From:	Wike, Vanessa
To:	Randlett, Susan A (DEC)
Cc:	Craig Fredeen; John Pepe; Beiswenger, David
Subject:	Kong Trip Report (Civil, Mech, Elec)
Date:	Monday, August 26, 2019 4:38:46 PM
Attachments:	26Aug2019_Kong Trip Report.pdf 19y08m26d Kong Site Inspection Trip Report_EDC.pdf 32190078_Kong_Treatment Schematic FIG 1 (1).pdf

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Good afternoon Susan,
I have attached my trip report from the Kong Site Visit July 22-23, 2019, which details drinking water issues, and summarizes recommendations for immediate repairs (for the water system, as well as mechanical and electrical systems). EDC's trip report provides more detail on the electrical / mechanical components. I have also attached a schematic of the water system and a draft table of primary system components.

The follow up DAR will provide information on needed water treatment, and associated long term improvements for the mechanical/electrical systems.

If you have any questions, please let me know.

Thanks,
v.

Vanessa Wike
Senior Civil Engineer
Bristol Industries, LLC
111 W.16th Avenue, Third Floor
Anchorage, AK 99501-5109
Phone : (907) 743-9302
FAX : (907) 563-6713
vwike@bristol-companies.com
http://www.bristol-companies.com/

Bristol
ENGINEERING
SERVICES COMPANY, LLC

111 W. 16th Avenue, Third Floor
Anchorage, AK 99501
(907) 563-0013 • Phone
(907) 563-6713 • Fax

Site Inspection Trip Report
Native Village of Kongiganak, Water Treatment Plant and Washeteria

This trip report summarizes a site visit completed July 23, 2018, to Kongiganak, AK. Findings from this report will be incorporated into a Design Analysis Report (DAR) detailing needed upgrades to the Water Treatment Plant and Washeteria

ITINERARY

REPORT DATE:	Monday Aug 26, 2019
INSPECTION DATE:	Tuesday July 22 – Wednesday July 23, 2019
PROJECT:	Kongiganak WTP / Washeteria, Bristol # 32190078
LOCATION:	Kongiganak, AK
VSW PROJECT LEAD:	Susan Randlett, PE, VSW
PERFORMED BY:	Vanessa Wike, PE; David Beiswenger; PE, John Pepe, PE; Craig Fredeen, PE
OTHERS PRESENT	Joseph Mute, Paul Paul
WEATHER:	Overcast, 55 °

Monday 22 July 2019

05:00 pm Arrive at Anchorage International Airport.
06:45 pm Depart Anchorage for Bethel on AK Air.
08:00 pm Arrive Nome. Overnight at the Long House Hotel (543-4613).

Tuesday 23 July 2019

09:00 am Arrive Ravn Air Terminal
10:15 am Leave Bethel (two separate Ravn flights were needed to transport team)
10:45 am Arrive Kongiganak
05:15 pm Leave Kongiganak Ravn Air
06:00 pm Arrive Bethel, proceed to AK Air Terminal
08:55 pm Leave Bethel AK Air
10:00 pm Arrive Anchorage

SCOPE

Bristol Engineering Services Company, LLC (Bristol) was contracted through the State of Alaska, Village Safe Water Program (VSW) to develop a design for needed upgrades to the Water Treatment Plant (WTP) and Washeteria serving the Native Village of Kongiganak. A site inspection was conducted to evaluate the processes and equipment in the WTP and Washeteria, and provided needed information for the DAR. This inspection (conducted July 23, 2019) follows a June 20-21, 2019 inspection which addressed the structural and geotechnical aspects of the facilities.

TRAVEL

The team arrived in Bethel, overnighted, and proceeded the next morning to the Ravn air terminal. Two flights (one leaving approximately 30 minutes after the first) were needed to transport all team members to Kongiganak. We met Joseph Mute (Native Village of Kongiganak Tribal Chief) and Paul Paul (WTP Operator) onsite. Team members conducted the site inspection and flew out on the afternoon Ravn flight. In Bethel, team members proceeded to the Alaska Air terminal for the flight back to Anchorage.

INSPECTION

The following findings address the water treatment equipment and processes. Information specific to the electrical and mechanical inspections is included in the field trip reports provided by EDC (attached).

System Information

At the time of the site visit the system had completed filling the 1.2 million gallon raw water storage tank from Contractor's Lake within the last week. The filling process took approximately 2 weeks (running 24/7). The system was actively treating water (coagulation, flocculation tank, media filtration, and chlorination. Treated water is stored in 61, 150-gallon, plastic tanks, cumulatively providing approximately 7,500 gallons of storage. The water treatment process is summarized in the attached schematic.

System Operations

The operator (Paul Paul) was new to the system, having started earlier in the summer. He was well organized, took careful operational notes, and was knowledgeable of the system. The Remote Maintenance Worker for the area (Allan Paukan) had trained Mr. Paul on system operations.

The following summarizes observed system operations.

- The water treatment processes are located on the second floor of the WTP. During filter inspection, there appeared to be a deflection in the floor under the pressure filters.
- The pre-filter systems were not in use (the housings showed zero pressure differential).
- The media filters had no air scour system and limited ability to backwash. It is expected that the limited backwash could result in mud balls and rapid media plugging. The media filters have limited head room over the access hatches, which would could make routine maintenance and media inspection/replacement very difficult.
- The post treatment filtration system (presumably for protozoa) was not in use (housings showed zero pressure differential).
- The soda ash pH adjustment system was not in use.

- The chlorination system was operational. Chlorine was injected into a single tank, within a group of tanks on the first floor of the treatment plant. The operator had been taking the residual chlorine measurement in this first tank. This chlorine measurement would not be reflective of the chlorine content in the remainder of the treated water storage. Many treated water storage containers are located in areas that with little to no hydraulic connection to the chlorination point, and likely have no measurable chlorine residual.
- The online turbidimeters were obsolete (Hach 1720C-1720D models), as were the controllers for the units.

The current water treatment system is not providing sufficient disinfection of the filtered water to meet the requirements of the Surface Water Treatment Rule. The current configuration of treated water storage tanks results in ineffective chlorination and areas of water storage that have limited to no flow (and would therefore receive not chlorination). Algae was observed in multiple treated water storage tanks. At the time of the site visit the operator was isolating and cleaning the tanks to remove accumulated biogrowth. Due to the piping, each tank had to be disconnected from the system to complete the cleaning (with chlorine solution) and rinsing.

Unfortunately, there is limited opportunity to improve the existing treatment system due to the limitations of the existing treatment equipment and the structure.

- The coagulation / flocculation process cannot be improved, because it would increase the sediment load on the media filters, which have a limited backwash process (with no air scour).
    - There is no effective way to improve the backwash rate (limited treated water storage).
- The pre-filter system had no bags installed. Pre-treatment bags (NSF 61 approved) could help control sediment in the system.
- The post filter system had no bags installed. Post treatment 1 micron bags (NSF 61 approved) could help remove protozoa. However, there are no DEC approved protozoa filter system that would fit the existing post filter housings. So although tighter bags would improve filtration, the lack of 3rd party verification of the filtration effectiveness would prevent any regulatory approval of protozoa removal for the system.
- Due to the arrangement of the treated water storage tanks, there is no reasonable way to maintain any level of chlorine residual throughout all 61 tanks. A separate treated water storage tank, located outside the WTP, would be needed to meet system disinfection requirements.

The above items will be discussed in detail in the Design Analysis Report (DAR) for the drinking water treatment system.

Water Testing

During the site visit raw water was tested using field equipment, samples were taken for laboratory analysis (see attached results), and approximately 25 gallons of water was collected for jar testing in Anchorage. The jar test results will be provided in the DAR, with a discussion of the coagulation/filtration treatment processes. The DAR will also include a discussion of corrosivity.

The following is a summary of raw water tests results.

Table 1: Raw Water Quality

Arsenic	ND	
Calcium	282	ug/L
Iron	750	ug/L
Manganese	9.96	ug/L
Color, True	70	PCU
pH	5.8	
Total Dissolved Solids	27	mg/L
Total Nitrate/Nitrite	0.185	mg/L
Total Organic Carbon	7.22	mg/L
Dissolved Organic Carbon	5.96	mg/L
Langelier Index	-5.97	
Alkalinity	ND	
Hardness	ND	

SUMMARY / RECOMMENDATIONS

The WTP equipment is outdated and cannot be safely supported by the WTP structure. There is no reasonable way to bring the water treatment system into compliance with the existing equipment, within the existing structure, within a short period of time. However, there are steps that can be taken within a short period of time to minimize health and safety risks for the public.

The following recommendations for immediate improvements are provided in order of priority.

IMMEDIATE REPAIR ITEMS:

1. **Stabilize existing structure:** As detailed in the structural trip report (June 20-21, 2019), and discussed during the July 22, 2019 site visit, the existing water treatment equipment cannot be safely supported by the existing water treatment plant structure. This poses a safety risk to anyone in the WTP building. Structural failure would not only present a dangerous risk to humans in the immediate area, but would also leave the community without drinking water. An estimate has been provided separately that addresses the immediate need for structural reinforcement. The importance of this cannot be over-stated.

2. **Labeling Fixtures:** The potable water from the fixtures does not meet minimum treatment standards and is not safe to drink. The public should be informed of the status of the drinking water in this public facility (EDC Site Inspection Report, page 4). DEC Drinking Water Program can provide more guidance for public notification.

3. **Water Heater:** The water heater needs to be immediately turned down to 120 degrees and have an ASSE 1017 certified tempering valve be located immediately above the water heater. Both actions are recommended (EDC Site Inspection Report, page 5).

4. **Piping / Plumbing Repair:** The existing piping/plumbing in the Washeteria showers is broken and leaking. This broken piping represents a contamination risk to the drinking water system due to breaks, loss of pressure, and potential for cross connection (EDC Site Inspection Report, page 5).

    a. It is recommended that the corroded copper pipe be replaced with PEX piping.
    b. The walls of the showers should be patched to prevent water from going into the walls.
    c. Three new water closets should be installed.

5. **Electrical Outlet Repair:** The original washing machines used 240 volt outlets. Replacement washing machines require 110 volt supply. Extension cords are used to provide power to the washing machines. This presents an electrical risk to the public, as well as a risk to the WTP, in the event of a short circuit or associated fire (EDC Site Inspection Report, page 6).

6. **Treatment Pump Replacement:** The pump that transmits water from the raw water storage tank through the treatment system is not effective at pumping the bottom 6 feet of the tank. A new pump would allow full access to the bottom portion of the tank. Alternatively, if the existing pump is used to connect the treated water to prime the pump, a backflow prevention device could be used to prevent contamination of the treated water (EDC Site Inspection Report, page 4).

Most of these items are could be completed by worker under the supervision of a skilled supervisor (such as a Remote Maintenance Worker). The electric repair would require a licensed electrician. The structural repairs would be completed according to structural engineering plans.

A full listing of electrical/mechanical recommendations is provided in the accompanying field report from EDC. Longer term repair/replacement items will be addressed in the Design Analysis Report.

ENGINEERING DESIGN & CONSULTING
An Alaskan Owned Professional Corporation

EDC, INC.
213 W. Fireweed Lane
Anchorage, AK 99503

Site Inspection Trip Report

To: Vanessa Wike, P.E., Bristol Engineering Services Company

From: John Pepe, P.E. and Craig Fredeen, P.E.

Subject: Kongiganak Site Inspection Trip Report: July 22-23, 2109

Project: Kongiganak Washeteria and WTP Improvements

Date: August 26, 2019

This trip report summarizes major and immediate findings from a site visit completed July 23, 2018, to Kongiganak, Alaska. Additional findings and explanations from this report will be incorporated into a Design Analysis Report (DAR) detailing needed mechanical and electrical upgrades to the Water Treatment Plant (WTP) and Washeteria.

Schedule

Monday 22 July 2019

05:00 pm	Arrive at Anchorage International Airport.
06:45 pm	Depart Anchorage for Bethel on Alaska Air
08:00 pm	Arrive Nome. Overnight at the Long House Hotel (543-4613).

Tuesday 23 July 2019

09:00 am	Arrive Ravn Air Terminal
10:15 am	Leave Bethel (two separate Ravn flights were needed to transport team)
10:45 am	Arrive Kongiganak
05:15 pm	Leave Kongiganak on Ravn Air
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10:00 pm	Arrive Anchorage

Existing Plumbing

Water Treatment Building

As described in the trip report from Bristol, the domestic water system is not providing water quality that meets potable water standards. Per the Uniform Plumbing Code, domestic water piping system that serve the public need to be clearly labeled that the water is non-potable.

The Treatment/Filter Pump that sends water from the Raw Water Storage tank to the filter system is reported to not be able to pull the lower 7 feet of water from storage tank. This is due to the NPSH rating of the pump. The site has connected a hose from the treated water system to the priming connection to provide artificial suction head pressure to get additional

water from the storage tank. This creates a cross-contamination issue that needs to be addressed.

The Low Flow Pressure Pump was not operating at the time of the site visit. The High Flow Pressure Pump was being used to charge the water pressure tanks. Because of this, the High Flow pump was cycling excessively.

Washeteria

The water heater that serves the facility was set at 165 degrees. This is higher than immediate scalding temperature. A tempering valve was located downstream of the water heater, but branches from the system did receive the full heat. There is no benefit to having this system at that temperature in its current configuration.

The entire facility domestic water system has experienced significant leaks in the domestic water system. This has led to several plumbing fixtures becoming unusable. The heating system was not noted as being affected by the leaks. The water analysis showed an aggressive pH which has likely caused these leaks. The heating system was not noted as being affected. Since that is a closed system, this corroborates the cause of the leaks being due to the aggressive fresh water as opposed to installation issues. The piping system will continue to experience pin-hole leaks as the piping is further deteriorated over time, even if the pH and water aggressiveness is addressed.

Plumbing Fixture Condition:

1. There are only two operational showers and both have significant sized holes in the shower surrounds with water is entering the wall and floor structure with each use. One shower was abandoned due to leaking pipes.
2. Two water closets were operational, one of those were leaking at the tank seal. The other two were abandoned due to leaking pipes and cannibalized for parts.
3. All four lavatories were operable.
4. The drinking fountain worked, but the water is not safe for drinking and it is doubtful that any residents actually use the drinking fountain.

Three clothes washers were operational with both hot and cold water. Two units were non-functional and one space was empty.

Existing Mechanical

Water Treatment Building

The heat plant in the Water Treatment Building consists of three fuel oil fired, cast iron boilers and a heat exchanger that receives “waste” heat from the adjacent power plant. The heat plant provides space heating for both the WTP and Washeteria. The heating plant was in adequate condition.

The facility is ventilated and heated from two fan-coil units. One of the units was missing but apparently is not needed.

Washeteria

The mechanical space heating for the Washeteria is provided from the WTP heat plant. A stand-alone boiler in the Washeteria provides heat for the clothes dryers. This boiler has signs of significant soot build up.

The clothes dryer ventilation system was operating inefficiently and is a candidate for significant energy saving opportunities. The original design of the make-up air system utilized a Variable Frequency Drive (VFD) to modulate the speed of the unit based on the actual number of operating dryers. This was replaced with standard starters so the unit operates at 100% volume continuously. This provides heated air through all dryers even when they are not operating resulting in significant fuel usage and excessive wear on the existing heating system.

Five of the six clothes washers were operational at the time of the site visit, though the far right unit was noted as having a low temperature. The far right dryer was noted as being low on heat. This is likely an issue with the heating system rather than the dryer. One of the original construction units was still operational, but it had a damaged door and was in poor condition.

Each dryer has an air-to-air heat exchanger that transfers heat from the discharge exhaust to the inlet air. A hydronic heating coil is provided to boost the temperature to dry clothes. There was also a significant amount of lint found in the discharge exhaust ductwork downstream of the dryer air-to-air heat exchangers. This likely means that the heat exchangers are partially plugged with lint and should be cleaned to achieve optimal heat recovery.

Existing Electrical Systems

Water Treatment Building

The existing electrical service consists of a 208Y/120 volts, 3-phase overhead utility drop from 25kVA pole mounted transformers. The service equipment, located on the northwest corner of the building, consists of a CT cabinet with integral meter (meter# 045 0000003) and 400 amp rated service disconnect with 200 amp fuses. The service is then fed to a 225 amp rated Main Distribution Panel (MDP) located on the second floor of the building. The MDP sub-feeds two branch circuit panelboards ‘B’ and ‘H’. The sub-feed to panel H is supplied through an Automatic Transfer Switch (ATS) which provides standby generator power to this panel automatically in the case of an outage. The standby generator is diesel-fired and rated 35kW/44kVA, 81 amps at 208/120 volts, 3-phase. The loads supported by panel H are mainly the building heating system (diesel-fired boilers) and the high demand pump providing critical high flow during times of fire demand. Panel B supports mainly the water treatment system loads including injection pumps, turbidimeters, mixers, etc.. The MDP, in addition to panel sub-feeds, supports the pressure pumps #1 and #2, backwash pump and the treatment/filter pump. The MDP has no backup connection from a standby power system and therefore these pumps will not be functional during an outage.

Washeteria

The existing electrical service consists of a 208Y/120 volts, 3-phase overhead utility drop from the same 25kVA pole mounted transformers that feed the Water Treatment Building. There is an intermediate support pole that raises the incoming conductors to the required

height above grade. The service equipment, located on the northeast corner of the building, consists of a 200 amp rated meter base (meter# 045 0000001) with integral 200 amp main circuit breaker. The service is then fed to a 225 amp rated Main Distribution Panel (MDP) located in the connecting utilidor between the washeteria and water treatment building. The MDP sub-feeds two branch circuit panelboards 'A' and 'B'. The loads supported by panel A are exclusively the washers and dryers within the facility. Panel B supports mainly the general-use receptacles within the washeteria and offices. The MDP, in addition to panel sub-feeds, supports the boiler and dryer circulation pumps, lift station pumps and controls, diesel-fired water heater and dryer exhaust circulation fans. The MDP has no backup connection from a standby power system and therefore these systems will not be functional during an outage.

In the existing branch circuit distribution system, there are several significant electrical issues that require correction:

1. The existing washers in the washeteria are using extension cords from adjacent general-use duplex receptables, routed overhead along the ceiling, to supply power to the units. This is both a code violation and a life safety issue for the users.
2. The existing branch circuits, dedicated to the washers, fed from Panel A are currently configured as 208 volt, 3-phase. This configuration is not compatible with the existing and preferred washer configuration at 120 volt, 1-phase.
3. The existing 3-phase branch circuits are routed behind the washers in damp location wireways. The individual circuits exit the wireway at different location in liquid-tight conduit. The circuit conductors have been disconnected from the non-functioning washers and have been left terminated only with wire-nuts on the conductor ends. This current condition represents a significant life-safety hazard given the wires proximity to the water in the adjacent open floor drain behind the washers.
4. The existing circuit connection for a secondary heat circulation pump supplying the dryers, currently connected using an extension cord.

Summary / Recommendations

Plumbing

Water Treatment Building

Per the Uniform Plumbing Code, all plumbing fixtures in both the WTP and Washeteria should have labels immediately applied stating, "CAUTION: NON-POTABLE WATER, DO NOT DRINK". Furthermore, the water to the drinking fountain should be immediately turned off.

The Treatment/Filter Pump should be replaced with a unit that has a lower NPSH requirement to allow more of the storage tank to be drawn down. Alternatively, a backflow preventer with a minimum hazard level of a reduced pressure principle backflow preventer, should be provided on the priming connection piping to protect against cross-contamination.

The Low Flow Pressure Pump should be repaired or replaced so that the High Flow Pressure Pump is not prematurely failed due to its short cycling.

Washeteria

The water heater needs to be immediately turned down to 120 degrees or have an ASSE 1017 certified tempering valve be located immediately above the water heater. We recommend both actions be completed.

It is recommended that all of the domestic water piping in the both the Washeteria and WTP be replaced with PEX piping. Short of a complete replacement, the branch piping that serves the plumbing fixtures should be replaced to provide adequate fixtures for public sanitation.

The walls of the shower stalls should be patched or covered immediately so that water no longer goes into the wall structure.

Three new water closets should be installed. One to replace the leaking water closet that is in imminent failure.

The two non-functioning clothes washers should be replaced. An additional third clothes washer should be considered, at least to provide redundancy for future replacement. The new washers should be 120 volts.

Mechanical

Water Treatment Building

The existing system apparently is providing adequate heat and ventilation for the existing system, but the ventilation system central equipment should be replaced and provided with operational heating coils and controls.

We saw no immediate needs for the heating plant.

Washeteria

The boiler and flue that serves the clothes dryers should be cleaned. The boiler should have a combustion test completed to ensure it is burning cleanly.

We recommend providing two new clothes dryers to replace the broken unit and the dilapidated dryer.

We recommend that the existing clothes dryer air-to-air heat exchangers and heating coils be cleaned of potential lint build-up to improve heating performance. The clothes dryer make-up air and exhaust air system would benefit from a controls upgrade to allow it to modulate based on the number of operational dryers, but the system is operational under its current

condition. Recommended long-term upgrades to this system will be noted within the DAR report.

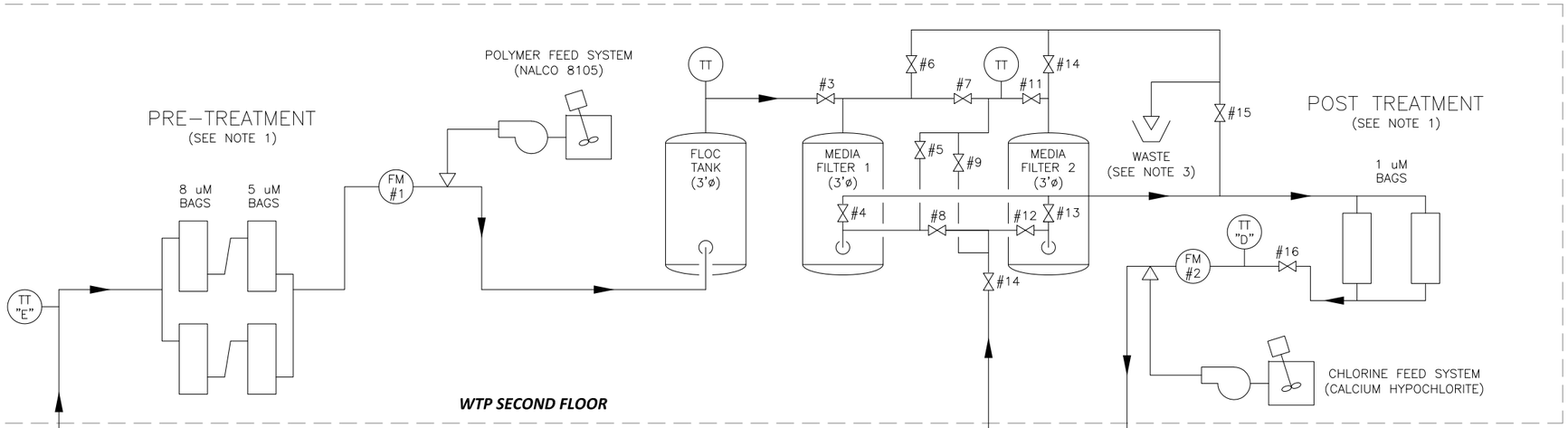
Electrical

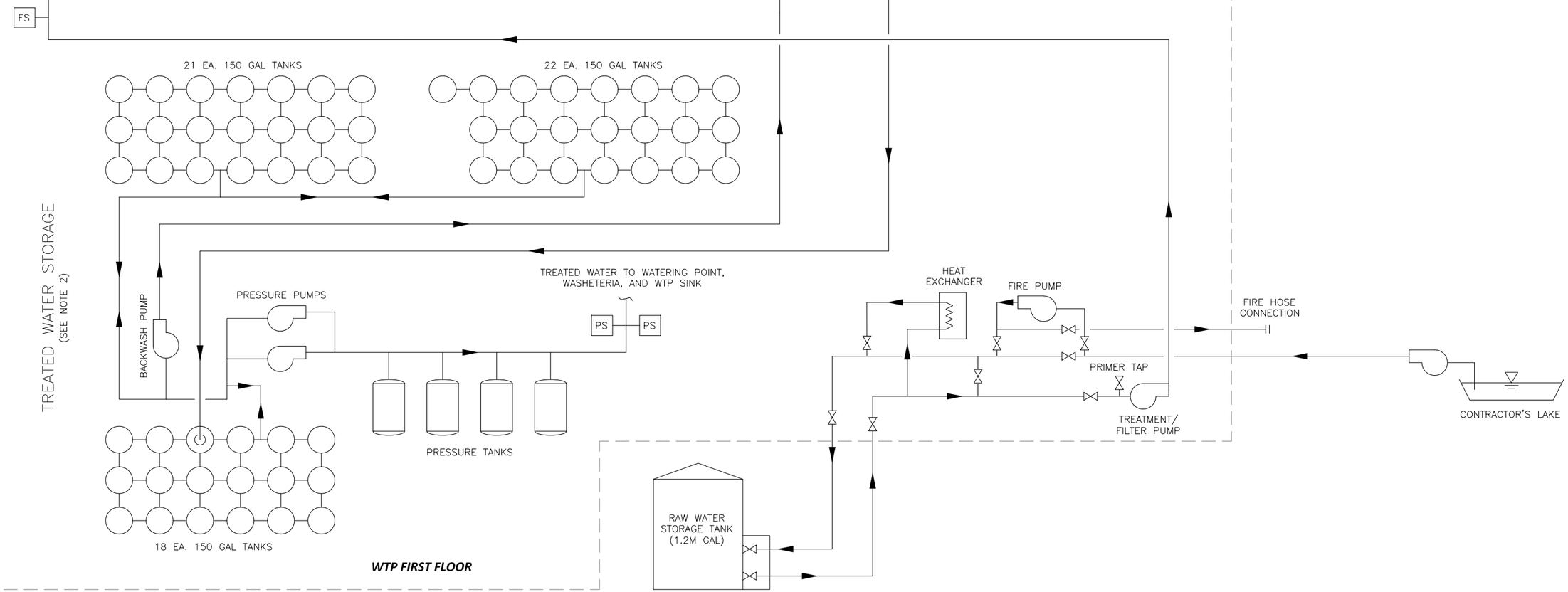
Water Treatment Building
The recommended electrical changes are:

- Electrical and controls support of water treatment system upgrade.
- Electrical support for the upgraded treatment/filter pump.

Washeteria
The recommended electrical changes are:

- Provide new, dedicated washer and dryer circuits configured for 120 volt, 1-phase to accommodate the existing and planned units. Connections need to be rated for a damp location environment.
- Provide new branch circuit for secondary heating loop circulation pump currently connected to power using an extension cord.
- Provide new dryer ventilation fan modulation controls to accommodate an energy-savings control scheme.





LEGEND

- FLOW DIRECTION
- PUMP
- STATIC MIXER
- MECHANICAL MIXER

ABBREVIATIONS

ø	DIAMETER
EA	EACH
FM	FLOW METER
GAL	GALLON
MG	MILLION GALLONS
TT	TURBIDITY TAP
WTP	WATER TREATMENT PLANT

NOTES

1. INOPERABLE ON 7/22/2019.
2. TOTAL TREATED WATER STORAGE IS APPROXIMATELY 7,500 GALLONS IN 61 EA 165–GAL TANKS.
3. WASTE DISCHARGED TO SEWER COLLECTION FOR WTP/WASHETERIA LAGOON.

REVISIONS				REVISIONS			
NO.	DATE	BY	DESCRIPTION	NO.	DATE	BY	DESCRIPTION

Project No. 32190078
AECC No. 697

Bristol
ENGINEERING SERVICES COMPANY, LLC
Phone (907) 563-0013 Fax (907) 563-6713

VILLAGE SAFE WATER

NOT FOR CONSTRUCTION

KONGIGANAK WATER TREATMENT PLANT
KONGIGANAK, ALASKA

EXISTING WATER TREATMENT PROCESS SCHEMATIC

SHEET NO.
FIG 1

SCALE: NTS | DESIGNED: DWB | CHECKED: VBW | DRAWN: JDW | DATE: AUG 2019 | SHEET 1 OF

User: DBEISWENGER Aug 23, 2019 – 1:12pm
Drawing: K:\JOBS\32190078 KONGIGANAK VSW\ACAD–DESIGN\PROCESS\32190078_KONG_TREATMENT SCHEMATIC.DWG – Layout: FIG 1
Xrefs: BR22X34REV.DWG – Images: None