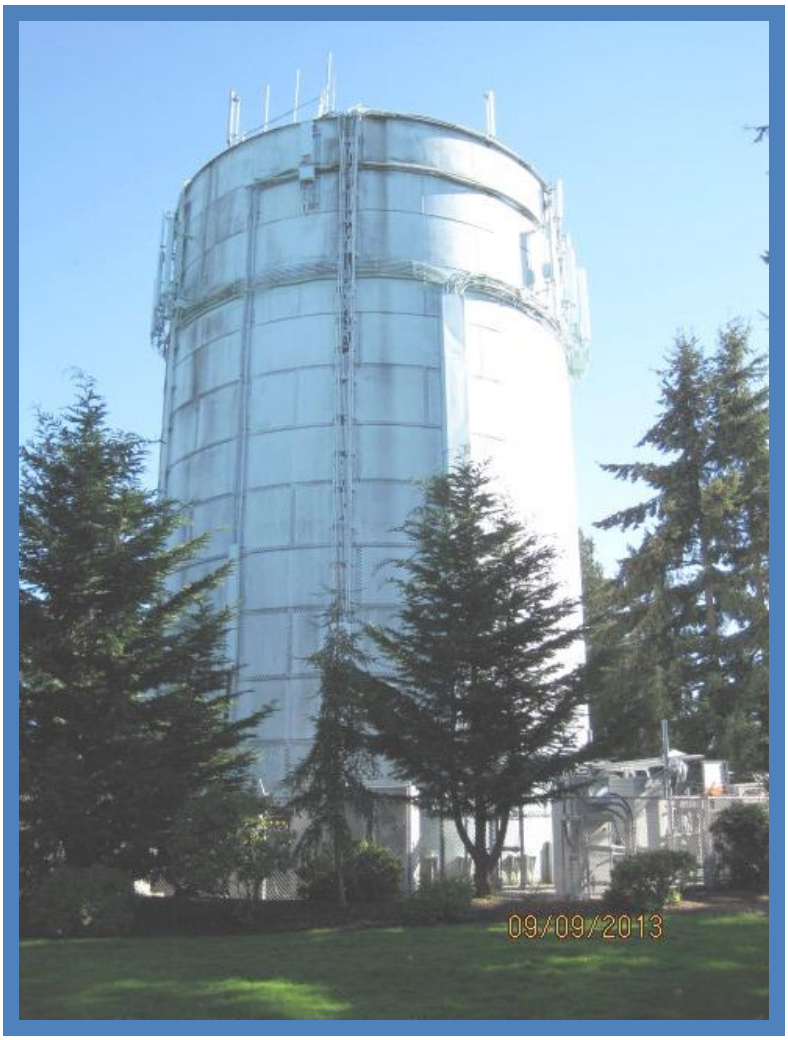
Washington State Department of Health

WATER SYSTEM SANITARY SURVEY REPORT
WASHINGTON STATE DEPARTMENT OF HEALTH (DOH)
-- NORTHWEST DRINKING WATER OPERATIONS --

TACOMA WATER DIVISION

Report Date: October 16, 2013

DOH System ID	86800 N	**Survey Dates**	**8/9/13 – 8/12/13**
System Type	Group A Community	**Operating Permit**	**Green**
Surveyor	John Ryding		



Tacoma Water's Fletcher Heights Reservoir

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BRIEF OVERVIEW

The Tacoma Water Division water system is a municipal water system that serves approximately 316,000 people directly in Pierce and King Counties in 2013. The utility also supplies water to partners and wholesale customers with an additional total population of approximately 330,000. Tacoma Water's main source of supply is the Green River in King County which is piped to Tacoma and the other water systems through two transmission lines: Pipeline 1 (PL1) and Pipeline 5 (PL5). Tacoma Water has undergone significant changes and improvements since the previous sanitary survey in 2009.

The most significant change has been the approval and start of construction of a dual media filtration plant on the Green River. The plant design will allow the plant to provide 150 MGD of water to its direct and wholesale customers. The construction documents were approved in 2012 and, at the time of the survey, plant construction was approximately 50% complete. In addition to allowing Tacoma Water to meet the requirements of the LT2 Enhanced Surface Water Treatment Rule, the plant will also provide significant improvements in water quality, water stability, reliability, and regulatory certainty. Filter plant completion and commissioning is estimated to be completed by the summer of 2015.

In addition, the covering of the McMillin open reservoirs was completed in 2012 since the previous survey in 2009. The project involved construction of two 33-million gallon concrete reservoirs at Tacoma Water's McMillin site and replaced the last uncovered reservoirs of Tacoma Water's system. The reservoirs were constructed in the south basin of the uncovered reservoir complex. The reservoirs have greatly reduced the amount of chlorine decay at the site and the 1-ton chlorine gas cylinders have been removed from the site because they are no longer needed. Construction of the new reservoirs has raised the hydraulic grade line of the main pressure zone from 576 feet to 581 feet.

Treatment facilities for the South Tacoma Pump Station and the Hood Street Reservoir site were approved in 2012. Aeration for corrosion control was installed at the South Tacoma Pump Station and was nearly operational at the time of the survey. Facilities for Sodium hydroxide addition for corrosion control and fluorosilicic acid for fluoridation (pictured) were near completion with an estimated startup of October, 2013. These facilities will treat groundwater from the South Tacoma Wellfield, which is a significant source of supply for Tacoma Water.

Tacoma Water is currently an unfiltered surface water system and meets the Criteria to Remain Unfiltered. The North Fork Wellfield can blend with and even replace the surface water source during periods of high turbidity in the Green River. The surface water source is supplemented during periods of high demand by a number of groundwater sources in Tacoma and unincorporated Pierce County. The most significant of these wells are those in the South Tacoma Wellfield.

Tacoma Water maintains 18 finished water reservoirs with a listed total capacity of 128 million gallons. The primary reservoirs are the two 33-million gallon covered McMillin McMillin Reservoirs located in the South Puyallup area. These reservoirs are fed by Pipeline 1 (PL1) and dictate the hydraulic grade lines for the majority of the distribution system downstream of PL1. The remaining finished water reservoirs are located throughout the City of Tacoma and in unincorporated areas of Pierce and King Counties. All of the finished water reservoirs are covered.

Sanitary Survey Process and Report

The survey was conducted over four days including a day for Tacoma Water's annual watershed inspection. This report summarizes the result of the Sanitary Survey including the watershed inspection. It is intended to build upon the previous sanitary survey which included capacity, operations and maintenance, and facilities reviews. Changes in capacity and operations and maintenance are summarized followed by a review of facilities visited this year. The facilities review is presented chronologically in the order in which facilities were visited. *Potential deficiencies and other items that may warrant recommendations are highlighted in yellow in the report*.

Significant Deficiencies pose a potential significant threat to public health and are required to be resolved within 45 days of receiving this report. ***Significant Deficiencies are summarized at the end of the report and are highlighted in bold red italicized text in the report.***

Changes in Capacity

Source

The Green River source has a *current* capacity of approximately 162 MGD, which is unchanged from the previous survey. PL1 has a capacity of 72 MGD and PL5 has a capacity of 90 MGD. The 90 MGD withdrawal rate is authorized by the second diversion water right obtained by Tacoma Water. The water right has placed restrictions on Tacoma Water's ability to use the water, primarily instream flow rates in the Green River. However, the source would be typically available during periods of high demand and it is considered to be a reliable source. The 72 MGD typically can be used year round given acceptable turbidity limits for unfiltered sources. During periods of high turbidity in the Green River, Tacoma Water

blends, or uses entirely, water from their North Fork wellfield located in the Green River watershed. The practical well capacity (not including North Fork wells) maintained by Tacoma Water is unchanged at approximately 50 MGD (Well #4A pictured). These wells can supply the utility's service area west of the McMillin Reservoir and are often used in the summer to supplement the Green River source during periods of high demand.

At the time of the survey it was reported that the construction of the Green River Filtration Facility (GRFF) was approximately 50% complete. The GRFF has been approved for a capacity of 150 MGD. The plant can be expanded in the future for an additional 12 MGD but it is anticipated that it will be many years before this will be needed.

Storage

Tacoma Water maintains a total storage capacity of approximately 128 million gallons (Portland Avenue Reservoir pictured). Since the previous survey the two North basins of the uncovered McMillin reservoirs (110 million gallons) have been disconnected from the distribution system and replaced with two 33-million gallon prestressed concrete reservoirs. This has reduced Tacoma Water's storage capacity by approximately 40 million gallons but their most recent Water System Plan update, approved in 2008, indicated that the utility has adequate storage capacity with the completion of the covered reservoirs. Tacoma Water plans to build a third 33-million gallon reservoir at the McMillin site as funds allow and water demands require.

Storage capacity to the various pressure zones appears to be adequate with the exception of the pressure zone which serves the Orting Valley. While the transmission pipeline in the area may be sufficient for normal equalizing, fire flow, and standby storage requirements, the lack of storage makes the pressure zone vulnerable to treatment upsets at the Headworks facility. It was reported that for chlorine outages of short duration, Tacoma Water could allow undertreated water to pass the Orting Valley because PL1 operates as two parallel pipelines in the valley.

Distribution System

A hydraulic model has been completed for the distribution system and the most recent update of modeling efforts will be given in Tacoma Water's 2014 Water System Plan update. It is assisting Tacoma Water in identifying distribution system deficiencies so they can be prioritized and addressed in a timely fashion. Tacoma Water has an active main replacement program which replaces a portion of the distribution system every year.

Treatment

No treatment changes have been made at the Headworks since the previous survey. Tacoma Water injects sodium hypochlorite into PL1 and PL5 after ozone is depleted (see below). Sodium hydroxide is also injected into each reactor for corrosion control. For the purposes of tracking and reporting treatment, Tacoma Water has defined the first 2,800 feet of both pipelines as Reactor 1 and Reactor 5. Inactivation ratios are calculated for each reactor separately when in use. This was necessary because the flows through the two reactors, the chlorine concentration, and the pH in the reactors sometimes vary resulting in different inactivation calculations. Fluorosilicic acid is also injected into each reactor for fluoridation.

The Ozone Facility started operation in 2007. Ozone is injected in Reactors 1 and 5 at the start of the reactors. The point of injection essentially defines the starting point of the reactors. Ozone is monitored in each reactor in five monitoring stations located along the length of the reactors. The primary purpose of the Ozone Facility is for taste and odor control. While Tacoma Water does not currently take routine disinfection credit for ozone treatment due to difficulties in calculating routine inactivation ratios, they are collecting sufficient data to demonstrate adequate disinfection treatment in the event of chlorination treatment upsets. The Chemical Treatment Facility includes a tank of sodium bisulfite for ozone quenching in the event of ozone overfeed. The sodium bisulfite is injected, if necessary, prior to sodium hypochlorite injection. The rate of injection is controlled by the level of ozone that passes the final ozone monitoring station.

Corrosion control and fluoridation facilities located at the Hood Street Reservoir for the South Tacoma Wellfield have been constructed since the previous survey but were not yet active. See the Day 1 facilities review for a description of the treatment provided.

Reliability

Tacoma Water is making and has made great strides in increasing the reliability of the supply and quality of water reaching its customers. Since the previous survey the most significant improvements have been the on-going construction of a filtration plant for the Green River Supply and the covering of the reservoirs at the McMillin site. Another important improvement has been the construction of the groundwater treatment facilities at the Hood Street Reservoir and at the South Tacoma Pump Station.

A number of significant storms in the past several years have provided challenges with North Fork Wellfield turbidity, damage to watershed roads and infrastructure, and damage and repairs to the Howard Hanson Dam. These events have challenged operators to meet turbidity and other treatment standards. The filtration plant will give operators an important tool to meet these challenges with greater certainty and to improve the water quality of the finished product. The plant and the North Fork Wellfield will be able to handle a much broader range of environmental conditions than the current infrastructure.

The facilities will also enable Tacoma Water to meet the Cryptosporidium removal requirements of the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) with a high degree of certainty.

Repairs to the Howard Hanson Dam, needed after the January 2009 storm, were reported to be essentially complete. These repairs were needed to allow the dam to be used in its full capacity for flood control and water storage. It was reported that the water storage operational elevations have now returned to the levels used before the storm.

Construction of the covered McMillin Reservoirs has allowed Tacoma Water to meet the covered finished water reservoir requirements of LT2ESWTR. These reservoirs provide a significant increase in Public Health protection and they have increased the stability of the finished water project, especially in terms of chlorine demand and decay. It was reported that Tacoma Water still maintains an adequate volume of distribution storage, even with the decrease in volume at the McMillin site.

Summary and Conclusions

Tacoma Water appears to have adequate capacity to provide safe and reliable water service to its customers. The most significant finished improvement since the previous survey is the completion of the covered McMillin Reservoirs. Additionally, the new filtration plant should be on-line within the next two years. The groundwater treatment plants should be in full operation by the end of the year.

CHANGES IN OPERATIONS AND MAINTENANCE

Routine Maintenance

There were no significant changes noted from the previous survey. The water system appears to be well maintained.

Operator Certification

The plant certification level at the Headworks is unchanged from the previous survey. Hilary Lorenz is the Plant Manager (operator certification number 3738, WTPO 4, WDM 4, CCS) and Jeff Bolam is the Plant Supervisor (operator certification number 6198, WTPO 4, WDM 3) and both meet the current minimum WTPO 3 requirements. It is anticipated that the filtration plant under construction at the time of the survey will require a WTPO 4 for operators in charge. In addition to the supervisors, three other operators are also certified at the WTPO 4 level. There is an operator on-duty 24-hous a day, seven days a week. Six days a week, (all but Tuesday), Tacoma Water has two operators on duty during day shift from 0600 hours to 1800 hours and one operator on duty night shift from 1800 hours to 0600 hours the following morning. Tuesdays are divided into three 8-hour shifts for accounting purposes. There are currently six certified operators, two operators-in-training, and two certified supervisory personnel assigned to the Headworks.

Tacoma Water is required to have a Water Distribution Manager 4 for its distribution system due to population. Linda McCrea is the Superintendent of Tacoma Water and is

certified as a WDM 4 (#5266). In addition the section managers have WDM 3 certifications. Tacoma Water appears to meet the minimum operator certification requirements.

Production

There were no significant changes noted from the previous survey. It appears that source and service meter reading procedures are adequate. Under the Water Use Efficiency Rule Tacoma Water was reporting a leakage rate of 4.8% in 2012 with a three-year annual average leakage rate of 5.6%. It appears that Tacoma Water meets the maximum leakage rate of 10% in the Water Use Efficiency Rule.

Cross Connection Control

Tacoma Water has a rigorous cross connection control program that is lead by Scott Hallenberg who is a certified cross connection control specialist (CCS) (#7640). There have been no significant changes in the program since the previous survey. Compliance rates for installation and testing of backflow assemblies were reported to range between 95 to 97 percent at any given time. Tacoma Water indicates public education has been very important in maintaining these compliance rates. Customers tend to be more responsive when they understand the need to protect the distribution system from potential hazards. An ordinance change is being considered to help maintain compliance rates for customers that have been "significant non-compliers". These changes would clarify and improve the utility's ability to enforce the cross connection requirements for repeat offenders.

Water Quality Monitoring

Water quality sampling discussed in this section generally refers to source and distribution chemical monitoring and coliform monitoring. Monitoring for turbidity and chlorine residuals at the Headworks is discussed in the Facilities Review.

Chemical Monitoring

In general, Tacoma Water has kept up well with routine chemical source and distribution monitoring. Their monitoring schedule is very complex and discussion of it is beyond the scope of this report. Please refer to the Tacoma Water 2013 Water Quality Monitoring Report for specific monitoring requirements. The most recent set of 50 lead and copper samples was collected this year and the lead and copper 90th percentile levels (Pb – 0.010 mg/L, Cu – 0.228 mg/L) met their respective Action Levels (Pb – 0.015 mg/L, Cu – 1.3 mg/L). The water system is in compliance with lead and copper sampling requirements and the next round of 50 samples is due by 2016. The water system also appears to be in compliance with DBP monitoring requirements for TTHMs, HAAs, and bromates.

Coliform Monitoring

The Water Quality section develops and maintains the Coliform Monitoring Plan (CMP) for Tacoma Water. The section collects all routine and repeat coliform samples and all sample collectors are certified operators. The Supply section no longer collects the routine samples. This is a change since the previous survey.

Dedicated sample stations have been added to the sampling network since the previous survey. There are now enough sample stations that improved rotational schedules are being developed to improve the spatial coverage of the distribution system. An updated CMP is due to be completed by mid-December with the updated rotational schedule. The CMP will also include the additional repeat samples site locations associated with each sample station. The updated CMP will be submitted to DOH when it is finalized. Distribution system coliform samples are analyzed by Water Management in Tacoma. Raw water fecal coliform samples and finished water coliform samples collected at the Headworks are sent to Seattle Public Utilities for analysis.

Tacoma Water has also been developing a triggered source sampling plan as part of compliance strategies with the Groundwater Rule. The transmission and distribution system has been broken down into four zones and the plan has been approved for three of the four zones. The approved zones cover the distribution system and PL5 from roughly the 356th St. BPS back to the Headworks and PL1 from the McMillin reservoir site back to the Headworks. The fourth zone contains the actual city limits of Tacoma and the immediate surroundings. This zone is by far the most complicated of the zones relative to potential groundwater contributions from groundwater sources. Additional work is ongoing to understand the potential for Tacoma's groundwater sources to contribute to their routine sample stations. Tacoma Water is working to coordinate sample schedules with wholesale customers to assist in sampling requirements of the Groundwater Rule in the event a wholesale customer obtains an unsatisfactory routine sample result.

Water Rights

Water rights were reported to be adequate for current and future uses within the 6-year planning period defined by Tacoma Water's Water System Plan (WSP) update. Water rights will be addressed in Tacoma Water's upcoming 2014 WSP update.

Summary and Conclusions

Tacoma Water appears to be in very good shape with respect to operations and maintenance practices, cross connection control, and water quality monitoring. Notable improvements since the previous survey include increased certified operator coverage at the Headworks, consistent compliance rates for cross connection control requirements, an improved Coliform Monitoring Plan and the development of a triggered source sampling plan relative to Groundwater Rule requirements.

FACILITIES REVIEW

South Tacoma and UP Wells, North and South End Reservoirs – Day 1

Hood Street Reservoir

The Hood Street Reservoir is a 10-milion gallon below grade concrete reservoir. It is fed by surface water from the Green River and by groundwater via the flume line from the South Tacoma Wells. It discharges via a 48-inch line to the Tacoma Tideflats, which has a number of very large industrial customers, and to Downtown Tacoma via a 24-inch line. The reservoir site also holds a large chlorination facility for the treatment of the well water from the flume line. At the time of the survey groundwater was flowing into the reservoir at a rate of approximately 5.8 MGD and the chlorine residual at the reservoir inlet was 0.6 mg/L. *It was reported that the treatment facility and contact time in the reservoir provide a CT of 6 to the wells but documentation for this has not been reviewed and approved by DOH.*

Corrosion control and fluoridation facilities (DOH Project #11-0717) had been constructed and were near completion at the time of the survey. It is anticipated that final punch list items and acceptance testing will be completed by October 2013. Corrosion control will be achieved through addition of sodium hydroxide (25%) into a 32-inch line that conveys the groundwater flow. Fluoridation will be achieved through the injection of fluorosilicic acid. Backpressure sustaining valves were installed on each of the injections pumps on the pressure side of the pumps. There is an RPBA on the plant water service line into the building. The table below summarizes the alarm settings for pH and fluoride.

Hood Street Treatment Plant Alarm Settings

Parameter	Type	Setting	Action
pH	Low	6.5	Alarm to operator. Shut off fluoride injection.
	Low	7.1	Alarm to operator.
	High	8.0	Alarm to operator.
	High	8.5	Alarm to operator. Shut off NaOH injection.
Fluoride	Low	0.5 mg/L	Alarm to operator.
	High	0.9 mg/L	Alarm to operator.
	High	1.0 mg/L	Alarm to operator. Shut off fluoride injection.

The following observations were noted:

- The hatch drains were in good condition and have proper drainage. *The hatch drain discharges should be covered with a fine mesh screen. This is true of all of the at grade reservoirs.*
- The reservoir vents were screened with fine mesh. This is an improvement from the previous survey.
- *The ability of the disinfection system to provide a CT of 6 has not yet been evaluated by DOH*.
- The Simpson mill is the largest single customer of the Tacoma Water system. It was reported that Simpson uses approximately 16-17 MGD. The Maximum Day Demand (MDD) demand has remained fairly static since the previous survey and is approximately 100 MGD.
- The on-site hypochlorination facilities are actively vented to prevent build-up of hydrogen gas.
- There are instantaneous and total flow meters on the flume line and they control the chlorine injection pumps. Sodium hypochlorite solution (0.8%) is injected in the reservoir just above the inlet to the reservoir. The chlorine injection pumps startup with a flow of 3.5 MGD in the well inlet (flume) pipe.
- There is a chlorine analyzer and a pH monitor at the outlet of reservoir. At the time of the survey the free chlorine residual at the outlet was 0.84 mg/L with a pH of 7.04. It was reported that the pH is lower at this location than seen in other locations in the distribution system because of the influence of South Tacoma Well water. The pH will be higher after start-up of the NaOH injection system
- There are plans to replace the existing on-site chlorine generators with new units. This should increase existing treatment capacity of approximately 35 MGD. The existing generators would be moved to another well location such as the Gravity Wells.

South Tacoma Wells

All of the permanent and seasonal South Tacoma Wells were visited during the survey. All of the wells discharge to the flume line that runs to the Hood Street Reservoir. None of the wells are treated prior to Hood Street Reservoir. Raw water taps are available at all wells. The general sequence priority for the most used wells is 11A, 6B, 5A, 3A, 1B because they are generally the most efficient wells of the system (Well 10C is efficient but not a big producer). In general, vents haven't been added where none existed because of the difficulty in installing the vents without damaging the wells but finer mesh screen has been installed on those that do have vents.

Well	Observations
1B	The well is in a deep vault on the property of the South Tacoma Pump Station. It is generally used to balance flows to the pump station. The well has a raw water sample tap but does not have any vents. There is an adequate air gap and screening on the pump waste blowoff line.

2B	The well is located next to the old Nalleys foods office. A fine mesh screen was installed on the vent during the survey. There is an adequate air gap and screening on the pump waste blowoff line.
2C	The well is located in a vault that has been outfitted with redundant sump pumps and alarms to prevent flooding. The well was conditionally approved in 2009 pending submittal of treatment construction documents. The well has detectable ammonia and breakpoint chlorination will have to be installed at the well. Because demand growth has been slow the well has not been needed, treatment has not yet been designed, and the well has yet to be used. There is an adequate air gap and screening on the pump waste blowoff line.
3A	The well is the southernmost well of the wellfield. The well has a raw water sample tap but does not have any vents. The pump waste discharge was screened but there is an inadequate air gap to the receiving vault. ***The air gap must be increased to meet minimum standards for air gaps***. 
4A	The well is seldom used. It is an inefficient well and is also influenced by the groundwater contaminated Time Oil hazardous waste site. There is a fine screen on the vent. There is an adequate air gap and screening on the pump waste blowoff line.
5A	The well has a raw water sample tap but does not have any vents. The meter and the pump waste globe valve are located in a vault next to the wellhouse. There is an adequate air gap and screening on the pump waste blowoff line.
6B	The well is located next to Well 11A and does not have a vent but *it appears that there are penetrations available that would allow one to be put in*. There is a portable emergency chlorination feed system in the well house. There is an adequate air gap and screening on the pump waste blowoff line.
7B	The well is located in a vault and was disconnected for maintenance during the time of the survey. It appeared that there was an adequate air gap and screening on the pump waste blowoff line.
8B	The well and wellhouse are located in the middle of a residential road. There is a fine mesh screen on the vent. There is an adequate air gap and screening on the pump waste blowoff line.
10C	There is an unfluoridated tap available to customers who do not want fluoridated water. Sodium hypochlorite is added to the unfluoridated supply through a contact pipeline to provide a CT of 6. There is an RPBA installed on the raw water feed line. The well is unvented. ***The pump waste blowoff was screened but there is an inadequate air gap between the blow off discharge and the waste water receiving body.***

11A	This is the largest producer of the South Tacoma Wells with a production rate of approximately 9,000 gpm at startup. The well draws from a shallow aquifer and, by itself, can only be operated for 10 days at a time followed by a 10 day resting period due to the influence of the Time Oil hazardous waste site. The well can be run for longer periods of time if Well 12A is run at the same time. There have been a number of historical samples from the well with detectable VOCs. An inverted goose neck was installed on the air vent during the survey. There is an adequate air gap and screening on the pump waste blowoff line. 
12A	It was reported that the well is often frequently operated during the summer high demand season. The well is outfitted with packed tower air strippers used to remove VOCs (primarily hydrocarbons) from the Time Oil site. There is an expanded metal vent on top of each of the stripper air exhaust stacks to prevent bird entry. ***However, they do not prevent surface water from entering the stripping towers. The openings must be covered with some sort of a vent covering to prevent surface water entry into the towers.*** A recommended air filter was located and installed for the air intakes. This will reduce the potential of drawing airborne contaminants into the stripping towers. 
13A	The well is located in a vault and does not have a vent. There is a flood alarm located in the vault and is set at the floor grate elevation. There is an adequate air gap and screening on the pump waste blowoff line.

South Tacoma Pump Station

The South Tacoma Pump Station is the largest single pump station in the Tacoma Water system. The pump station consists of four turbine motor driven booster pumps with a total capacity of 15 to 17 MGD. The pump station is fed by Wells 1B, 8B and the wells located south of the pump station. The pump station supplies the West End Transmission Line to the west end of the distribution system and eventually provides water to the north end. It is typically run during periods of high demand or low flow in PL1.

Fine bubble diffusers had been installed in the pump station wet well as part of a corrosion control project (DOH Project # 11-0717). At the time of the survey, startup was dependent upon

successful acceptance testing of the system. The blower air intake was well protected by a vent cap and was outfitted with an air filter.

After aeration chlorine is injected at the pump inlets via a calcium hypochlorite tablet chlorinator. The free chlorine residual leaving the pump station is typically in the range of 0.6 to 1.0 mg/L. A chlorine analyzer on-site measures the distribution system residuals in the vicinity of the pump station.

North End Reservoir and Standpipe

The site is occupied by a below grade concrete reservoir and a steel standpipe reservoir. Both reservoirs are fed by the North End Transmission Line from the main 581 pressure zone whose hydraulic grade line is dictated by the McMillin Reservoir. The standpipe feeds the 478 zone and overflows to the concrete reservoir which feeds the 446 zone. There is a booster pump in the valve house that is controlled by a pressure transducer in the transmission line. If the pressure in the line is less than 30 psi for more than 2 minutes the booster pump is activated to draw water from the reservoir to the standpipe.

In the past there have been stagnation issues associated with the concrete reservoir with low chlorine residuals. As they have done with the Sunset Reservoir, Tacoma Water has made changes in the operational storage levels in the reservoir to reduce water age in the reservoir. The concrete reservoir is 25 feet deep and Tacoma Water is currently running an operational level of 21 to 16 feet in the tank. The changes have helped to reduce water stagnation and lower than desired chlorine residuals. There is a chlorine analyzer at the outlet of the reservoir. Operators can change valves to monitor chlorine levels in the standpipe. The overflow outlet of the reservoir was located in a manhole and a screen was installed during the week of the survey. The concrete reservoir vents were screened with fine mesh screening. This was an improvement since the previous survey. A fine mesh screen was installed on the standpipe vent.

Fletcher Heights Reservoir

The reservoir is a steel reservoir that is filled by the North End Transmission Line from the main 581 pressure zone. It feeds the 478 zone. It was reported that there are no stagnation issues with the reservoir. The reservoir was in good condition. The overflow outlet of the reservoir was located in a manhole and was screened. This is an improvement since the previous survey.

University Place Infrastructure

UP-1 Well

The UP-1 well is typically one of the last wells called upon when wells are activated. It appeared to be in good condition. Chlorine is injected into the well and in order to obtain a raw water sample the well would have to flushed through the pump waste blowoff until chlorine free water is obtained. At the time of the survey the chlorine

residual in the distribution system at the well site was 0.50 mg/L. The sodium hypochlorite storage tanks were in good condition. There is an adequate air gap and screening on the pump waste blowoff line.

UP Tanks

The UP tanks consist of two steel standpipe type storage tanks that appear to operate in parallel. They appeared to be in good condition. They have physically separated inlets and outlets. The tanks are fed by the 531 pressure zone through an altitude valve and they feed the 478 zone. With separate inlets and outlets it was reported that stagnation problems have not been experienced by the tanks. *The overflow outlet for the two tanks is located in a manhole at the end of a downward facing elbow. The actual outlet opening could not be observed but it was reported that the outlet was screened. This must be verified because if it is not it would be a Significant Deficiency.* The tanks were originally outfitted with float gauges that are still operational but are not used. ***The conduit piping for the gauge wires faces downward but is unscreened. This is an unnecessary unprotected opening and should be capped or removed as soon as possible.***

Watershed Inspection – Day 2

The watershed inspection started at the Headworks and was led by Bryan King of Tacoma Water. The first stop was the intake facilities followed by Well 2 of the North Fork Wellfield with Hilary Lorenz. This was followed by travel to Lester and Friday Creek. It is anticipated that there will likely be only one more annual watershed inspection because Tacoma Water will no longer have an unfiltered surface water source after completion of the filtration plant. The following are notes and observations from the inspection.

The following is a summary of issues discussed before and during the watershed inspection.

1. Proposed modifications to the intake structure were discussed. The modifications focus on facilities for improving screen cleaning, and modifications to improve sediment removal. Modifications to the intake will be submitted to DOH for review prior to changes being made. Fish are not being captured for transport above the Howard Hanson Dam but they are being captured for State and Tribal hatcheries further downstream of the Headworks facilities. The completion of the Corps fish passage facilities for the dam appears to be on hiatus indefinitely.

2. Hilary Lorenz discussed the general anticipated schedule for using direct and conventional filtration. It is currently anticipated that the switchover between filtration modes will occur twice a year (to direct filtration in the spring and to conventional filtration in the early fall). Algae growth behind the Howard Hanson Dam and dam operations will likely impact the schedule.

3. At the time of the inspection the North Fork storage tank and the bypass around the tank were out of service as part of the construction of the filtration plant. The facilities were reported to be out of service for up to four days. Tacoma Water was keeping a close eye on river turbidity because this work prevented the blending valves from being used in the event of elevated raw water turbidity.

4. Changes were being made to generator capacity at the North Fork wellfield. These changes should allow up to five of the wells to be operated during power outages at the wellfield.

5. Tacoma Water plans to maintain the current level of watershed control and supervision after completion and activation of the filtration plant. This is important because the filtration plant was designed and piloted given the water quality conditions under the current level of watershed control.

6. The US Army Corps of Engineers continues to try different strategies for removing sediment behind the dam. The Corps was denied permission to discharge 1,000 NTU water from the dam by the Department of Ecology. There continue to be discussions between Tacoma Water and the Corps on low water elevations and their impacts on the amount of exposed sediment in the reservoir.

7. Water storage levels have been returned to those that existed before the January 2009 storm that caused damage to the dam.

8. Logging activity in the watershed has generally been low compared to historical activity but logging in the watershed had increased in the previous years. More logging trucks were encountered this year compared to last year's inspection.

9. Hancock Timber has put up its land holdings in the watershed for sale. The timber company was reported to own approximately 8% of the watershed. Tacoma Water obtained several hundred acres of land in the watershed in the past year.

10. A security camera has been installed at the Massey gate since last year's inspection. Data is downloaded from the camera every other day.

11. There were no chemical detections in water quality samples collected in the watershed during monitoring of BNSF spraying activities in the past year.

12. There were no significant accidents in the watershed in the past year since the previous inspection.

Headworks Facilities – Day 3

Ozone Facility

The Ozone Generation Facility is located on the site of the former fluoride injection facilities next to the 10-million gallon reservoir used to store North Fork Wellfield water. The Ozone Facility contains two ozone generators which are typically alternated in use. The plant uses pure oxygen to feed the generators. There are also two liquid oxygen tanks that are alternated in use. Ozone is injected into carrier water using up to three venturi injectors for each reactor: two 6-inch venturis and one 4-inch venturi. The original contract for the installation of the injectors specified a minimum ozone transfer rate of 95% to solution. Minor modifications have been made to the smaller injectors to allow the transfer rate to be met. Since the previous survey, wide diameter off-gassing domes have been installed. This was done to prevent water from "burping" into the thermal destruct units. These wide diameter domes have accomplished this purpose. The thermal destruct unit for the off gassed ozone at the start of the reactors is housed in the first ozone monitoring station.

At the time of the survey the following ozone concentrations were observed in the two reactors at the various ozone monitoring stations.

Reactor	Flow	Station 1 O_3	Station 2 O_3	Station 3 O_3	Station 4 O_3
R1	29MGD	0.39 mg/L	0.05 mg/L	ND	ND
R5	50 MGD	0.35 mg/L	0.12 mg/L	0.01 mg/L	ND

ND – Not Detected

The 10 million gallon North Fork steel tank has not been cleaned since the previous survey. However, it was inspected this year and the interior looked to be in good shape. At the time of the survey the tank was out of service due to filtration plant construction. After completion of the plant the current North Fork tank will be used to store filtered water for backwashing filters. A new three million gallon pre-stressed concrete reservoir was under construction next to the existing 10 million gallon steel tank. The new concrete reservoir will be used to store water from the North Fork Wellfield which will be used for blending with river water. The steel tank will be painted and cleaned next year after the concrete reservoir goes into service. The tank hatches are inspected weekly. The tank overflow back to the river is grated.

Chemical Treatment Facility

Construction activities were observed in the Chemical Treatment Facility. Chemical storage tanks were being installed and, in some cases, replaced. Chemical injection systems were being modified for the filtration plant. It was reported that these activities had caused a low chlorine episode a month ago when flow looped back through a peristaltic pump that had recently been moved. The flow meter indicated proper flow to the injection point but it was not able to detect that some of the flow was looping back into the system through this pump. Minimum CT requirements were reported to have been met by taking ozone CT into account. Repairs have been made including installation of check valves to prevent this loop flow from reoccurring. It was reported that diaphragm pumps will be installed as part of the filtration plant project.

An emergency chlorination pump system had been installed in the last ozone monitoring station (Station #5) at the end of the reactors. At the time of the survey telemetry improvements were being installed that will allow the automatic start up of the emergency injection pumps in the event that construction activities disrupt the injection pumps in the Chemical Treatment Facility. Grab samples collected in Palmer will be used to ensure the emergency pumps add adequate chlorine. Residual chlorine measurements used for CT calculations will continue to be collected at the 214th Ave. Pump Station (PL1) and the Covington Turnout (PL5).

Coliform samples before the entry to distribution and before the first customer continue to taken from the R1 and R5 analyzer lines on the old instrument board. Additionally, monthly routine coliform samples are collected from the Headworks portion of the distribution system served by the Green River Headworks Well (S45) which serves the Headworks facilities. Chlorine and pH are monitored in Station #5. Fluoride is still monitored at the old instrument board. The following parameters were observed leaving the Headworks.

Reactor	Free Chlorine	pH	Temperature	Fluoride
R1	1.95 mg/L	8.10	20.2 ^{o}C	0.82 mg/L
R5	1.84 mg/L	8.16	20.3 ^{o}C	0.77 mg/L

Fluoride Treatment

In 2012 there were some issues related to fluoride dosing and sample results. There was disagreement between calculated concentrations, bench scale sample results, and accredited lab results. It was reported that the discrepancies have been resolved. A number of recommendations from the watershed report have been undertaken by the operators.

- Instrument offset levels have been reset to appropriate levels. The existing analyzers have been calibrated to known standards.

- The operators have switched to using an ion selective electrode (ISE) method from the SPADNS method for measuring fluoride for bench scale check sample testing.
- The operators are routinely testing check samples to verify good analytical technique. Results are recorded and documented. It was reported that there has been good agreement between operator results and the known standard. The operators should be able to reduce this type of testing to quarterly with good demonstrated performance using the ISE.
- Blind standard samples are being sent to the accredited lab once or twice a year. To date, the lab results have been within 0.01 mg/L of the known standard concentration.
- Fluoride injection pumps are calibrated monthly with a calibration cylinder by each operator.

Rural King and Pierce County Facilities – Day 3

Covington Turnout

The Covington Turnout is the point of CT compliance for R5 and PL5 located next to Kentlake High School. It is the first of two interties with the Covington Water District. Water quality samples are taken from the 16-inch line that is fed by PL5 (60" at turnout). It was reported during the previous survey that the sample water can be somewhat stagnant if Covington is not drawing water. However, it was reported that Covington has since purchased a share of the North Fork blending facilities as part of the filtration plant project and can now take water at all times. A data logger on-site collects and stores data for chlorine, turbidity, pH, and temperature. These parameters can also be read from Tacoma Water's waterworks control center building in the city. The turbidimeter (1720 E) is cleaned every week. It was unclear whether it has been calibrated recently. *It is recommended that the turbidimeter be recalibrated once per quarter.* There is an autostart generator on-site for power outages. At the time of the survey the following values were noted: Cl_2 – 1.4 mg/L, Turbidity – 0.89 NTU, pH – 7.95, Temperature – 17 ^{o}C. The facilities were in excellent condition.

Cumberland PS & Reservoir

The Cumberland Pump Station and Reservoir are located in King County. The turnout at this location feeds the Cumberland portion of Tacoma Water's service area, which serves approximately 94 direct service customers and wholesale service to Cumberland Co-Op . The pump station pumps from PL1 to the reservoir and consists of two pumps each capable of 100 gpm to the reservoir. The pump station is in a vault and appeared to be in good condition. Operation of the pumps is controlled by the water level in reservoir. The reservoir is cleaned every three years. Since the previous survey the buried overflow has been disconnected and an above grade overflow structure with outlet screening has been installed. This is a significant improvement from the previous survey. The roof is accessed annually by Tacoma Water staff and a screened vent was visible from the ground. The reservoir is not visible to the community and it was reported that the hatch was welded shut to prevent vandalism and unauthorized access. The facilities appeared to be in adequate condition.

214th Avenue Pump Station

The 214th Avenue Pump Station is located southeast of Bonney Lake and is the CT compliance point for Reactor 1 and Pipeline 1 (PL1). The NaOH injection facilities have not been used since the 2009 survey and the chemical levels in the tank have not changed since the 2009 survey. Because pH is being raised in PL1 at the Headworks, the NaOH facility at the pump station is only used during high flows with low temperatures in order to meet CT requirements. This has not been necessary with the startup of PL5 as flows are typically split between the two transmission pipelines. Since the completion of PL5, PL1 flows have been lower than historical flows in the pipeline. The facilities were in very good condition. It is unclear how the treatment facilities would respond to being started up after such a long down time.

At the time the pump station was visited the following water quality parameters were noted: Cl_2 – 1.36 mg/L, pH – 7.76, Temperature – 67 deg F, Turbidity – 0.96 NTU. There is no monitoring redundancy at the pump station. The next point of chlorine and pH monitoring occurs downstream at the inlet to the new McMillin Reservoirs. Tacoma Water is considering moving the CT point of compliance further upstream on PL1 after completion of the filtration plant.

Prairie Ridge Reservoir

The Prairie Ridge Reservoir is a steel tank that serves the pressure zone fed by the 214th Ave. Pump Station. The reservoir appeared to be in very good condition. The

following observations were noted:

- It was reported that the reservoir roof is accessed twice per month and that vent screens and hatches are checked at that time. A fine mesh vent screen was installed on the reservoir vent.
- The overflow outlet was located below the reservoir with a significant elevation difference and the outlet was screened.
- The chlorine analyzer installed at the site indicated that the chlorine residual out of the tank was 0.33 mg/L. It was reported that the outlet residual is typically 0.6 to 0.7 mg/L. Craig Downs is investigating the lower than expected residuals.
- It was reported that significant demand had been observed this summer from the Prairie Ridge booster pump station with a peak flow of 2,500 gpm. The pump station had been installed to serve the then named Cascadia development. The Cascadia development went to bankruptcy, was sold, and has been renamed to Tehaleh. It was reported that significant home construction started this summer in Tehaleh. At the time of the survey the pump station was supplying 500 gpm to the development.

Prairie Spring

Prairie Spring is listed as a seasonal source in Tacoma Water's Water Facilities Inventory (WFI). Water from the spring is pumped into the pressure zone served by the Prairie Ridge Reservoir when the spring is in operation. It is rarely used historically. A number of items have been identified that must be addressed before using the source for non-emergency purposes. ***These include several Significant Deficiencies that were identified.***

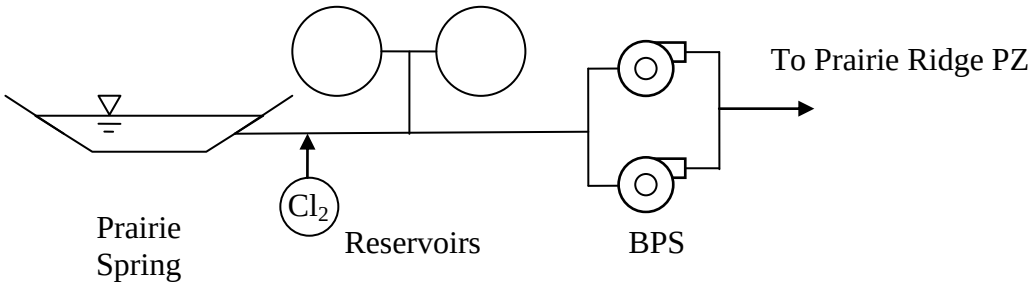
- There were unprotected openings into the pump wetwell between the cistern lid and the cistern itself (pictured at left). These openings have since been eliminated by the time of the report.

- *There was an inadequate air gap between the pump cistern overflow and the receiving creek (pictured at right).*

- *There was an apparent cross connection between the spring collection manhole "blowoff" and the creek. The blowoff discharge was submerged and was isolated from the spring collection manhole by a single gate valve.*

Additionally, it was reported that the spring is under consideration as a source of supply for a water bottling company. In addition to the repairs mentioned above the source must complete its evaluation as a potential Groundwater Under the Influence of Surface Water. The source was monitored for water quality parameters in the late 1990s but it appears the evaluation had not been completed. *A minimum of two Microscopic Particulate Analysis (MPA) tests during wet season high precipitation events must be collected with low risk results before this source can be used as a reliable source for the distribution system and as a bottling source*.

Currently, the use of the spring requires 4-log inactivation of viruses (CT of 6). As of the date of the report it is unclear whether a CT of 6 can be provided when the source is in use. *A CT evaluation should be submitted for review before using the source*.



The reservoirs appeared to be in fair condition. *The vent screens were loose and need to be tightened*. Based on the schematic shown above it appears the reservoirs cannot be used for contact time in providing a CT of 6 to the spring.

McMillin Reservoir, SE and NE Tacoma – Day 4\

McMillin Reservoir

The two 33-million gallon covered pre-stressed concrete reservoirs have been constructed since the previous survey and were in operation. There are no longer any uncovered reservoirs in Tacoma Water's distribution system. The remaining existing uncovered North Basins have been physically disconnected from the distribution system. This is an additional improvement since the previous survey. The North Basins will be available to collect water from PL1 that is not intended for the distribution system. Water from the North Basins can then be discharged to the Puyallup River drainage.

Historically, water from the uncovered reservoirs was rechlorinated using a chlorine gas facility that used 1-ton chlorine gas cylinders. The covered reservoirs have greatly limited the amount of chlorine off-gassing and decay that was normally associated with the uncovered reservoirs. It was reported that winter chlorine reductions from inlet to the outlet have typically been around 0.1 mg/L. The reductions have typically been around 0.3 mg/L in the summer. At the time of the survey the chlorine drop was approximately

0.36 mg/L (inlet Cl_2 – 1.34 mg/L and outlet Cl_2 – 0.98 mg/L). The pH was unchanged at 7.80 at both the inlet and outlet. It is anticipated that the drop in chlorine will be even smaller after the filtration plant is completed. The chlorine gas cylinders have been removed from the site and rechlorination is no longer practiced at the McMillin site. It was reported that each reservoir will be drained and cleaned this fall as part of the warranty conditions for the reservoir.

There is an emergency blow off at the north end of the reservoir site that allows direct access to PL1 (pictured at left). ***The blowoff is covered by a wide mesh grate which must be protected by a finer mesh screen.*** The hatch drains were in good condition and have proper drainage. *The hatch drain discharges should be covered with a fine mesh screen. This is true of all of the at grade reservoirs.*

Sunrise Reservoir

The Sunrise Reservoir is a 104-foot high steel tank that serves a pressure zone south of McMillin Reservoir which is supplied by booster pump stations located south of the reservoirs. To improve the free chlorine residuals in the tank the amount of operational storage has been increased. Tacoma Water increased the operational storage level prior to the previous sanitary from 3 feet to 9 feet to improve circulation. Changes were also made in the operation of the booster pump stations that feed the pressure zone. The tank appeared to be in good condition. The roof is accessed annually and in response to intrusion alarms. The roof was last accessed in April. It was reported that the screened vents and hatches were in good shape.

A chlorine analyzer monitors chlorine residual on the fill/discharge line. During periods when the tank is filling with fresh water from the McMillin Reservoir site the analyzer reads levels consistent with water coming from the Headworks into the McMillin Reservoir. This is typically around 1.3 mg/L. When the tank is discharging the analyzer reads the chlorine levels from the bottom of the tank where water is discharging. At the time of the survey the chlorine residual was 0.53 mg/L which indicates the tank was discharging. The free chlorine residual is monitored at the waterworks control center.

The overflow outlet was improved with a smaller mesh screen at the discharge structure. This is an improvement since the previous survey.

Gravity Wells

The Gravity Wells, GPL 1 and GPL 2, are located alongside transmission Pipeline 4 (PL4) and are rarely used. The wells were used briefly this year to test telemetry

upgrades to the site. The wells are not efficient and are typically some of the last called wells in the Tacoma Water system. The design flow rate of both wells is 3,200 gpm at 485 TDH. There is no treatment on the wells and raw water sample taps are available. As of the date of the survey it is not clear whether a disinfection CT of 6 is required for the wells. The wells may not be able to provide a CT of 6 to customers immediately downstream of the wells.

The globe valve on the pump waste blow off line was found to be in the open position while the well pumps were out of service. This is different from the wells of the South Tacoma Wellfield whose globe valves are closed when the wells are off-line. ***The blow-off discharge is located in a grassy basin (pictured). This is a potential cross connection with the wells and it needs to be reconstructed to provide an adequate air gap.***

SE Tacoma Wells

Several of the SE Tacoma Wells were visited: SE#2, SE#6, SE#8, SE#11and SE#11A. The wells were in generally fair to good shape. There is an adequate air gap and screening on the pump waste blowoff lines for each of the wells. There are chlorination facilities at each well site. It appears that only SE#8 has been used this year. Customers can drive up to Well SE#8 to obtain unfluoridated water which has been treated to a minimum CT of 6. Chlorine residual grab samples are collected once to twice a week on the unfluoridated tap. Water pumped into the distribution system does not appear to have achieved a CT of 6 at this site. At the time of the survey the free chlorine residual in the distribution system was 0.82 mg/L.

Wells SE#2 and SE#6 are treated for corrosion control using NaOH injection. In the facility, injection pumps have anti-siphon valves and the post-injection pH analyzer is located in the wellhouse for SE#2. The facility was last used in August 2012. There is also a chlorine monitor located at the site. Both wells have raw water sample taps and neither have vents. At the time of the survey the free chlorine residual in the distribution system was 0.70 mg/L with a pH of 7.75. *It appears a vent could be easily added to a pipe stub coming from the pedestal of Well SE#2* (pictured).

Wells SE#11 and SE#11A do not have vents and it appears that it would be difficult to install them. Like the other wells it does not appear a CT of 6 is provided to nearby customers who receive water from the well. There is a chlorine analyzer on site and at the time of the survey the free chlorine residual in the distribution system was 0.56 mg/L.

Bismark Standpipe

The Bismark Standpipe is a steel tank on E. 64th Street that feeds the 478 pressure zone. The reservoir is fed from the 581 zone via PL4 through an altitude valve. A PRV provides inlet control. There were no reported stagnation issues. The reservoir roof is accessed annually for vent inspection or to respond to intrusion alarms. It was reported that birds sometime set off the motion sensor. The overflow outlet discharges to a stormwater catch basin and was screened. This is an improvement from the previous survey.

Portland Ave Reservoir and Well

The Portland Ave. Reservoir is a 20-milion gallon below grade concrete reservoir. Prior to its construction the site housed an uncovered 50-million gallon reservoir. It was reported to be generally fed by a mix of water from Pipeline 4 (PL4) and PL5. On at least one occasion it has been used to capture and dump partially treated water from PL5 to prevent entry into the distribution system. It was also used to collect super chlorinated water for the PL5 disinfection startup. The reservoir is due to be cleaned next year and is on a 3-year cleaning schedule. Chlorine is monitored at the outlet of the reservoir but chlorine is no longer added at the site. At the time of the survey the free chlorine residual at the outlet of the reservoir was 0.89 mg/L with a pH of 7.72. The reservoir vents were screened with fine mesh screen. This is an improvement since the previous survey.

The overflow outlet for the reservoir was located in a vault below the reservoir. The outlet could not be seen in the vault. It is not clear whether there is an adequate air gap into the vault. The outlet may be less than 32 feet in elevation below the reservoir overflow. *The overflow outlet must be verified to be more than 32 feet below the reservoir overflow elevation. If it is not, this is a Significant Deficiency and an adequate air gap must be installed between the outlet and the vault. Also, the presence of a screen on the outlet must be verified.*

The well does not have a vent and is located in a vault. It was used briefly this year to test its performance into the system. It is rarely used.

Marine View Drive Pump Station

The Marine View Drive Pump Station is a four pump booster station with a capacity of 8.5 MGD. It can be used to pump water from the Tideflats area of Tacoma up to NE Tacoma and the Indian Hills Reservoirs. However, the completion of PL5 and the 356th Ave. Pump Station in general has eliminated the need for the pump station to operate to supply NE Tacoma. It was reported that it is used briefly once per week in the summer and every other week in the winter to prevent stagnation issues in the distribution system near the pump station.

The pump station plays a significant role in Tacoma Water's Groundwater Rule Triggered Monitoring Plan. If the pump station is not in use, only surface water can enter NE Tacoma. If it is in use water from the Hood Street Reservoir, which receives water from the South Tacoma Wellfield, can reach the pump station and NE Tacoma. In this scenario, positive routine coliform samples from NE Tacoma would require raw water sampling from the South Tacoma Wells that were in use at the time of the positive sample collection.

Indian Hills Reservoir

The Indian Hills Reservoir is located in NE Tacoma and is actually a set of four reservoirs located at the site: 3.5-million gallons, 1-million gallons, and two 250,000 gallon tanks. All are concrete reservoirs at or below grade. The two small tanks are buried and are not visible. There are two small booster pump stations located at the site that feed the pressure zone at the top of the hills where the reservoirs are located. The reservoirs are primarily fed from PL5. The overflow outlet of the two largest reservoirs discharges to a manhole at a lower elevation than the reservoirs. The outlet was screened. The reservoir vents were screened but with a fine mesh screen mesh. This is an improvement from the previous survey. The vent for the mid-sized reservoir was enclosed in a metal cylinder (pictured). *It was unclear whether the cylinder could fill with water and flow into the reservoir. If water can collect in the cylinder and overflow into the reservoir it would be a Significant Deficiency.* The hatches for all of the reservoirs were locked. The largest reservoir's hatch had a rubber gasketed seal. *The mid-sized and two smallest reservoir hatches must be outfitted with a rubber gasket seal.*

End of Facilities Review

Facilities Review Summary and Recommendations

In general, Tacoma Water's facilities are in very good to excellent condition. It is clear that a great deal of time and effort go into maintaining the facilities. The amount of infrastructure investment and development undertaken by the utility in the past eleven years has been significant, substantial, and appropriate. It is highly likely that no other water system in Washington State has undertaken such major projects within the past eleven years. In short, Tacoma Water is and has been a great partner in protecting the health of their community.

However, with a water system of great size and complexity there are always opportunities to make improvements that benefit Public Health. There are a number of recommendations that were generated by the Facilities Review and they are mentioned below. There were also a number of *Significant Deficiencies* that need more immediate attention. Most of these should be resolvable in a reasonably small amount of time but several may take some more substantial time to address. A plan to address the Significant Deficiencies must be submitted to DOH within 45 days of the date of this report. The tables below contain short descriptions of the recommendations and the Significant Deficiencies and where they are located within the report.

Page	Recommendations
10	Hood Street Reservoir CT Determination
11	Hood Street Reservoir Hatch Drain Screening
23	McMillin Reservoirs Hatch Drain Screening
15	UP Tanks Overflow Issues
25	Portland Avenue Reservoir Overflow Issues
26	Indian Hills Mid-Sized Reservoir Vent in Metal Cylinder
26	Indian Hills Reservoirs Hatch Seals
12	Well 6B Vent
24	Well SE#2 Vent
19	Covington Turnout Turbidimeter Calibration Frequency
22	Prairie Spring MPA Requirements and CT Evaluation
22	Prairie Spring Reservoir Vent Screen Tightening

Page	Significant Deficiency
12	Well 3A Blowoff Discharge Air Gap
12	Well 10C Blowoff Discharge Air Gap
24	Gravity Wells Blowoff Discharge Air Gap
21	Prairie Spring Overflow Air Gap to Creek
21	Prairie Spring "Blowoff" Cross Connection with Creek
23	McMillin Reservoirs Emergency PL1 Blowoff Screening
15	UP Tanks Inactive Float Gauge Penetration
13	Well 12A VOC Stripping Tower Air Exhaust Exposure to Surface Water

TACOMA WATER

3628 South 35th Street
Tacoma, Washington 98409-3192

TACOMA PUBLIC UTILITIES

November 27, 2013

Mr. John Ryding, P.E.
Regional Engineer
Washington State Department of Health
NWRO / Drinking Water Operations
20435 72nd Ave SE Suite 310
Kent, WA 98032

RE: 2013 Tacoma Water Sanitary Survey
Significant Deficiencies Response and Plan

Dear Mr. Ryding:

This letter is in response to your letter dated October 16, 2013 regarding the 2013 Sanitary Survey Inspection, which was completed August 8-12, 2013. In the report there were 8 items identified as *Significant Deficiencies,* requiring timely response and prompt resolution. These items required a plan on how we proposed to address them be submitted to DOH within 45 days.

Each one of these items has been investigated by Tacoma Water staff, and planned responses and completion dates have been developed. Attached to this letter is a summary of these planned responses and completion dates.

If you have any questions regarding this letter please feel free to contact me at (253) 502-8210 or Craig Downs at (253) 396-3063.

Sincerely,

Chris R. McMeen, P.E.
Deputy Water Superintendent
Water Quality Manager

Cc: Glen George, Tacoma Water
Stuart Vaughan, Tacoma Water
Hilary Lorenz, Tacoma Water
Scott Hallenberg, Tacoma Water

2013 Water System Sanitary Survey Report

Identified Significant Deficiencies with planned solutions and completion dates.

Prepared by: Stuart Vaughan / Craig Downs

Significant Deficiency	Description of Deficiency	Planned Solution	Planned Completion Date
Well 3A Blow off Discharge Air Gap	The existing air gap on the blow off line does not meet minimum air gap requirements of 2x pipe diameter.	The existing blow off will be modified to meet the required 2x pipe diameter air gap above the concrete discharge floor.	Estimated completion 1st Quarter 2014
Well 10C Blow off Discharge Air Gap	The existing air gap on the blow off line does not meet the 2x pipe diameter above the high water level in the discharge basin.	The existing blow off will be modified to meet the required 2x pipe diameter air gap above the high water level of the drainage basin.	Estimated completion 1st Quarter 2014
Gravity Wells Blow off Discharge Air Gap	The existing air gap on the blow off line does not meet the 2x pipe diameter above the high water level in the discharge basin.	The existing two blow offs from both GPL wells will be raised to meet the minimum 2x pipe diameter air gap above the high water level of the drainage basin.	Estimated completion 1st Quarter 2014
Prairie Springs Overflow Air Gap to Creek	The air gap at the discharge point does not meet the required 2x pipe diameter.	The discharge will be raised so that it meets the minimum requirement of 2x pipe diameter air gap above the high water level in the creek.	Estimated completion end of 2014
Prairie Springs Blow off Cross Connection with Creek	The existing blow off discharge is under the water level of the creek.	The existing blow off is no longer needed, and will be plugged and physically disconnected.	Estimated completion end of 2014
McMillin Reservoirs Emergency PL1 Blow off Screening	The mesh on the blow off outlet is not the correct size.	New #24 mesh will be attached to the existing blow off outlet.	Estimated completion 1st Quarter 2014
UP Tanks Inactive Float Gauge Penetration	The penetration where the float gage enters the tanks has an existing gap that is not screened.	The existing float gauge will be manually raised to its highest position and secured in this position. Once this is completed the gap around the cable will be covered with steel plate.	Estimated completion 1st Quarter 2014
Well 12A VOC Stripping Tower Air Exhaust Exposed to Surface Water	The tops of the air stripping towers are screened, but not protected from rain water entering. As a result, there is the potential of rain water to mix with the well water in the towers.	A new hood will be placed on the top opening of each of the stripping towers to block surface water from entering the exhaust vents.	Estimated completion end of 2014

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310, Kent Washington 98032-2388

October 27, 2016

CHRIS MCMEEN
TACOMA WATER DIVISION, CITY OF
POST OFFICE BOX 11007
TACOMA WA 98411-0007

Subject: Tacoma Water Division, City of; ID #86800
Pierce County
2016 Routine Surface Water Treatment Plant Sanitary Survey

Dear Mr. McMeen:

I would like to extend my appreciation to all of your staff who helped me to complete this year's sanitary survey of the Green River Filtration Facility (GRFF), especially Gary Fox, Jeff Bolam, and Bryan King. The survey was conducted July 14 and 15. I am sorry for the delay in getting this report to you. This was the first sanitary survey of the GRFF and procedures and write-ups have changed significantly from the time when Tacoma Water used an unfiltered surface water supply.

I started with a trip into the watershed led by Bryan King. This included my first trip to Eagle Lake in the watershed. Bryan explained the temporary summer operations last year during the drought conditions to transfer water from the lake to the North Fork of the Green River. It sounded like it was a herculean task that was conducted in a timely and professional manner. From there we travelled to Lester where I was able to observe the damage to the road near Lester due to migration of the river. I understand that it may not be possible to rebuild the road for a number of reasons. However, it appears that there is a stable, albeit longer, bypass around the damage that allows operators to reach Lester and the upper reaches of the watershed. It does not appear that this damage has impacted the water quality reaching the plant. There were also no reported accidents or unusual water quality concerns since my last watershed inspection in 2014.

The watershed inspection was followed by an inspection of the physical plant of the GRFF. In general, the plant was in great physical and operational condition during the survey. I have enclosed your first ever field data sheet for the plant. The field data sheet describes many of the operational and design parameters of the plant. There are several recommendations from the survey that are listed below. They are highlighted in yellow in the report. There were no Significant Deficiencies or Significant Findings identified during the survey.

- Turbidity notes and calibration tags should be included for the raw water turbidimeter like they are for the filtered water turbidimeters.
- Chemical pump outputs are monitored by magmeters. Calibration columns are available

for each monitoring pump. Chemical pump outputs should be verified by calibration columns monthly.

- The alarms were last tested during plant commissioning a little more than a year ago. Alarms are most easily tested by setting alarm set points in the plant SCADA system to the current reading of the analyzers and alarms being tested and observing the result. All alarms should be tested at least once per year. Priority should be given to the most critical alarms (pH caustic soda shut down, fluoride injection shut down, individual filter effluent turbidity activating FTW, and chlorine residuals post-clearwell).
- The clearwell vents were protected with a fine mesh screen. It was difficult to determine whether there was a fine mesh screen on the 10 MGal Backwash Storage Tank from the photographs provided. Verify that the 10 MGal tank vents are protected with a fine mesh screen.

Please feel free to call me at (253) 395-6757 if you have any corrections, comments or questions regarding this report. Based on the criteria in WAC 246-290-416, the next sanitary survey of the GRFF is due in the calendar year 2019. The sanitary survey of the distribution system is due to be conducted in calendar year 2018, five years from the previous survey in 2013.

Drinking Water Regulations require that all Group A public water systems have a routine sanitary survey every 3 to 5 years. In order to receive credit for the survey, a sanitary survey fee must be paid. Enclosed is an invoice for $2,754.00 along with a worksheet that shows how the amount was determined. Please send your complete payment in the form of a check or money order within thirty days of the date of this letter to: **DOH, Revenue Section, P.O. Box 1099, Olympia, WA 98507-1099**.

Thank you for all of your efforts. The water system has made tremendous strides in the 13 years I have been your Regional Engineer.

Sincerely,

John Ryding

John Ryding, P.E.
Regional Engineer
Northwest Drinking Water Operations
(253) 395-6757

Enclosures

cc (with enclosures):
Tacoma-Pierce County Health Department

Electronic cc:
Brietta Carter, WSDOH
Nancy Feagin, WSDOH
Jolyn Leslie, WSDOH
Bryan Boye, WSDOH

Department of Health
Office of Drinking Water
Sanitary Survey Time Tracking

System Name	Tacoma Water Division	PWS ID #	86800
County	Pierce		
Surveyor	John Ryding	Date:	7/14 & 7/15

System over 10,000 Connections? YES

	Quantity				Cost
Department of Health Paid Costs	**Hours/Miles**				
Survey Program RO Coordination	1	$	102	$	102.00
Survey Program Administrative Support	1.5	$	102	$	153.00
Travel expenses (Mileage)	131		(# Miles) x ($.337/Mile)	$	44.10
Technical Assistance		$	102	$	-
		$	-	$	-
Total Department of Health Costs to Perform All Surveys				$	299.10
Water System Paid Costs	**Hours**				
Scheduling, research, prep	2	$	102	$	204.00
Survey Field Work	16	$	102	$	1,632.00
Survey documentation – preparation of survey report to the purveyor	6	$	102	$	612.00
Additional Water System Paid Costs for systems serving 10,000 or more connections					
Costs for Systems >10,000 Connections	**Hours**				
Travel Time	3		102	$	306.00

Total Cost of Survey	$	3,053.10
Total Department of Health Unreimbursed Costs	$	299.10
Water System Paid Costs (More than 10,000 Connections)	**$**	**2,754.00**

Washington State Department of Health
Environmental Health Programs
Office of Drinking Water

Sanitary Survey of Rapid Rate Filter Plant

Field Data Sheet

System Name	I.D. Number	Date	Evaluation By
Tacoma Water Division, City of	**86800**	**July 14 and 15, 2016**	**John Ryding**

Operator(s) Present	WTPO#	Certification Level	Title	Phone Numbers
Gary Fox	**13911**	**WTPO4**	**Operations Manager**	**(253) 502-8214**
Jeff Bolam	**6198**	**WTPO4, WDM3**	**Water Treatment Supervisor**	**(253) 502-8346**

Identify lead operator/WTP supervisor above.
Is lead operator new since the last survey? (Y/N) Y
Does this person sign the reports? (Y/N) Y
Present during the survey? (Y/N) Y

Source Water & Watershed Information *(Review Watershed Risk Report from Surface Water Database (SWDB); Gather information needed if incomplete) Intake: Protection provided to Intake facilities; adequate screening; adjustable levels of withdrawal; pumped or gravity (reliability concerns)? Frequency and location of raw water turbidity and fecal coliform samples.*

Tacoma Water's watershed is the Green River watershed with multiple landowners. Tacoma Water owns approximately 11% of the watershed including all land adjacent to the river and its major tributaries in the watershed upstream of the intake. Access to the watershed from the treatment plant up to the Lester townsite is controlled through a manned security gate at the plant, a part time secured gate (Massey Gate) on the access road to the south end of the Howard Hanson dam, and a locked and unmanned gate at Lester. Tacoma Water conducts manned patrols of the watershed between the treatment plant and Lester. The Watershed Risk rating is 8 (low risk).

The intake is a concrete structure approximately 3 miles downstream of the Howard Hanson Dam and immediately upstream of an impoundment dam which establishes the hydraulic grade of the intake. Water passes through a bar screen and fish screens before flowing by gravity to the treatment plant. The hydraulic capacity of the intake is in excess of 150 MGD, which is the current approved capacity of the treatment plant.

Raw water fecal samples are collected at the treatment plant between the spill chamber and the ozone injection facility. This system has been doing monthly source samples. The counts for fecal and e. coli have generally been low (<20/ 100 mL), while the total coliform can be over 1000/100 mL. The watershed risk rating is low.

Hach Surface Scatter 7 Turbidimeter is used for raw water turbidity monitoring. Turbidity notes and calibration tags should be included for the raw water turbidimeter like they are for the filtered water turbidimeters.

Plant Schematic *– Use schematic from Comprehensive Performance Evaluation (CPE) report, if available; Show actual compliance monitoring locations for Combined Filter Effluent (CFE) turbidity, Concentration of Residual x Time of Contact (CT), and residuals @ entry point to Distribution System (DS); Place arrow and letter at chemical addition points and identify in tables below.*

See attached GRFF Process Flow Diagram. The monitoring locations are cross referenced with the monthly SWTR monitoring report forms.

Chemical Addition - Coagulant(s), Filter Aid(s), pH Adjustment, Pre-Cl_2 /Rapid Mix:

Chemical		Location	Dose	Chemical		Location	Dose
Alum	x	SA5	3.4 to 20 mg/L	Soda Ash			
Ferric Cl/SO_4				Caustic Soda	x	Prior to Flash Mix	0-13 mg/L
PACl				Lime			
CAPolymer:	x	SA5	0 to 0.3 mg/L	Pre Chlorine			

CAPolymer:				Potassium Perm			
FAPolymer:	x	SA7-C	0.01 - 0.08 mg/L	Other: CO_2	x	Prior to Flash Mix (rarely)	1 to 6 mg/L

All chemicals used in the WTP NSF Standard 60 Approved: ☒ If not, which ones?

Note: PACl = Polyaluminum Chloride; CAP = Coagulant Aid Polymer; FAP = Filter Aid Polymer; Insert name(s).
How are dosages determined; how are they controlled?(Jar tests, Visual floc formation, streaming current monitor, historical, monitoring data, etc.); what turbidity variation triggers a change?(Compare monthly chemical usage to dosage.) Bulk storage? Day tanks?

Coagulation changes are triggered by Zeta monitor, and Streaming Current Meter readings. The zeta monitor target readings are -5 to 5. The SCM is used for trend monitoring and the goal is to stay under +50. No jar testing is being done t the present time.

Chemical pump outputs are monitored by magmeters. Calibration columns are available for each monitoring pump. Chemical pump outputs should be verified by calibration columns monthly.

Rapid Mix Type: Static Mixer [ ] Mechanical Mixers [ ] Injection Mixers [x] In-line Blender Mixers [ ]

Mixing Energy (G or GT): 1,500 sec^{-1}

Two flash mixers at SA5 on the Process Flow Diagram. Each mixer has a design capacity of 168 MGD. The channel dimensions are 16 ft x 83.5 ft. There are two injection pumps and the injection rate is 2,050 gpm per pump.

Flocculation:

Flocculator Type: **NONE** [ ] Hydraulic [ ] Mechanical [x] Number of basins: 4

Target Mixing Energy (G or GT): 10 to 70 sec^{-1}

Appearance of floc; tapered energy input?

A fine pin floc was observed in the filters above the media. Floculation energy is tapered through the floc basins.

The design capacity of the floccualtors is 168 MGD in Direct Filtration mode and 90 MGD in Conventional mode. There are a total of 32 flocculator mixers, which consist of vertical hydrofoil blades. The size of the train is 44 ft x 88 ft with 20 ft water depth. The detention time is approximately 20 minutes in Direct Filtration mode and 37 min in Conventional mode.

Sedimentation/Clarification:

NONE (Direct Filtration)*		Horizontal-flow rectangular with High-rate Plate Settlers and Sludge Scrapers	x	Tube Settlers		Dissolved Air Flotation	
Adsorption Clarifier		Horizontal-flow round		Inclined-plate		Other:	

Basin Dimensions: Length: 89 ft Width: 89 ft Depth: 20 ft

Number of basins: 2 Total Basin Volume: 2.36 Million Gallons

* The sedimentation basin has an ultimate design capacity of 168 MGD and a hydraulic capacity of 200 MGD but would likely never see these rates. In the summer the plant would operate in Direct Filtration mode (up to 150 MGD) during

which the sedimentation basins would not be used. Each basin has an ultimate design capacity of 84 MGD. The basins will likely be cleaned once per year but there is currently limited experience on the needed cleaning frequency.

Filtration:

Single Media		Dual Media	x	Mixed Media		Pressure Filter		Deep Bed Mono-media	
Media Type:		Sand	x	Anthracite	x	Garnet		Other: _____	

Filter Dimensions: Length: 42 ft Width: 20 ft No. Filters: 8

Total Area: 6,720 ft^2 Max. plant Production: 150 MGD Filter Rate: Approved to 10 gpm/SF

50 in anthracite and 20 in sand L/D ratio: 1700 Total Effective Size: Sand 0.66, Anthracite 1.32

Individual Filter Turbidimeters [x] Combined Filter Effluent Turbidimeter [x] Calibration Date: quarterly

Backwash criteria: 70 hrs or HL, 12.5 ft Conventional 14 ft Direct Filtration Rate 23 gpm/SF, 25 gpm/SF max Time 4-5 min

Backwash initiation is a combination of filter run time, terminal head loss, and plant demands

Backwash is delivered to Washwater Equalization Basins followed by Washwater Clarifier. Decant goes to Return Equalization Basin which is pumped to the head of the plant. Solids underflow goes to Solids Metering Vault followed by the Thickener, Sludge Blending Tank, and Screw Presses. Zero liquid discharge plant.

Filter-to-waste: No [ ] Yes [x] Time 20 minutes min. Stopped @ 0.10 ntu if > 0.10 NTU after 20 minutes

Filter to waste is conveyed to Return Equalization Basin which is pumped to the head of the plant.

Condition of media (mounding, cracking, mudballs); when replaced; Control of filter rate and backwash rate; Variability of filter rate; Turbidimeters properly operating? Numbers reported when plant is running? Models of turbidimeters: continuous and benchtop; filter to waste (FTW) at all start-ups or after backwash (BW)? Recycle backwash water, thickener supernatant, or sludge dewatering process liquid? Where to? Request to see required records.

IFE and CFE Turbidimeters (Sample locations SA8 through SA17)

Sample line lengths are short. The IFE turbidimeters (Hach 1720E) are mounted near the filter discharge point. Filter rates are typically established on a weekly basis depending on forecasts of water needs in the distribution system. Filter media is a little over a year old.

The readings during the survey were:

Raw water turbidity 1.25 NTU
Filter 1 IFE 0.024 NTU
Filter 2 IFE 0.025 NTU
Filter 3 IFE Offline
Filter 4 IFE 0.027 NTU
Filter 5 IFE 0.024 NTU
Filter 6 IFE Offline
Filter 7 IFE 0.022 NTU
Filter 8 IFE 0.027 NTU
CFE 0.031 NTU

Chemical Addition – Disinfection:

Chemical		Location	Dose	Chemical		Location	Dose
Gas Chlorine				UV			
NaOCl	x	Filter Outlet Weir Structure (SA18) and SA20 & SA21	1.5 mg/L total dose	Ozone*		Head of R1 and R5	0.8 to 1.0 mg/L
$Ca(OCl)_2$				Chloramines			
ClO_2				Other:			

** Ozone is added for taste and odor control and disinfection credit is not normally taken for ozone injection. Operators collect enough data to calculate CT for ozone if it becomes necessary to do so such as a major failure of the NaOCl system.*

Clearwell Dimensions: P1: 1.3 MGal, 80 ft ID P5: 6.6 MGal, 265 ft ID Depth: P1 – 35 ft max, P5 – 16 ft max

The operational storage levels are 30 to 35 feet for the P1 clearwell and 10 to 15 feet for the P5 clearwell.

Parameter Monitored	Location	When/ Frequency
pH	Clearwell exit (P1, SA20; P5, SA21) and at CT Compliance points	Continuous
Temperature	at CT Compliance points	Continuous
Disinfectant Residual	Several locations in plant and at CT Compliance points	Continuous
Disinfectant Residual	See below	
Peak Hourly Flow (PHF)	at CT Compliance points	Continuous
Other:		

Redundancy of equipment; Contact time (T) evaluation – how derived, variable or constant; How is Peak Hourly Flow (PHF) determined – compare to value used for T in CT calcs; Check CT Summary Report in database, complete as necessary (If CT summary Report is not available, review CT determination in system files); Clearwell vents and screens; Calibration of pH meters and disinfectant residual monitors

CT values are calculated for both Pipeline 5 (PL5) and Pipeline 1 (PL1). A CT summary has been developed by Craig Downs, P.E. showing the contact time calculations for both pipelines. Tacoma Water is transitioning the CT points of compliance to Black Diamond (PL5) and Enumclaw (PL1). Water quality data (Cl_2 concentration, temperature, and pH) will continue to be collected at the Covington (PL5) and 214th Ave (PL1) monitoring stations. Contact times to Black Diamond and Enumclaw will be determined by peak hour flows from the plant and used in the CT calculation spreadsheet. In cases where the flow down PL1 is less than 24.7 MGD the Cumberland turnout the contact time will be less than to Enumclaw. Inactivation ratios for both Enumclaw and Cumberland will be shown on the monthly report form.

There is continuous chlorine monitoring in the distribution system. The residuals are never non detects. Chlorine residuals are also measured at the time of coliform sampling in the distribution system. pH meters are calibrated quarterly. Chlorine analyzers are recalibrated when they diverge more than 0.2 mg/L from daily grab samples.

pH meters: Rosemont Emerson pH 56 part HART analyzer/3900 VP Insertion/Submergent

Chemical Addition – Corrosion Control/Stability/Other:

Chemical		Location	Dose	Chemical		Location	Dose
Soda Ash				Orthophosphate			
NaOH	X	SA18	3.4-5 mg/L	Polyphosphate			

Lime ☐ _____ _____ Other: ☐ _____ _____

Target finished optimal water quality parameters:

pH: 8.2 Alk: 20 mg/L as $CaCO_3$ Phosphorus: _____ Other: _____

Fluoridation: None ☐ Hydrofluosilicic Acid X Sodium Fluoride (Saturator) ☐ Sodium Silicofluoride (Dry Feed) ☐

NaOH is typically added before the flash mix if needed during the coagulation process and after the clearwells to achieve the pH target (8.2). Target dose is around 0.7 mg/L.

General Plant Operations/ Cross-Connection Protection (CCP)

Has purveyor had plant hazard evaluation by Cross Connection Control Specialist (CCS)? If so, when?

The Chemical Injection Facilities have undergone a hazard evaluation/walk through by Scott Hallenberg of Tacoma Water. Scott is planning to do an evaluation/walkthrough of the filtration plant later this year.

Internal CCP – chemical makeup; use of day tanks; chemical feed/ makeup interconnections; split chemical feeds? Submerged inlets in chemical feed tanks? Surface washers? FTW connections? Protection from overfeed? Connections to pumps? Hoses/ hose bibs? Any other treatment provided?

Is plant staffed during all times of operation? No ☐ Yes ☒

The plant operates 24 hours a day, 7 days a week. There are two shifts per day, each is a 12-hour shift. Two to four operators are onsite during the day shift and one operator is onsite during the night shift.

Plant staffing – plant rating/mandatory level; certification levels of operators; coverage, shift operation; vacations/ weekends/holidays.

All operators are WTPO 3 or higher. Several are certified as WTPO 4. Currently there are nine operators assigned to the plant along with Gary Fox and Jeff Bolam. Ultimately the goal is to have eight certified operators and two OITs assigned to the plant along with Gary Fox and Jeff Bolam.

If unattended or operated remotely, how many hours a day is an operator at the WTP?

This plan is not operated remotely. An operator is present 24/7. There is a security guard at the watershed and WTP entrance 24 hours a day/7 days a week.

The clearwell vents were protected with a fine mesh screen. It was difficult to determine whether there was a fine mesh screen on the 10 MGal Backwash Storage Tank from the photographs provided. Verify that the 10 MGal tank vents are protected with a fine mesh screen.

Critical Water Quality Alarms

Parameter	Monitoring Point	Alarm Level	Shutdown Level	Response
Turbidity - Raw	SA2A & SA2B	2 and 5 NTU	NA	Alarms are for notification only
Turbidity - IFE	SA8 - SA16	0.08 and 0.09 NTU	0.09 NTU	0.08 NTU is notification warning. 0.09 NTU triggers FTW cycle.
Chlorine Residual	SA20 & SA21	Low: 0.50 and 0.45 mg/L High: 1.5 and 2.0 mg/L	NA	The alarms are for notification only. The operators can boost the chlorine levels post-clearwells prior to travel down the transmission lines.
pH - Finished	SA20 & SA21	Low 7.4 High 8.9	9.75	8.9 is notification warning. 9.75 shuts off caustic injection.
Turbidity - CFE	SA17	0.05 and 0.10 NTU	NA	Alarm is for notification only
Fluoride	SA 20 & SA 21	1.0 and 1.7 mg/L	1.7 mg/L	Notification alarms. Shut down fluoride injection at 1.7
Part. Count – CFE	SA17	1500 and 2000 in 2-5 um range	NA	Alarms are for notification only
Part. Count - IFE	SA8 - SA16	100 and 200 in 2-5 um range	NA	Alarms are for notification only
Streaming Current	SA5	Low: - 65 High: + 100	NA	Alarms are for notification only

When was the last time critical water quality alarms were tested? What was done?

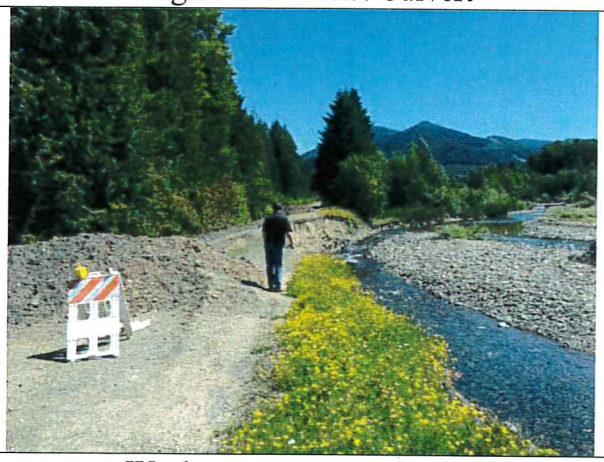
The alarms were last tested during plant commissioning a little more than a year ago. Alarms are most easily tested by setting alarm set points in the plant SCADA system to the current reading of the analyzers and alarms being tested and observing the result. All alarms should be tested at least once per year. Priority should be given to the most critical alarms (pH caustic soda shut down, fluoride injection shut down, individual filter effluent turbidity activating FTW, and chlorine residuals post-clearwell).

Version 03a; April 2011

2016 GRFF Sanitary Survey Photographs

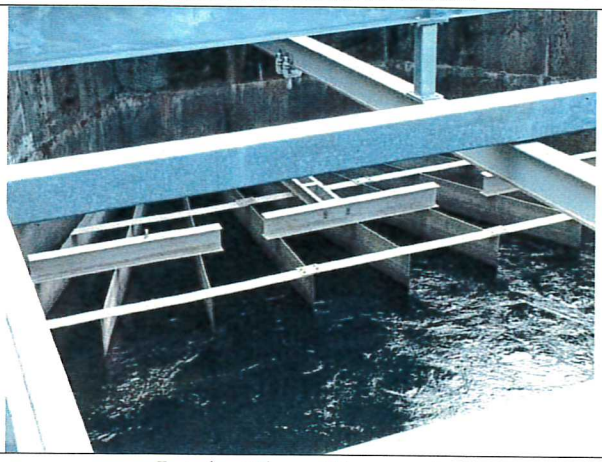
Eagle Lake Outlet Culvert

Eagle Lake



Washout on Road to Lester

Intake Dam

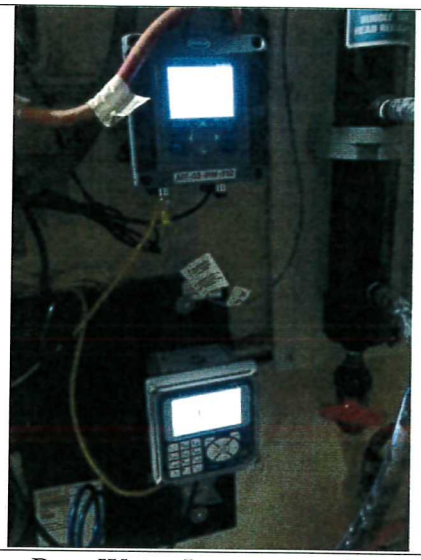


Intake Flow Dispersal

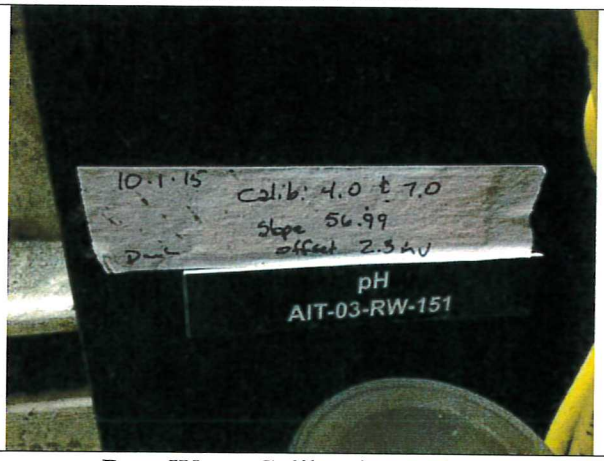
Spill Trailer at Intake

2016 GRFF Sanitary Survey Photographs

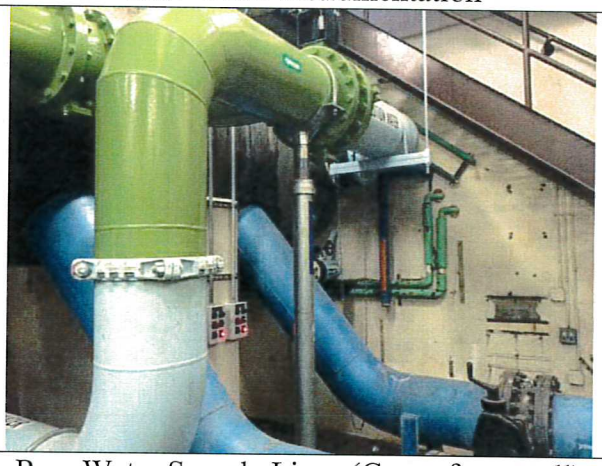
Intake Bar Screen



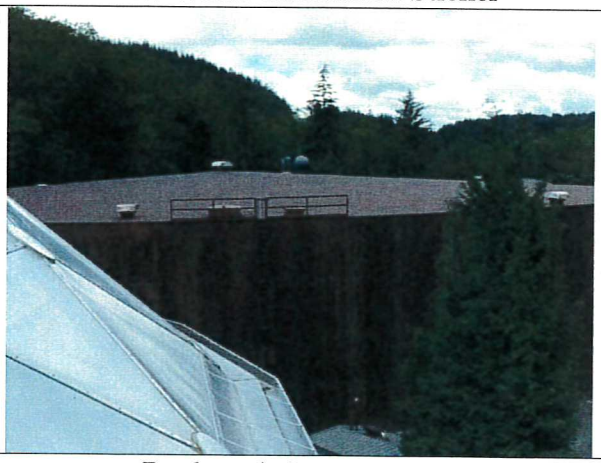
Raw Water Instrumentation



Raw Water Calibration Sticker



Raw Water Sample Lines (Green from wall)



Backwash Storage Tank

Liquid O_2 Delivery

2016 GRFF Sanitary Survey Photographs

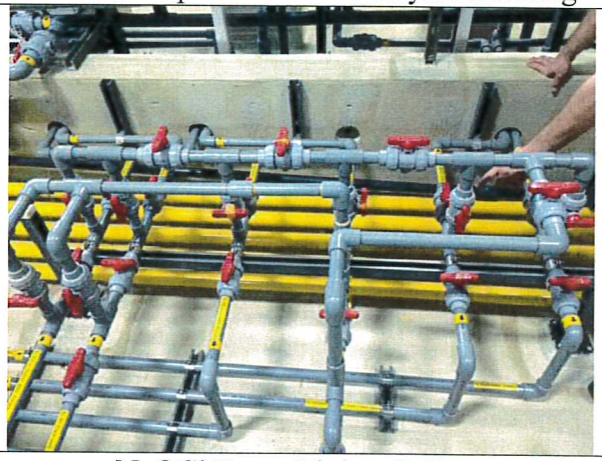
Ozone Generators

Ozone Injection Building

Ozone Injection Pumps

Ozone Sample Station 1 Analyzer Reading

North Fork Tank Overflow Outlet



NaOCl Pump Piping Gallery

2016 GRFF Sanitary Survey Photographs

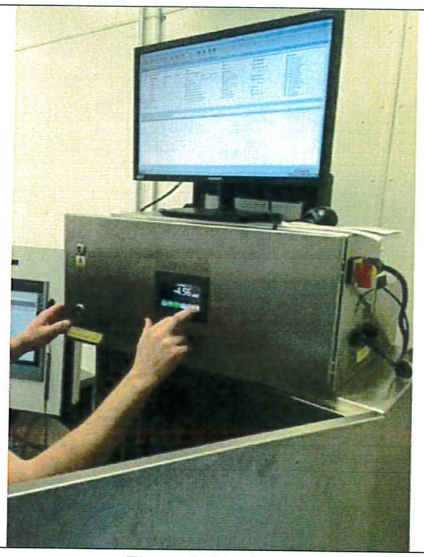
NaOH Pump Piping Gallery

Coagulant Storage

Chem Feed Pump

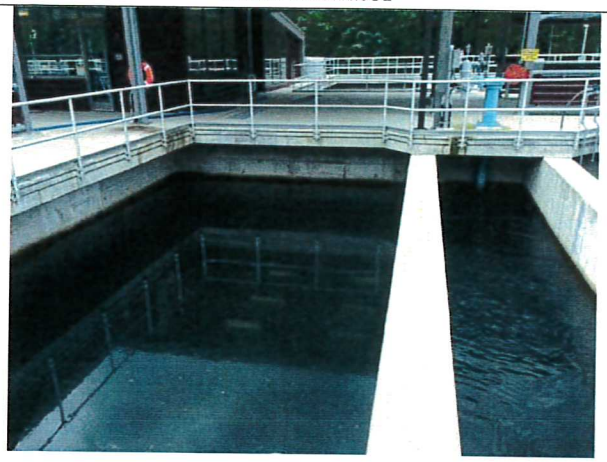
Floc Basin Deck

2016 GRFF Sanitary Survey Photographs

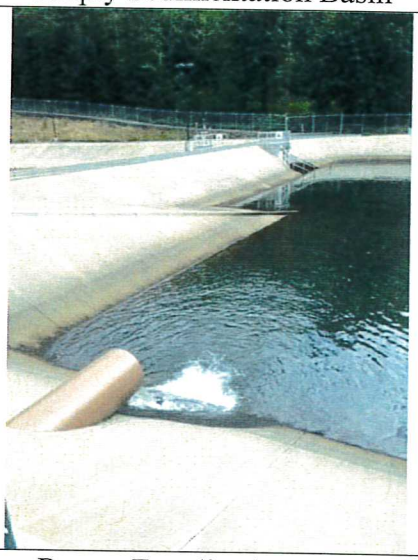


Zeta Monitor

Empty Sedimentation Basin

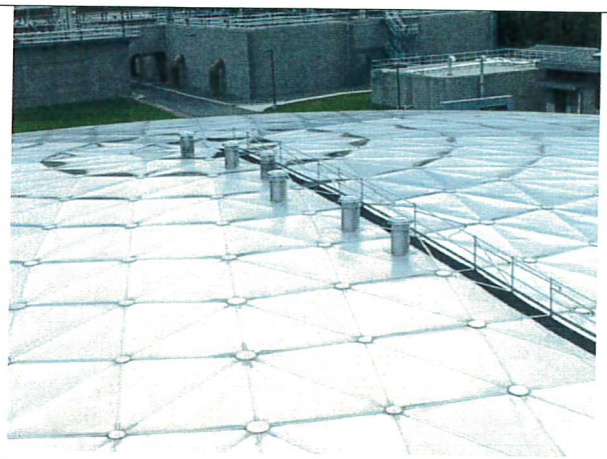


Filter Basin



Return Equalization Basin

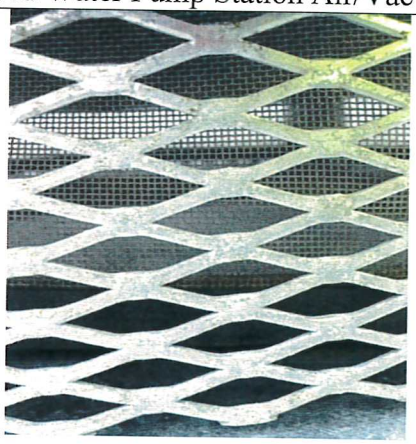
2016 GRFF Sanitary Survey Photographs



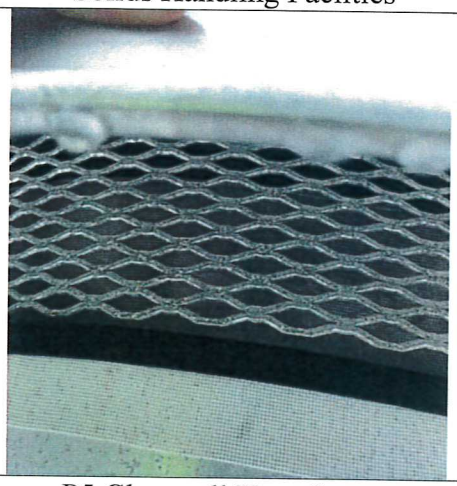
P5 Clearwell Roof

Filtered Water Pump Station Air/Vac Vent

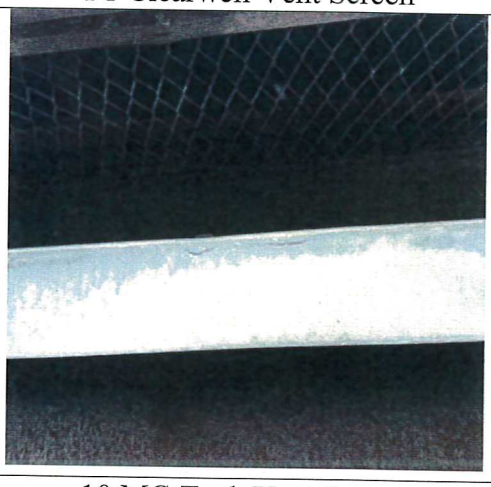
Solids Handling Facilties



P1 Clearwell Vent Screen



P5 Clearwell Vent Screen



10 MG Tank Vent Screen

TACOMA WATER

36932 SE Green River Headworks Road

Ravensdale, Washington 98051

TACOMA PUBLIC UTILITIES

12/29/2016

John Ryding
Washington Department of Health
Northwest Drinking Water Regional Operations
20425 72nd Ave. S. Suite 310
Kent, WA 98032-2388

Subject: 2016 Routine Surface Water Treatment Plant Sanitary Survey dated October 27, 2016

Mr. Ryding,

I have received the 2016 Sanitary Survey and do appreciate the time you spent putting it together. I would like to inform you that we have addressed the highlighted recommendations from your report, specifically:

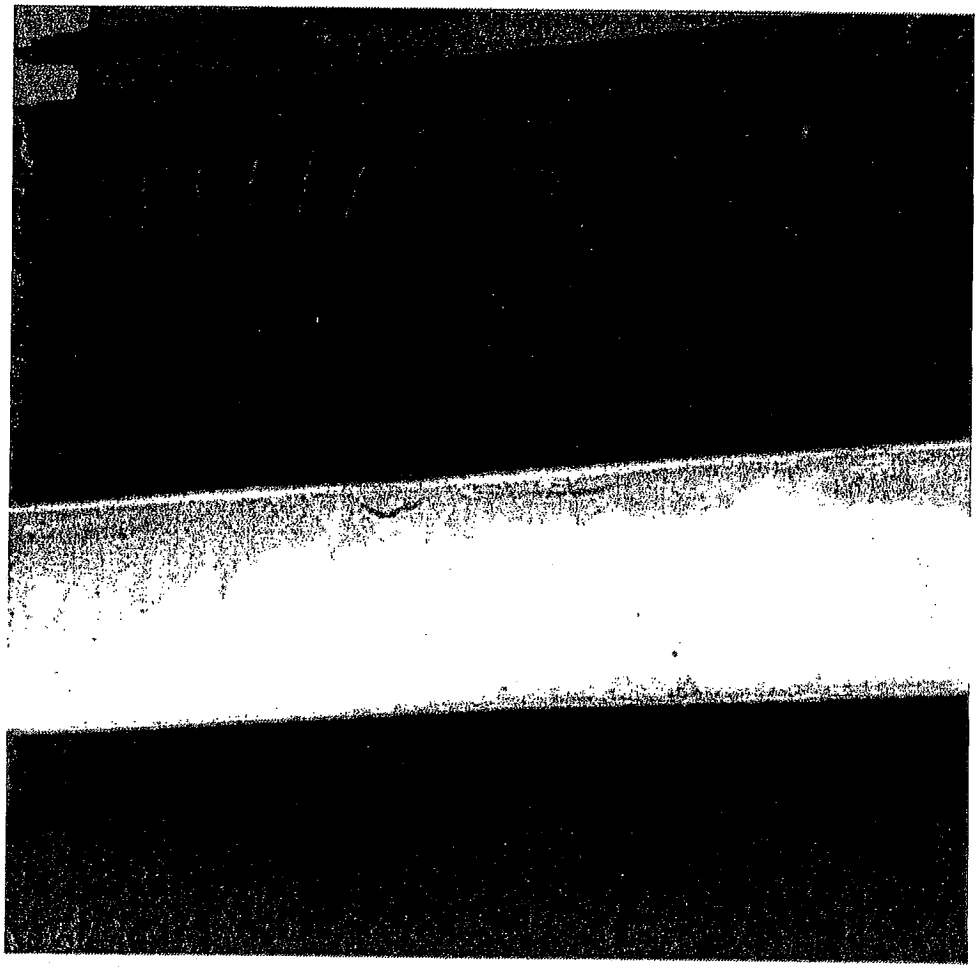
- Turbidity notes and calibration tags posted with analyzers.
  Our intake and Blended turbidity analyzers now have the basic operation information and the most recent calibration date on the analyzer itself.
- Chemical pump outputs should be verified by calibration columns monthly.
  Our active chemical feed pump outputs (flow meters) are checked against drawdowns at least monthly. The information from drawdowns is kept in a pump log located at each corresponding chemical bay in the plant as well as our maintenance management program (SAP).
- Verify the 10MG tank vents are protected with fine mesh screen.
  We have, and attached please find a photograph labeled NF Tank.
- All alarms should be tested at least once a year.
  The alarms we identified during our conversation and you noted on the report are on a quarterly schedule. The remaining approximately 3000 are not yet on a schedule to test annually. I will continue to work towards an effective method to test and our priority will remain those that actually effect physical functions of the plant (such as shutting down a system like ozone leak). In the meantime we will begin to mark block 39 of the SWTR Summary report as "Yes" as the critical alarms will be tested.

In summary, I agree your recommendations are beneficial to GRFF operations and by extension Tacoma Water customer's best interests and are implemented with earnest. As always it is a pleasure working with you and viewing our operations through the eyes of DOH is very helpful.

With best regards,

Jeff Bolam
Water Treatment Supervisor
Tacoma Water Division, City of: ID # 868001

CC: WDOH File



10 MG Tank Vent Screen