding into the distribution system. Chlorination began around 1962, the conventional treatment plant was constructed in 1983 with upgrades completed in 2004. A single intake draws water from the Trent River (surface water), one kilometer downstream of Rice Lake into the low lift pumping area where the raw water is coarse screened and pumped into the plant for full treatment. The conventional treatment process includes coagulation, flocculation, sedimentation, filtration and chlorine disinfection ([see](#) Appendix 3).

Poly aluminum chloride (PACL) is used as the primary coagulant. Chlorine is used for pre-chlorination, primary and secondary disinfection. The other chemical used is sodium silicate (corrosion control). The current rated capacity of the plant is 1961 m³/day. The PTTW currently authorizes water taking at 1961 m³/day (22.7 L/s).

6.2.2 Water Storage Tanks and Reservoirs

Treated water is stored at a water standpipe located at 45 Division Street East in Hastings, Ontario. The standpipe consists of a Tideflex[®] mixing system that allows water to be added at to the top of the standpipe and removed from the lower portion, which maintains adequate secondary disinfection levels in the distribution system. Storage is used to supplement supply during times of high water demand and in emergency situations such as firefighting. The water storage capacity in the system is 499 m³ (0.49ML).

6.2.3 Water Distribution Piping System

The water distribution system serves a population of 1,600 in the core area. This includes a population of 150 in the Trentview Estates Subdivision. The water distribution system consists of a total of 15.3 km of piping made up of ductile iron, cast iron, PVC and asbestos cement with sizes ranging from 50 mm to 250 mm with 80 fire hydrants in service, and 713 individual services.

6.2.4 Monitoring

The following parameters are monitored on a continuous basis at the WTP:

- Flow
- Turbidity

- Chlorine dosage and residuals
- Pressure
- Water Storage levels
- CT & Log removal level

6.2.5 Raw Water Supply

The Village of Hastings WTP obtains its raw water from the Trent River and is located approximately one kilometer downstream of Rice Lake. Rice Lake is a shallow, eutrophic lake that supports extensive aquatic vegetation and algae growth. The Hastings Water Treatment Plant draws through a 300 mm opening located 30 meters from the north shoreline. Pre-chlorination for zebra mussel control is initiated when the water temperature reaches 12°C. A raw water chlorine analyzer is located on the low lift pump discharge header. The quality of the Trent River changes due to seasonal fluctuations in temperature and upstream activities including, but not limited to, the spring run-off, rainfall events, storm water runoff, agricultural activities and spills. Inputs from upstream sources can increase the amount of nutrients that enter the water course. Increased nutrient loading can result in increased algae growth and the potential for the creation of taste and odour concerns at the water treatment plant. Storm-water runoff can also cause rapid fluctuations in turbidity levels entering the plant.

6.2.6 General Characteristics of Raw water

A brief description of the water characteristics as outlined below in the table:

Parameter	Units	Common Low Value	Normal Value	Common High Value
Turbidity	NTU	0.18	---	15.2
Colour	TCU	0		26
Temperature	°C	0	---	24
Hardness	mg/L CaCO ₃	100	122	134
Dissolved Organic Carbon	µg/L	3.7	5.7	7.9
Alkalinity	µg/L	88	102	118
Sulphate	µg/L	8.0	11.0	15.0
Sodium	µg/L	6.0	7.0	8.0
Geosmin	ng/L	3	5	7
MIB	ng/L	3	3	3
E.coli	count/100 ml	0-10	---	11-500

6.2.7 Connections to other Drinking Water System

The Hastings WTP supplies water to Trentview Estates. This subdivision is owned and maintained by the Township of Asphodel-Norwood, west of Hastings. A water meter is installed at the property boundary and is owned by the Municipality of Trent Hills.

6.2.8 Historical, seasonal or common event-driven fluctuations

Type of Fluctuation	Description	Operational Challenges/ Threats
Historical Variation	Introduction of zebra mussels into source water have decreased the level of turbidity. The penetration of sunlight further into the water column allows deep-water algae to proliferate.	Algae and zebra mussel decay can cause geosmin and 2MIB formation. These are known to cause taste and odour complaints. This has been addressed by the use of GAC
Seasonal Variation	Spring run off	The treatment of the drinking water would need to be altered to adjust for the increased turbidity. Increases in coagulant and chlorine levels.
Seasonal Variation	Increase water temperature	Higher summer water temperature can result in elevated algae growth in the river. This increase of blooms being drawn into the intake can cause elevated turbidity and TOC levels resulting in heavier usage of chlorine, which results in increased THM levels etc.
Event Driven Fluctuation	Low water temp can affect the performance of the coagulation/flocculation process.	Leads to increased Clarifier and filter turbidity levels.
Event Driven Fluctuation	Upstream spill.	This would be apparent through a visual inspection or through a notification. It is unlikely that the fuel would contaminate the intakes due to the depth of the intake.
Event Driven Fluctuation	Flooding, heavy rainfall will all cause increases in turbidity.	The treatment of the drinking water would need to be altered to adjust

		for the increased turbidity. Increases in coagulant and chlorine levels.
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6.2.9 Critical Upstream/Downstream processes

None

6.3 Warkworth

6.3.1 Water Treatment Plant

The plant is located on the east shore of the Burnley Creek at 140 Banta Road, Warkworth, Ontario. The original plant was constructed in 1966 and placed into service in 1967. The system began with conventional treatment to feed into the distribution system. In 1992, the water treatment system was upgraded to improve the water quality and to accommodate population growth. A single intake draws water from the Burnley Creek (surface water) into the low lift pumping area where the raw water is pumped into the plant for full treatment. The conventional treatment process includes coagulation, flocculation, sedimentation, filtration and chlorine disinfection ([see](#) Appendix 4).

Poly aluminum chloride (PACL) is used as the primary coagulant. Chlorine is used for primary and secondary disinfection. Polymer (coagulant aid) is used continuously. The current rated capacity of the plant is 900 m³/day. The PTTW currently authorizes water taking at 900 m³/d (10.4 L/s).

6.3.2 Water Storage Tanks and Reservoirs

Treated water is stored at an underground reinforced concrete storage tank located 120 m north of the intersection of Church Street and Main Street in a wooded area. Storage is used to supplement supply during times of high water demand and in emergency situations such as firefighting. The water storage capacity in the system is 506 m³ (0.506 ML).

6.3.3 Water Distribution Piping System

The water distribution system serves a population of 660 in the core area. The system consists of a total of 7.9 km of piping made up of ductile iron, cast iron, PVC and asbestos cement with 309 individual water services and 50 fire hydrants.

6.3.4 Water Booster Stations

There are two individual pressure zones in Warkworth. A booster pumping station is located at 24 old Hastings Road to maintain adequate system pressure in the adjacent subdivision.

6.3.5 Monitoring

The following parameters are monitored on a continuous basis at the WTP:

- ◆ Flow,
- ◆ Turbidity
- ◆ Chlorine residuals
- ◆ CT & log removal
- ◆ Water storage level

6.3.6 Raw Water Supply

The Village of Warkworth WTP obtains its raw water from Burnley Creek. Burnley Creek originates just west of County Road 45 and flows northeast for approximately 22 km through the Village of Warkworth and eventually drains into the Trent River. The water quality of Burnley Creek changes from season to season. Specifically, the turbidity and organic loading increase during the spring freshet and extended storm events.

6.3.7 General Characteristics of Raw water

A brief description of the water characteristics as outlined below in the table:

Parameter	Units	Common Low Value	Normal Value	Common High Value
Turbidity	NTU	0.66	2.53	30.6
Colour	TCU	5	35	389
Temperature	°C	0.7	10	21
Hardness	mg/L CaCO ₃	169	219	256
Dissolved Organic Carbon	µg/L	2.4	4.1	7.9
Alkalinity	µg/L	140	195	225
Sulphate	µg/L	9.7	15.1	21.4
Sodium	µg/L	4.29	5.86	7.25
Geosmin	ng/L	3	3	3
MIB	ng/L	3	3	6
E.coli	count/100 ml	0-10	-	11-500

6.3.8 Connections to other Drinking Water system

None

6.3.9 Historical, seasonal or common event-driven fluctuations

Type of Fluctuation	Description	Operational Challenges/ Threats
Seasonal Variation	Fluctuations of the water quality is constant, especially after heavy rainfall events and during spring run off.	Turbidity, colour and bacterial concentrations increase. The water plant staff handle these fluctuations and make appropriate adjustments. These fluctuations may affect the demand of chlorine within the contact chamber.
Seasonal or event driven Variation	Chemical contamination may occur due to surrounding land use (agricultural)	These fluctuations may affect the demand of chlorine within the contact chamber.
Seasonal Fluctuation	During the summer months there is a slight water use increase.	Water use by-law is in effect but not enforced.
Event Driven Fluctuation	Burnley creek becomes ice covered over the winter. In the spring the nitrogen content is higher than normal and affects the free chlorine residual	The free chlorine residual is diminished; the operator will add additional chlorine to boost free chlorine residual this however increases the total chlorine significantly.
Event Driven Fluctuation	Flooding, heavy rainfall or spring runoff will all cause increases in turbidity.	The treatment of the drinking water would need to be altered to adjust for the increased turbidity. Increases in coagulant and chlorine levels.

6.3.10 Critical Upstream/Downstream processes

None

7.0 Risk Assessment Procedure

Purpose

The purpose of the risk assessment procedure is to describe the method used for the Municipality of Trent Hills water system to analyze risks associated with the drinking water system. This includes a process-based system for risk identification and risk assessment, Critical Control Point (CCP) and CCP threshold limits. MECP recommended minimum CPPs such as disinfection, filtration, and coagulation are considered during procedure.

Scope

This procedure is applicable to the risk identification, risk assessment and CCP in the drinking water system including treatment, storage, pumping and distribution.

Related Document

Drinking Water Quality Management Standard -Element 7
SOP-01 Risk Assessment
Risk Assessment Matrix spreadsheets

Procedure

The risk assessment procedure is outline in detail in SOP-01.

8.0 Risk Assessment Outcomes Procedure

Purpose

The purpose of this procedure is to detail the outcomes from the risk analysis procedure in paragraph 8 of this Operational Plan. The results include a list of ranked hazards with appropriate control measures, control limits for CCP's, monitoring methods and method used for recording and reporting deviation from CCP limits.

Scope

This procedure is applicable to the risks identified by the risk analysis process as outlined in paragraph 7 of this Operational Plan, which covers the drinking water system including treatment, storage, pumping and distribution.

Related Documents

Drinking Water Quality Management Standard - Element 8
SOP-01 Risk Assessment

Procedure

Once a drinking water risk has been defined in paragraph 7 as a CCP it shall be monitored and controlled according to the individual standard operating procedure (SOP). The SOP shall include a description of the associated hazards and risk of the CCP, establish a critical control limit, define procedures to monitor the CCP, document the procedure for a deviation and the associated reports required for a deviation.

If a hazardous event is not considered a CCP then the method to control the hazardous event must be documented on the Risk Analysis Matrix (Appendix to SOP-01).

8.1 Campbellford

The following drinking water risks have been identified as a Critical Control Point:

- | | |
|----------------------------------|--------|
| ▪ Loss of Coagulant | SOP-17 |
| ▪ Primary Disinfection failure | SOP-14 |
| ▪ Secondary Disinfection Failure | SOP-15 |
| ▪ High Filter Turbidity | SOP-16 |

8.2 Hastings

The following drinking water risks have been identified as a Critical Control Point:

- | | |
|----------------------------------|--------|
| ▪ Loss of Coagulant | SOP-17 |
| ▪ Primary Disinfection failure | SOP-14 |
| ▪ Secondary Disinfection Failure | SOP-15 |
| ▪ High Filter Turbidity | SOP-16 |

8.3 Warkworth

The following drinking water risks have been identified as a Critical Control Point:

- | | |
|----------------------------------|--------|
| ▪ Loss of Coagulant | SOP-17 |
| ▪ Primary Disinfection failure | SOP-14 |
| ▪ Secondary Disinfection Failure | SOP-15 |
| ▪ High Filter Turbidity | SOP-16 |

9.0 Organizational Structure, Roles, Responsibilities and Authorities

Purpose

The purpose of this procedure is to outline the organizational structure of the drinking water system. It is also to define the roles, responsibilities and authorities used to ensure the drinking water system is adequate.

Scope

This procedure is applicable to the outlined roles and responsibilities within the Operational Plan governed by the DWQMS. This covers the entire water treatment and distribution process

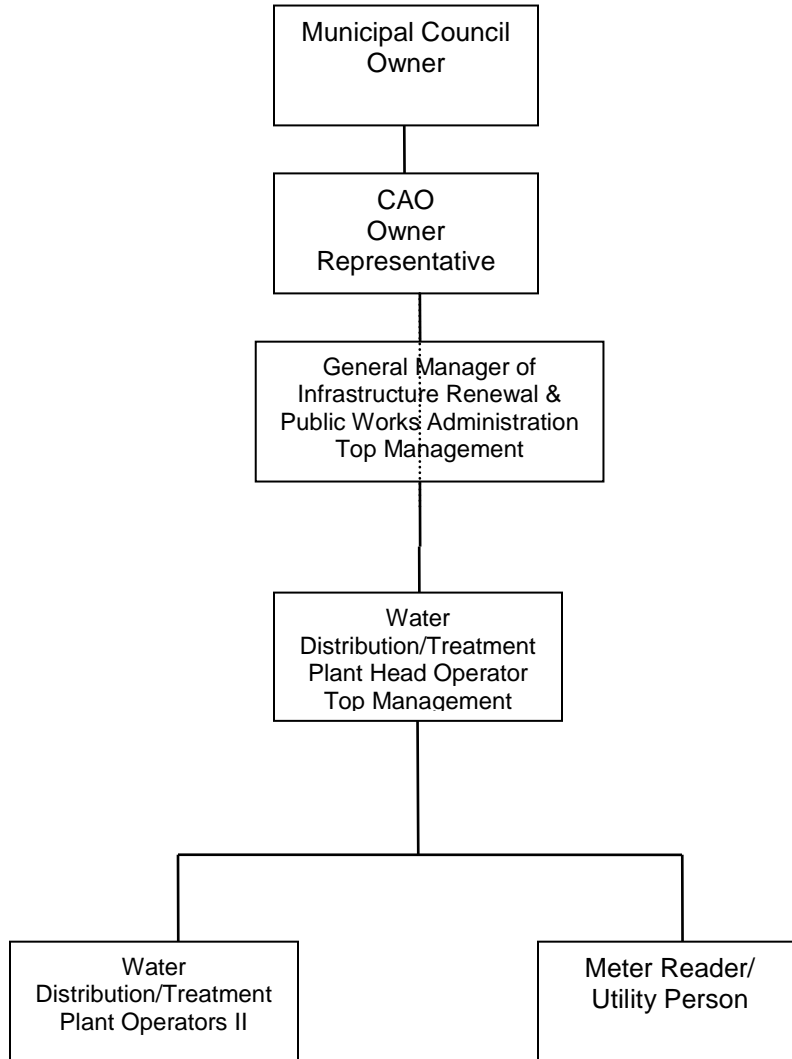
Responsibilities and Authorities

The QMS Representative is responsible to ensure that the roles and responsibilities outlined in this procedure are reviewed annually to ensure accuracy. This is usually completed as part of the Internal Audit procedure in paragraph 19.0 but may be updated as result of organizational or staff changes.

Related Documents

Drinking Water Quality Management Standard - Element 9
Municipality of Trent Hills Organizational Chart
SOP-02 Personnel Coverage

9.1 Water Treatment and Distribution Organizational Chart



9.2 Responsibility and Authorities - Owner

9.2.1 Chief Administrative Officer – Owner Representative

- To manage operate, maintain, replace and rehabilitate the water system facilities of Trent Hills;
- Approving an annual budget;
- Approving annual water rates;
- Approving 5 and 10-year capital budget predictions;
- Establishing bylaws and policies.

9.3 Responsibility and Authority – General Manager of Infrastructure Renewal and Public Works Administration

The General Manager of Infrastructure Renewal & Public Works Administration as the operating authority for the Municipality of Trent Hills Water Division is responsible to operate, maintain and improve the municipal drinking water system. All operating and management staff directly responsible for the water system are employed by the Municipality of Trent Hills.

9.4 Responsibility and Authorities - Top Management

Top Management is described by the DWQMS as a person, persons or group of people at the highest level within an operating authority that makes decisions respecting the QMS and recommendations to the Owner respecting the drinking water system

It is the responsibility of Top Management to demonstrate a commitment to the implementation of the DWQMS by:

- Ensuring that the QMS is in place and meets the DWQMS.
- Ensuring that the Operating Authority is aware of applicable legislations and regulations.
- Communication according to paragraph 12.0.
- Participation in the Management Review as per paragraph 20.0.
- Determine, obtain or provide the resources needed to maintain and continually improve the QMS.
- To provide annual budget for training, attendance at conferences, workshops, seminars.

Top Management consists of the following persons in Municipality of Trent Hills.:

- General Manager of Infrastructure Renewal and Public Works Administration
- Water Distribution/Treatment Plant Head Operator

9.5 Responsibility and Authorities - Operational Management and Staff

A detailed description of the key responsibilities and authorities of the Operational and Management Staff are held on file with the Municipal human resources office. The Overall Responsible Operator (ORO) and the Operator in Charge (OIC) duties and responsibilities are described in SOP-02.

10.0 Competencies

Purpose

The purpose of this procedure is to describe the competencies of personnel whose job activities directly affect the quality of the drinking water.

Scope

This procedure applies to the personnel identified by this procedure as personnel whose job can directly affect the quality of the drinking water of Campbellford, Hastings and Warkworth.

Related Documents

Drinking Water Quality Management Standard - Element 10
SOP-02-Personal Coverage
SOP-11 Satisfying Competencies.

Procedure

The following personnel perform duties that directly affect the quality of the drinking water. The competencies are described in SOP-11.

- General Manager of Infrastructure Renewal & Public Works Administration
- Water Distribution/Treatment Plant Operator (Level I II III)
- Water Distribution/Treatment Plant Head Operator
- Utility Person/ Meter Reader

10.1 Satisfying competencies

10.1.1 The detailed procedure describing competencies for employees whose job directly affects the drinking water is outlined in SOP-11.

11.0 Personnel Coverage

Purpose

The purpose of this procedure is to document the procedure used at Municipality of Trent Hills, Water Division to ensure that sufficient personnel meeting the outline competencies in paragraph 10 are available to perform duties that directly affect the drinking water quality system.

Scope

This procedure applies to the water division for the Municipality of Trent Hills

General

The Municipality of Trent Hills employs licensed operators, all of whom are required to have and maintain licenses (distribution or treatment) according to the Certification of Drinking Water System Operators and Water Quality Analysts (O. Reg. 128/04).

Call out for additional staff to cover emergency or sick time is done as per the Water Division on-call Schedule.

Related Documents

Drinking Water Quality Management Standard - Element 11
Operational Plan paragraph 10, Competencies
SOP-02 Personal Coverage

Procedure

The detailed procedure to ensure that sufficient competent personnel are available for duties that directly affect drinking water is contained in SOP-11.

Collective Agreement

Employment for the WTP and distribution system is according to the terms and conditions of a collective agreement between Municipality of Trent Hills and CUPE Local 3051. During a strike/lock-out business continuity is maintained by the General Manager of Infrastructure Renewal and Public Works Administration.

12.0 Communication

Purpose

The purpose of this procedure is to identify the method for communicating the Quality Management System to all stakeholders.

Scope

The procedure applies to the communication of relevant aspects of the Operational Plan between Top Management and the Owner, Operating Authority Personnel, suppliers and the public.

Related Documents

Drinking Water Quality Management Standard – Element 12
SOP-08 Communication

Procedure

The communication procedure is outline in detail in the SOP-08.

13.0 Essential Supplies and Services

Purpose

The purpose of this procedure is to identify essential suppliers and services that may affect quality of drinking water and to ensure availability of those supplies and services.

Scope

This procedure applies to the following essential supplies and services:

Supply or Service	Hastings	Campbellford	Warkworth
Poly Alum Chloride, (coagulant)	X	X	X
Sodium Silicate (corrosion inhibitor)	X		
ENV 24P10 (corrosion inhibitor)		X	
Chlorine cylinders	X	X	
Granular polymer (coagulant aid)			X
Liquid Chlorine		X	X
SCADA services	X	X	X
Testing Services	X	X	X
UV Suppliers		X	

Supply or Service	Hastings	Campbellford	Warkworth
Instrumentation/PLC	X	X	X
Water Quality Testing Equipment Calibration	X	X	X
Flow Meter Calibration	X	X	X
Potable Water Haulage	X	X	X
On-Call Communications	X	X	X
Backup Power Generator Fuel	X	X	X
Distribution System Materials	X	X	X
Mechanical/Millwright	X	X	X
Backup Power Generator Maintenance & Repairs	X	X	X

Related Documents

Drinking Water Quality Management Standard – Element 13
 SOP-13 Chemical Deliveries to the WTP
 SOP-03 Essential Supplies and Services

Critical supplies and services list

The procedure by which the Water Division ensures the quality and availability of essential supplies and services is outlined in SOP-03.

14.0 Review and Provision of Infrastructure

Purpose

The purpose of this procedure is to outline the method used at the Municipality of Trent Hills will annually review the infrastructure of the drinking water systems (Campbellford, Hasting & Warkworth). This review shall determine if the infrastructure is adequate to operate and maintain the drinking water system.

Scope

This procedure applies to the infrastructure relating to the provision of drinking water.

Related Documents

Drinking Water Quality Management Standard - Element 14
 Paragraph 20 Management Review

SOP-12 DWQMS Infrastructure

Procedure

The infrastructure is reviewed annually during the management review process outlined in Paragraph 20 of the Operational Plan, additional details on the review and provision of infrastructure are provided in SOP-12.

15.0 Infrastructure Maintenance, Rehabilitation and Renewal

Purpose

The purpose of this procedure is to summarize the infrastructure capital program used by the Municipality of Trent Hills in order to maintain the drinking water system's infrastructure maintenance, rehabilitation and renewal programs for Campbellford, Hastings and Warkworth drinking water systems.

Related Documents

Drinking Water Quality Management Standard - Element 15
SOP-12 DWQMS Infrastructure

Procedure

A summary of the Municipality of Trent Hills, Water Division infrastructure maintenance program of rehabilitation and renewal is described in SOP-12.

16.0 Sampling, Testing and Monitoring

Purpose

The purpose of the following procedure is to describe the sampling and monitoring and testing activities for the treatment and distribution system to ensure compliance to applicable drinking water legislation and for the provision of safe drinking water.

Scope

This procedure is applicable to the water treatment plant and water distribution operations.

Related Documents

Drinking Water Quality Management Standard – Element 16
Water Treatment Plant Operator and Maintenance Manual
Water Treatment Plant Laboratory Analysis Book

SOP-04 Sampling and Monitoring
SOP 05 Procedure to Respond to Adverse Water Quality Result

Procedure

The procedure developed to meet the requirements of Element 16; Sampling, Testing and Monitoring are described in SOP-04.

17.0 Measuring & Recording Equipment Calibration Maintenance

Purpose

The purpose of this procedure is to describe the process used to calibrate and maintain measuring and recording devices used within the water treatment process.

Scope

This procedure is applicable to the measuring and recording devices used by the Water Treatment Plant for monitoring of raw, in-process and potable drinking water from intake, through treatment, storage, pumping and distribution.

Related Documents

Drinking Water Quality Management Standard – Element 17
SOP-04 Sampling and Monitoring Procedure
Instrumentation manuals

Procedure

The procedure that describes activities for the calibration and maintenance of measurement and recording equipment is outlined in SOP-04.

18.0 Emergency Management

Purpose

This purpose of this procedure is to describe the process to maintain a state of emergency preparedness for the drinking water system.

Scope

This procedure shall include all potential emergency situations or service interruptions for the water treatment and water distribution system for the Municipality Trent Hills.

Related Documents

Drinking Water Quality Management Standard – Element 18
SOP-18 Emergency Preparedness and Response
Municipal Emergency Plan for Municipality of Trent Hills

Procedure

The emergency management procedure is outlined in SOP-18.

19.0 Internal Audit

Purpose

The purpose of the Internal Audit procedure is to describe the method used at the Municipality of Trent Hills, water division to verify conformance to the Operational Plan and to the Drinking Water Quality Management Standard. Internal auditing is a tool to be used to be proactive and continually improve the water quality management system.

Scope

This procedure is applicable to the Municipality of Trent Hills Drinking Water System operations that are described within this Operational Plan.

Related Documents

Drinking Water Quality Management Standard – Element 19
Continual Improvement Paragraph 21 of Operational Plan
SOP-07 Internal Audit Procedure

Procedure

The Internal Audit Procedure is outlined in detail in the SOP-07.

20.0 Management Review

Purpose

The purpose of this management review procedure is to outline the method used at the Municipality of Trent Hills, water division to evaluate the continuing suitability, adequacy and effectiveness of the Drinking Water Quality Management System.

Scope

The scope of this procedure includes management activities, water treatment plant operations and water distribution activities identified in the Operational Plan.

Responsibilities and Authorities

QMS Representative is responsible to the General Manager of Infrastructure Renewal & Public Works Administration, Municipality of Trent Hills for ensuring that detailed and comprehensive reviews are carried out.

QMS Representative is responsible to the General Manager of Infrastructure Renewal & Public Works Administration, Municipality of Trent Hills for ensuring that the necessary documentation and records are maintained and made available for review by Management.

The QMS Representative is responsible to communicate the results of the management review to Owner Representative.

Related Documents

Drinking Water Quality Management Standard – Element 20
Operational Plan Paragraph 21 Continual Improvement
SOP-06 Management Review

Procedure

The management review procedure is outline in detail in the SOP-06.

21.0 Continual Improvement

Purpose

The purpose of this procedure is to describe the system used at the Municipality of Trent Hills to continually improve the effectiveness of the DWQMS by initiating timely corrective action on deficiencies identified in the drinking water QMS and to take preventative action where potential problems are identified.

Scope

This procedure applies to the correction of actual or potential non-conformities in the drinking water QMS, or other systemic problems affecting the drinking water quality.

Related Documents

Drinking Water Quality Management Standard – Element 21
SOP-10 Continual Improvement
Corrective Action Request
Corrective Action Log

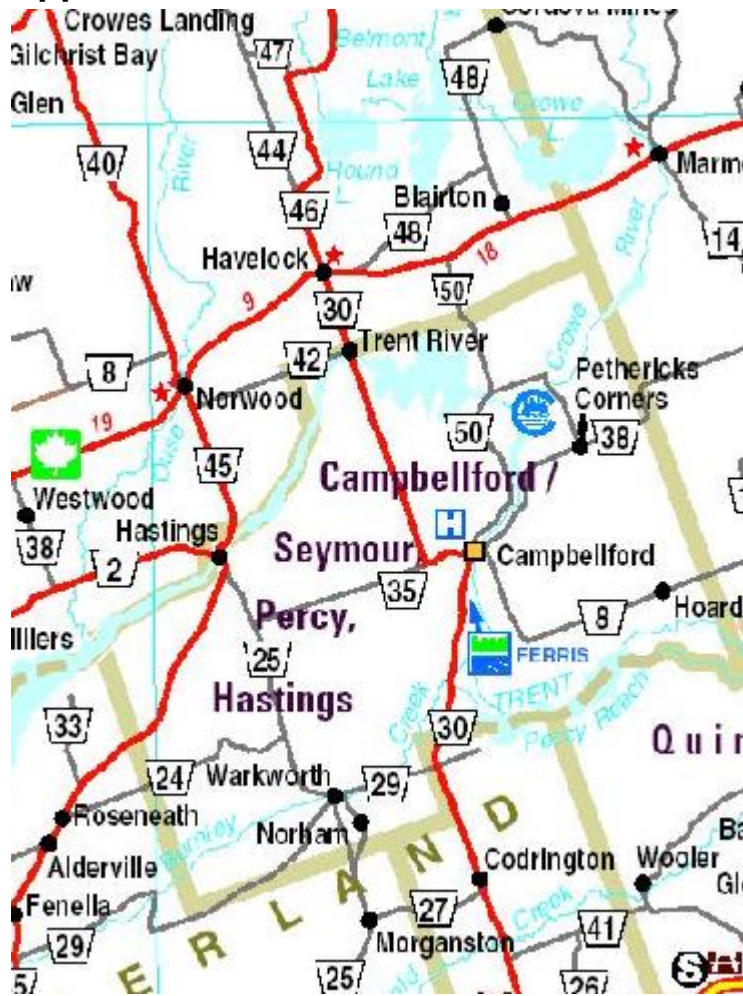
Procedure

The corrective action (Continual Improvement) procedure is outline in detail in the SOP-10.

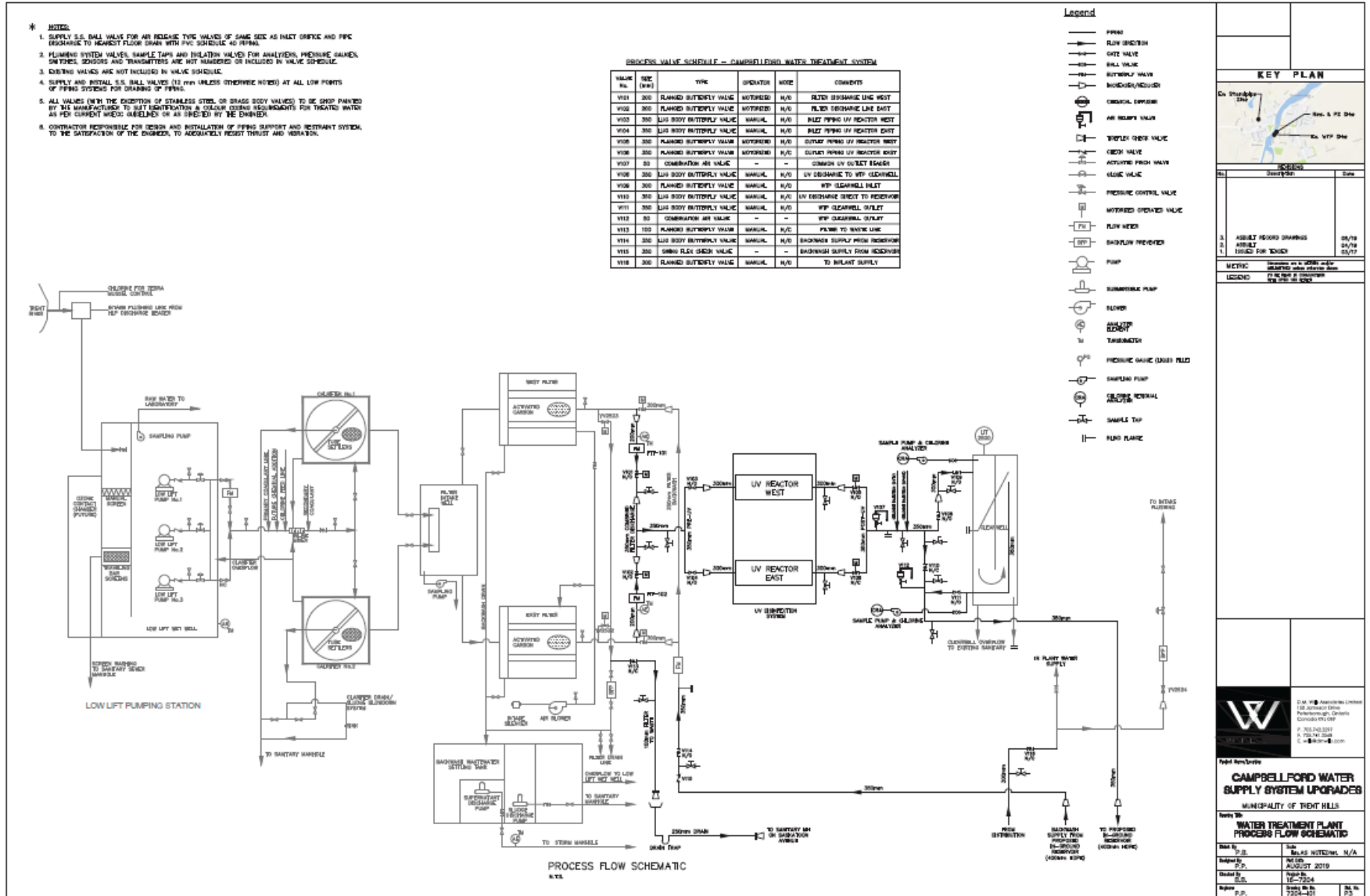
22.0 DEFINITIONS

2MIB	2 methylisorbeneol
Alum	Aluminum Sulphate
C	Celsius
CaCO ₃	Calcium carbonate
CAR	Corrective Action Request
CCP	Critical Control Point
CUPE	Canadian Union of Public Employees
DWQMS	Drinking Water Quality Management Standard
GAC	Granular Activated Carbon
km	Kilometer
L	Litre
m	metre
M ³	Cubic metre
ML	Megalitre
ML/day	mega litre per day
MOE	Ministry of Environment
NTU	Nephelometric Turbidity Unit
OIC	Operator -in-Charge
ORO	Overall Responsible Operator
PACL	Poly Aluminum Chloride
PSI	Pounds per square inch
QMS	Quality Management System
SCADA	Supervisory Control and Data Acquisition
SOP	Standard Operating Procedure
TCU	True Colour Unit
THM	Trihalomethane
TOC	Total Organic Carbon
Ug/L	Microgram per litre
UV	Ultra Violet
WTP	Water Treatment Plant

Appendix 1



Appendix 2 Water Treatment Plant – Campbellford

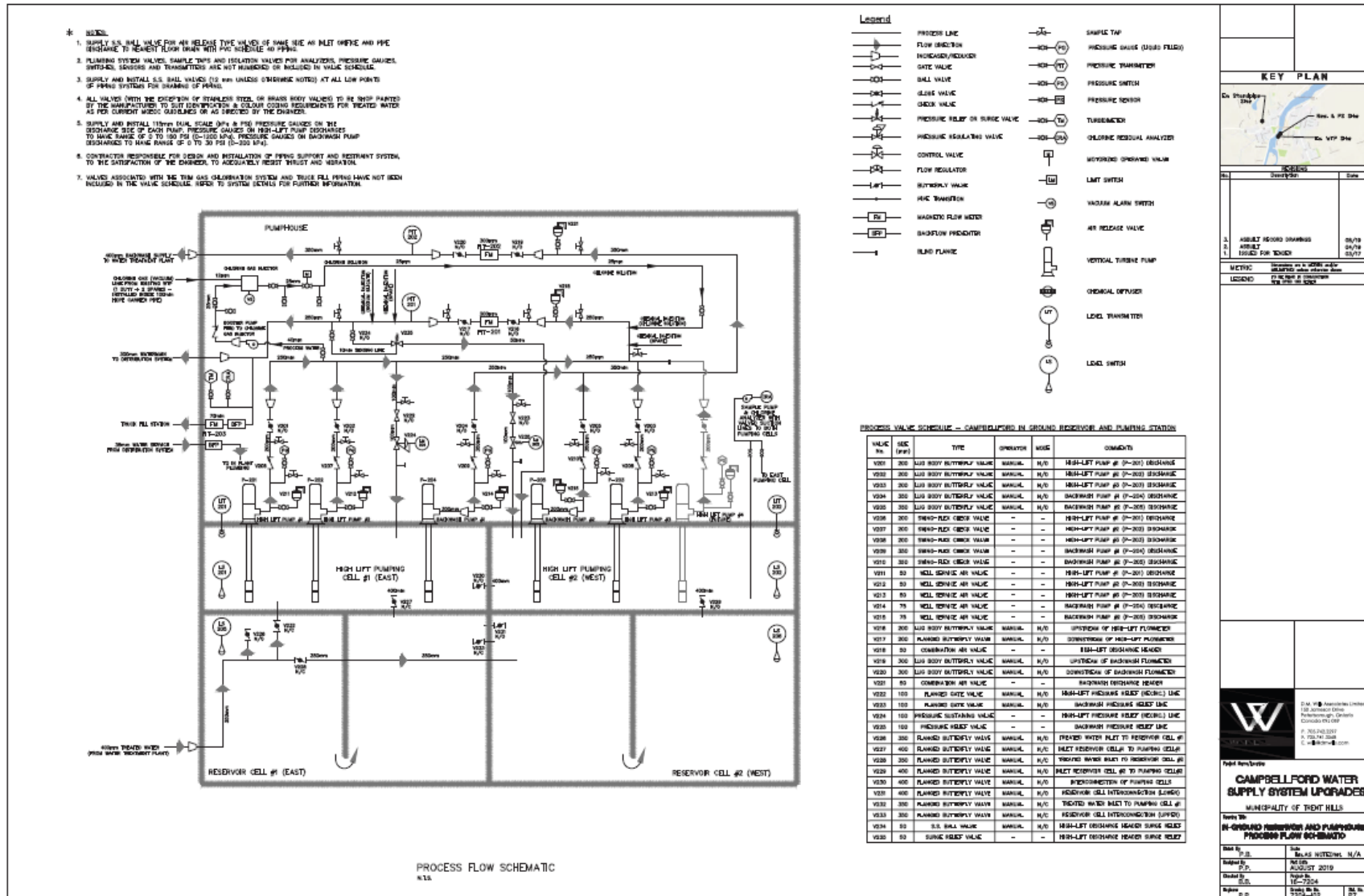


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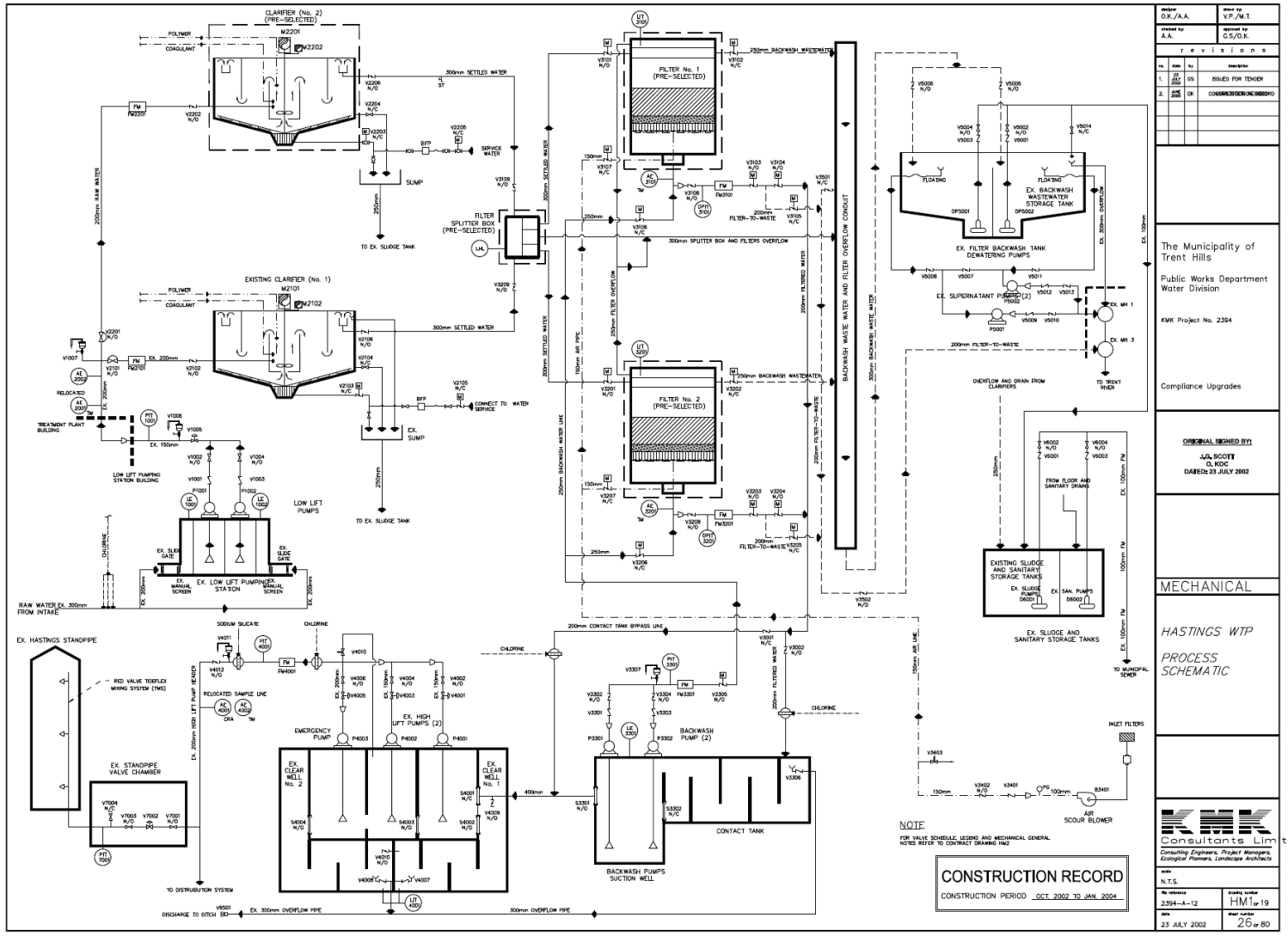
CAMPBELLFORD WATER SUPPLY SYSTEM UPGRADES
 MUNICIPALITY OF TRENT HILLS
WATER TREATMENT PLANT PROCESS FLOW SCHEMATIC

Date: 11/23/2019
 Project: CAMPBELLFORD WATER SUPPLY SYSTEM UPGRADES
 Scale: AS SHOWN
 Author: J. S. [Name]
 Check: J. S. [Name]
 Date: 11/23/2019
 Project: CAMPBELLFORD WATER SUPPLY SYSTEM UPGRADES
 Scale: AS SHOWN
 Author: J. S. [Name]
 Check: J. S. [Name]

Appendix 2 Campbellford High Lift Pump Station

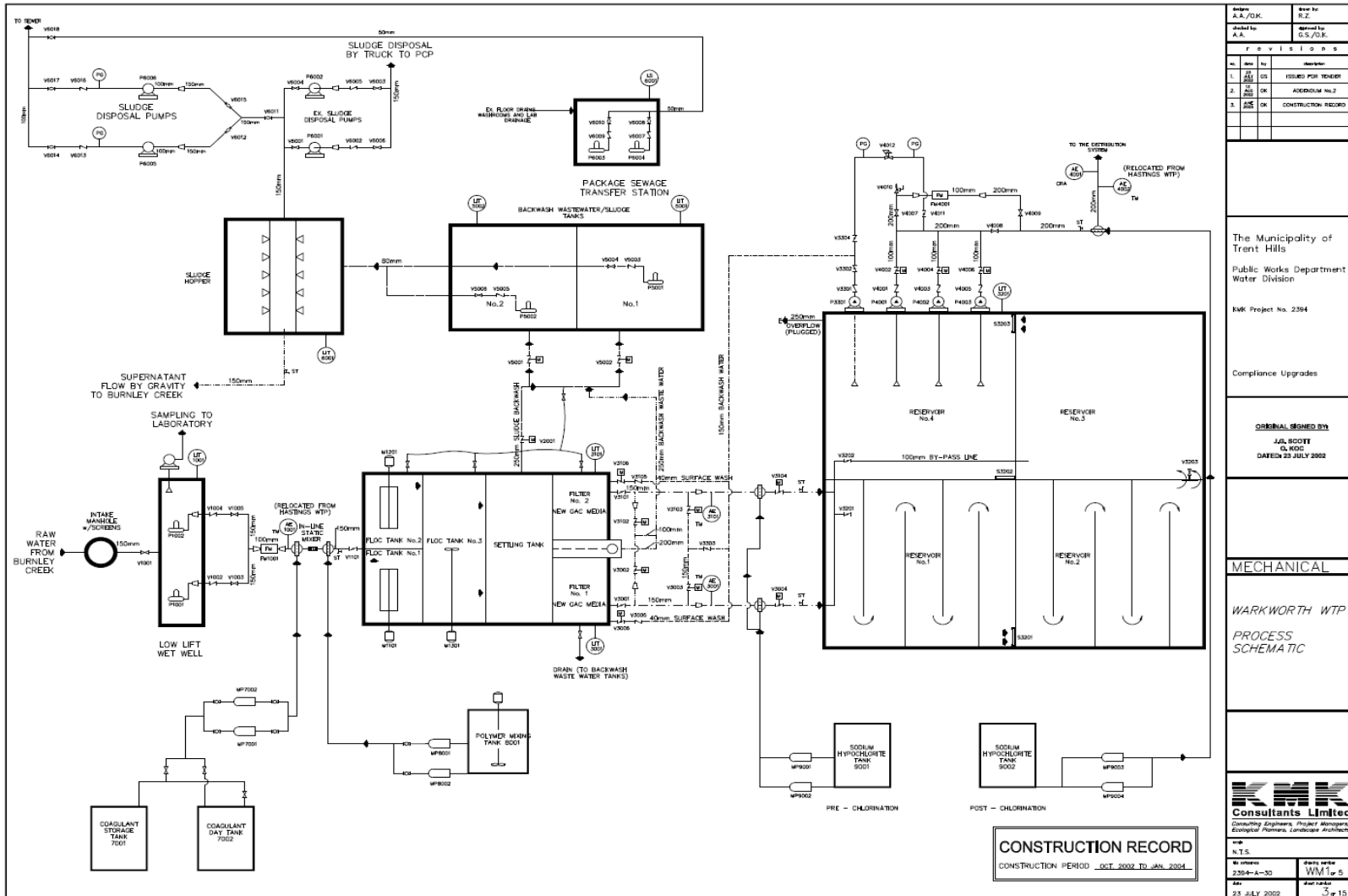


Appendix 3 Water Treatment Plant – Hastings



DESIGNED BY	OK/AA	CHECKED BY	VP/M.T.
DRAWN BY	AA	APPROVED BY	CS/G.E.
REVISIONS			
NO.	DATE	BY	REASON
1	2002	DS	ISSUED FOR TENDER
2	2002	DS	CONSTRUCTION RECORD
The Municipality of Trent Hills Public Works Department Water Division KMK Project No. 2394 Compliance Upgrades			
ORIGINAL DESIGNED BY: JUL SCOTT O. NOC DATED: 23 JULY 2002			
MECHANICAL			
HASTINGS WTP PROCESS SCHEMATIC			
 Consultants Limited Consulting Engineers, Project Managers, Ecological Planners, Landscape Architects			
DATE	N.T.S.	ISSUE NUMBER	HM1-19
NO. SHEETS	2394-A-12	DATE	23 JULY 2002
CONSTRUCTION PERIOD		2002	TO JAN. 2004
SHEET NUMBER		26	OF 80

Appendix 4 Water Treatment Plant – Warkworth



Drawn by A.A.	Checked by G.S./D.K.
REVISIONS No. Date Description 1. 05/08/02 ISSUED FOR TENDER 2. 06/08/02 ADDENDUM No. 2 3. 06/08/02 CONSTRUCTION RECORD	
The Municipality of Trent Hills Public Works Department Water Division Wark Project No. 2394 Compliance Upgrades ORIGINAL SIGNED BY J.A. SCOTT G. KOC DATED 22 JULY 2002	
MECHANICAL WARKWORTH WTP PROCESS SCHEMATIC	
CONSULTANTS LIMITED Consulting Engineers, Project Managers, Ecological Planners, Landscape Architects	
N.T.S. No. sheets: 2394-A-30 Date: 25 JULY 2002 Sheet: WM 1 of 5 3 of 15	