CITY AND BOROUGH OF WRANGELL, ALASKA
REQUEST FOR QUALIFICATIONS
Water Treatment Plant Improvements Design

ADDENDUM TO THE PROJECT DOCUMENTS

Addendum No:	**3**	**Proposal Submission Deadline:**
Addendum Date:	**October 5, 2020**	**October 30, 2020 at 2:00 PM**
Pages This Addendum:	5 (Five), Plus two attachments	
Previous Addenda:	2 (Two)	

To: All Proposers

The following corrections, changes, additions, deletions, revisions and/or clarifications are hereby made a part of the Documents for the Request for Qualifications – Water Treatment Plant Improvements Design. In case of conflicts between this Addendum and previously issued documents, this Addendum shall take precedence. Acknowledge receipt of this Addendum in the space provided on the Proposal Form. Failure to do so may subject the Proposer to disqualification.

Item 1. Section **Request for Qualifications.** Subsection **Pre-Proposal Meeting.**

Remove Subsection Pre-Proposal Meeting in its entirety and replace with the following:

> **ON-SITE MEETING**. A mandatory on-site meeting will be required with each prime proposer, prior to their proposal submission. Firms interested in submitting a Proposal must have at least one consulting staff meet with Borough staff and visit the project site.
>
> Firms should consider traveling under the State of Alaska's protocol for critical workforce infrastructure, the criteria for which this project meets. The Borough expects that firms will schedule their time in Wrangell to visit the water treatment plant site, the two reservoirs and the wastewater treatment plant. By visiting the site, we believe firms will gain the best understand of Wrangell's existing conditions related to our water plant and of the physical separation of the various, associated sites, and to understand the physical environment of the entire municipal water system in Wrangell.

Item 2. Section **1.0 General Terms and Conditions.** Subsection **1.3 Proposal Development and Submittal**.

Remove Subsection 1.3 Proposal Development and Submittal in its entirety and replace with the following:

Submit sealed response, including one original, three copies, and one single PDF file on a flash drive, of the complete Statement of Qualifications, serving as the Proposal package, to the City and Borough of Wrangell. Proposals shall be completely sealed in an envelope which is clearly marked with the company name.

Alternatively, the Statement of Qualifications response may be submitted electronically to the Wrangell Borough Clerk, at clerk@wrangell.com, as a password-protected document, with the following guideline:

A. A Statements of Qualifications response, submitted electronically, shall be emailed under a password protected document. Following the submittal deadline, the firm(s) who elect to participate electronically will be contacted for their Statement of Qualifications document password. The person from whom the Statement of Qualifications password shall be verbally provided to the Borough Clerk shall be named, along with their phone number(s), in the body of the submittal email.

All Proposals submitted shall be binding upon the contractor, if accepted by the Borough.

Please note that overnight delivery from the Lower 48 (Contiguous U.S.) states is generally not available to Wrangell. Proposers should anticipate a minimum of four to five days delivery time for express, priority or expedited delivery services. No allowance may be requested for miscalculation resulting in late delivery.

All materials submitted in response to this RFQ shall become the property of the City and Borough of Wrangell. One copy shall be retained for the official files of the Borough and shall become public record after award of the Contract.

Proposals are to be prepared in such a manner as to provide a straightforward, concise delineation of the Proposer's capabilities to satisfy the requirements of this RFQ. Emphasis should be concentrated on conformance to the RFQ instructions, responsiveness to the RFQ requirements, and on completeness and clarity of content.

This solicitation does not commit the Borough to select any Consultant for the requested services. All costs associated with the respondents' preparations, submission and oral presentations shall be the responsibility of the Proposer.

Item 3. Section **3.0 Introduction and Scope of Work**. Subsection 3.6 **Timeline.**

Remove Subsection 3.6 Timeline in its entirety and replace with the following:

- Advertise for Design Proposals August 27, 2020

- Final Questions Due — October 23, 2020
- Proposals due to Borough Clerk — October 30, 2020
- Assembly approval of award for Design Services — October 27, 2020
- Intent to Award — October 28, 2020
- Notice to Proceed — November 4, 2020
- Pre-Engineering Design with Tech Memo and 35% Engineering Design complete — January 4, 2021
- Owner/USDA Review of 35% Design complete — January 18, 2021
- 65% Engineering Design complete — March 1, 2021
- Owner/USDA Review of 65% Design complete — March 15, 2021
- 95% Engineering Design complete — April 26, 2021
- Owner/USDA Review of 95% Design complete — May 10, 2021
- Construction Documents/Final Cost Estimate complete — May 24, 2021
- Bid Documents complete/Construction Solicitation begins — June 7, 2021

ADEC Approval to Construct must be received prior to the beginning of the Construction Solicitation.

Item 4. Section **4.0 Proposal and Submission Requirements**. Subsection **4.5 Cost Proposal.**

Remove Subsection 4.5 Cost Proposal in its entirety.

Item 5. Section **5.0 Proposal Evaluation Process.**

Remove Section 5.0 Proposal Evaluation Process in its entirety and replace with the following:

5.1 Evaluation Process

The Borough will form an Evaluation Committee, of no fewer than three people, to review and evaluate the Statements of Qualifications submitted in response to this RFQ. The Evaluation Committee will be responsible for evaluating all responses received according to the evaluation criteria outlined in this RFQ.

A responsive proposal is one which follows the requirements of the RFQ, includes all documentation, is submitted in the format outlined in the RFQ, is of timely submission, and has the appropriate signatures, as required. Consultants must demonstrate in their proposal that they have a clear understanding of the RFQ requirements. Consultants should articulate in the proposal their experience with the scope of work of this project and how they will fulfill the services required under the RFQ. Each firm should submit the requested documents that evidence capability to provide the services required for the Committee's review for short-listing purposes.

The Borough may contact one or more references. The Borough may use references named or not named by the Proposer.

The Evaluation Committee may hold interviews with the top three highest ranking firms and request additional information resulting from the initial evaluation. Firms may be asked to make presentations covering their relevant experience, their understanding of the project requirements and their own approach to designing and supervising the job. Unsuccessful firms will be notified.

For each firm receiving evaluation, an individual rating sheet will be completed and signed by each Evaluation Committee member. A summary rating sheet will be used to determine the highest ranked firm, as averaged by the Committee.

The evaluation criteria used to evaluate Proposals, and their associated point values, are as follows:

• Capability to Perform	10	Points
• Experience and Qualifications of the Firm	25	Points
• Experience and Qualifications of Key Project Staff and Subconsultants	30	Points
• Methodologies, Approach, Timeline	35	Points
Total Points	100	Points

5.2 Qualitative Rating Factor

Firms will be ranked using the following qualitative rating factors for each RFQ criteria:

1.0 = Outstanding
.8 = Excellent
.6 = Good
.4 = Fair
.2 = Poor
0.0 = Unsatisfactory

The rating factor for each criteria category will be multiplied against the points available to determine the total points for that category.

Item 6. Section **6.0 Selection Process.**

Remove Section 6.0 Selection Process in its entirety and replace with the following:

The Borough shall negotiate an agreement with the highest ranked firm for a lump sum fee that the Borough determines is a fair and reasonable price. If an agreement cannot be reached with the highest ranked firm, the Borough shall notify the firm and terminate negotiations.

In the event negotiations with the highest ranked firm are not successful, then the Borough may enter into negotiations with the second highest ranked firm. The process will continue in this sequence until an agreement is finalized. If agreement negotiations with a selected firm are successful, the Borough Manager will make a recommendation to the Wrangell Borough Assembly for award of the agreement, and the Wrangell Borough Assembly will decide the award of the agreement.

The City and Borough of Wrangell reserves the right to make a final selection based on the results of the Evaluation Committee, as deemed most advantageous to the Borough. The Borough reserves the right to reject any or all Proposals submitted.

Item 7. Section **8.0 Agreement.** Subsection **Item D.**

Remove Subsection Item D. in its entirety and replace with the following:

D. Consultant's Proposal, including negotiated Lump Sum Fee

Item 8. Section **9.0 Supplement Documents.**

Add the following Subsection Items:

H. DAF Pilot Study Lab Results from 2016
I. NPDES Discharge Permit for the Wrangell Wastewater Treatment Plant

Item 9. Section **10.0 Section Summary Cost Proposal Form.**

Remove Section 10.0 Summary Cost Proposal Form in its entirety.

END OF ADDENDUM NO. 3

CITY AND BOROUGH OF WRANGELL, ALASKA

WATER TREATMENT PILOT STUDY

FINAL DOCUMENT

December 2018

Prepared by: **CRW Engineering Group, LLC**
3940 Arctic Blvd. Suite 300 Anchorage, AK 99503

In cooperation with:
The City and Borough of Wrangell

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Acronyms and Abbreviations

AWC	AWC Water Solutions Ltd
CCA	coagulant charge analyzer
CBW	City and Borough of Wrangell
CRW	CRW Engineering Group, LLC
DAF	dissolved air flotation
DBP	disinfection byproducts
D/DBP	disinfectant / disinfection byproducts
DOC	dissolved organic carbon
°F	degree Fahrenheit
gpd	gallons per day
gpm	gallons per minute
gpm/ft^2	gallons per minute per square foot
HAA5	five haloacetic acids
LT1ESWTR	Long Term One Enhanced Surface Water Treatment Rule
LT2ESWTR	Long Term Two Enhanced Surface Water Treatment Rule
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
µg/L	micrograms per liter
mg/L	milligrams per liter
mg·min/L	milligram minute(s) per liter
NTU	nephelometric turbidity unit
O&M	operations and maintenance
ppm	parts per million
ft^2	square foot/feet
SWTR	Surface Water Treatment Rule
TDS	total dissolved solids
TOC	total organic carbon
TTHMs	total trihalomethanes
UVT	ultraviolet transmittance
WTP	water treatment plant
%	percent

1. Executive Summary

1.1 Overview

The City and Borough of Wrangell (CBW) retained CRW Engineering Group, LLC (CRW), and AWC Water Solutions Ltd (AWC—formerly Corix and ADI) to perform a water treatment pilot study. The objectives of the pilot study were:

- Confirming that the dissolved air flotation (DAF) and multimedia filtration water treatment process produces finished water quality that meets applicable drinking water standards, particularly for turbidity and disinfection byproducts (DBPs).
- Identifying a preferred coagulant for water treatment that provides best overall finished water quality.

The evaluation of DAF was selected based on a desktop assessment of water treatment technologies conducted in 2015. The pilot study successfully confirmed the suitability of DAF for reducing DBPs and turbidity, and identified Cascade Columbia PAX XL-19 as the preferred coagulant.

1.2 Existing Conditions

CBW's existing water treatment plant (WTP) consists of ozone injection followed by roughing and slow sand filters. The WTP has performed poorly in recent years relative to the Disinfectants and Disinfection Byproduct Rule (DBP Rule) requirements, which require systems that chlorinate to maintain water distribution system levels of total trihalomethanes (TTHM) and five haloacetic acids (HAA_5) below 80 µg/L and 60 µg/L, respectively.

Additionally, the existing treatment system is unable to meet peak distribution system demands, particularly in the late summer when water quality is at its lowest. These conditions are related to the poor performance of the roughing filters, which allow solids overloading of the downstream slow sand filters. To maintain operation of the water system, WTP staff operate with highly frequent backwashing and reduced slow sand filter ripening periods, which diminishes the process treatment efficiency.

1.3 Pilot System Overview

1.3.1 Treatment Process

DAF is an alternative to the conventional gravity sedimentation process. Rather than settle suspended particles out of the process flow, DAF utilizes microscopic air bubbles to float and lift coagulated particulate matter so it can be removed from the flow. The DAF unit process is preceded by pH adjustment (as necessary), coagulant injection, and flocculation. Air bubbles collide and attach to flocculated particles, carrying them to the water surface where they accumulate and are mechanically skimmed into a collection channel and then conveyed to a hopper or dewatering bin. The DAF process is then followed by multimedia filtration to

receive the filtration credits required for CBW's surface water source. Since DAF is a pre-treatment process, it was evaluated integrally with multimedia filtration for the purposes of this study.

1.3.2 Coagulant Assessment

The coagulants evaluated were alum and an aluminum chlorohydrate, PAX XL-19, manufactured by Cascade Columbia. PAX XL-19 yielded the best DAF performance and produced the best finished water quality with the lowest levels of turbidity, as well as the highest UVT.

1.3.3 Ozonation

The use of ozone in the proposed treatment process was evaluated to discern the possible reuse of the plant's existing ozone equipment. Ozonated water was evaluated as a source water to discern if the use of ozone would increase organics removal in the DAF process. The use of ozonated water led to poor flocculation characteristics and variable coagulant dosages in producing water quality generally on par with that from using non-ozonated water.

1.4 Conclusion & Recommendations

The DAF pre-treatment process provided high quality water with organics removal at a level expected to reduce DBP formation. Subsequent multimedia filtration provided filtrate turbidity levels well below the regulatory requirement of 0.30 NTU. PAX XL-19, without pH adjustment prior to the DAF process, produced the highest-quality filtrate of the coagulant regimens evaluated. The use of ozone appeared to complicate the performance of the DAF treatment process in this testing.

Based on the results of the pilot study, the recommended treatment approach is to replace the existing WTP with a new WTP consisting of PAX XL-19 for coagulation, DAF clarification, multimedia filtration including a layer of greensand for manganese removal, with post-filtration soda ash addition for corrosion control, and chlorine injection for disinfection.

2. Background

The City and Borough of Wrangell (CBW) is located in Southeast Alaska on Wrangell Island, approximately 700 air miles southeast of Anchorage and 150 air miles southeast of Juneau. The CBW received a grant for conducting a pilot study with the goal of identifying a technology that would improve their water treatment process by efficiently meeting future water demands and drinking water standards. CBW currently operates a water treatment process featuring ozonation, followed by roughing and slow sand filtration.

The roughing filters are performing poorly, allowing solids overloading of the slow sand filters downstream. This condition greatly challenges the CBW WTP's capacity for meeting peak summertime water demands. To maintain operation of the water system, WTP staff operate with highly frequent backwashing (approximately every 7 to 10 days), which greatly diminishes the process treatment efficiency, and reduced slow sand filter ripening periods prior to placing filters on-line.

The treatment process has also struggled to meet the Disinfectants and Disinfection Byproduct Rule (DBP Rule) requirements, which require systems that chlorinate to maintain distribution system levels of TTHM and HAA_5 below the maximum contaminant levels (MCLs) of 80 µg/L and 60 µg/L, respectively. Several regulatory samples and a locational running average of HAA_5 have exceeded the MCL. While no TTHM measurements have exceeded the MCL, a few samples measured between 40 and 60 µg/L.

2.1 Desktop Assessment

As an early step of this project, a desktop assessment was conducted of the performance and operation of CBW's existing water treatment process. Raw water samples were collected and measured for key water parameters. A limited jar testing effort evaluated the performance of various coagulants. Five water treatment technologies were evaluated as candidates for pilot testing, based on technical and economic merit:

- Improvements made to the existing water treatment process.
- MIEX process followed by multimedia filtration.
- MIEX combined with ozonation followed by biological filtration.
- Dissolved air flotation (DAF) followed by multimedia filtration.
- Multimedia filtration followed by membrane nanofiltration.

Of these five, DAF with multimedia filtration was selected for pilot testing. The *Desktop Assessment* report provides detailed description and discussion of the existing water treatment process, as well as the selected new process. This water treatment report provides only brief summaries of some of the information collected in the desktop assessment effort.

2.2 Raw Water Source

The CBW obtains its water via a buried transmission pipeline from two mountain lakes, an upper and lower reservoir, located north of the treatment facility. The raw water source is considered a surface water and therefore requires treatment in accordance with the Surface Water Treatment Rule (SWTR) and its various amendments in the "LT1" and "LT2" Rules.

2.3 Raw Water Quality

The raw water supplied by the reservoirs is considered to have good aesthetic characteristics, but is sensitive to seasonal fluctuations based on rainfall and water level. Based on recent sampling and testing records:

- Turbidity levels typically range between 0.8 to 5 NTU, with most measurements falling below 3 NTU.
- Total organic carbon (TOC) has generally measured between 4 and 9 mg/L.
- True color has ranged between 28 and 80 Pt-Co units.
- Alkalinity and hardness levels have generally measured around 10 mg/L as $CaCO_3$.
- pH levels have ranged between 5.4 and 6.9, depending on the season.

Raw water quality data sampled for the desktop assessment are summarized in Table 1 and show elevated levels of TOC, color, iron, and manganese.

Table 1 – July 2015 Raw Water Characteristics

Contaminant or Property	Units	Value	Regulatory Limit
Turbidity	NTU	nm	1.49
Total Organic Carbon (TOC)	mg/L	5.3 – 6.4	**
Dissolved Organic Carbon (DOC)	mg/L	3.9 – 6.1	n/a
True Color	Pt-Co	60	15
Iron	mg/L	1.0	0.3
Manganese	mg/L	0.1	0.05
pH	--	6.8	6.5 to 8.5
Alkalinity	mg/L as $CaCO_3$	9	n/a
Hardness	mg/L as $CaCO_3$	9	n/a
Total Dissolved Solids (TDS)	mg/L	34	500
Temperature	degrees C	5-13	n/a
Ultraviolet Absorbance (UVA_{254})	cm^{-1}	0.14 – 0.18	n/a
Ultraviolet Transmittance (UVT)	%	66.1 - 72.4	n/a
Specific UVA (SUVA)	L/mg-m	2.9 – 3.6	n/a

Key:
NTU = nephelometric turbidity units
Pt-Co = Platinum-Cobalt color units
nm = not measured in laboratory testing
n/a = not applicable
mg/L = milligrams per liter
$CaCO_3$ = calcium carbonate
cm^{-1} = reciprocal centimeters

**45% removal of TOC required per EPA Disinfectants and Disinfection Byproducts Rule

The raw water is typical of many southeast Alaskan lake sources, with relatively low turbidity, alkalinity, hardness, pH, and TDS, which make the water aggressive and potentially unstable. Turbidity tends to increase during storm events, especially after the reservoirs are drawn down, which exposes their shoreline banks to erosion and subsequent suspension of particles in the water. Moderately elevated TOC and color values indicate potential for elevated DBP formation potentials. This tendency is also indicated by moderately low UVT levels. SUVA values were calculated to be moderately low as well, which suggest a medium amenability to remove organics by coagulation methods.

2.3.1 Particle Analysis

In 2017 and 2018, as part of a separate engineering effort, self-cleaning Forsta mechanical filters were considered as a potentially simple and interim way for improving the roughing filter process until the new WTP improvements could be built. A particle count analysis of the raw water was conducted in May 2017 to help select an appropriate filter screen mesh size for pilot-testing the Forsta mechanical filters. The particle analysis indicated that the captured solids were largely comprised of iron bacteria (*Leptothrix* and *Gillionella*), 95% of which were 10 µm in size or smaller (Appendix D). According to CBW's operator, the iron bacteria has not adversely affected influent process works. See Section 6.5 for a conclusion of this testing.

3. Pilot Testing Process Considerations

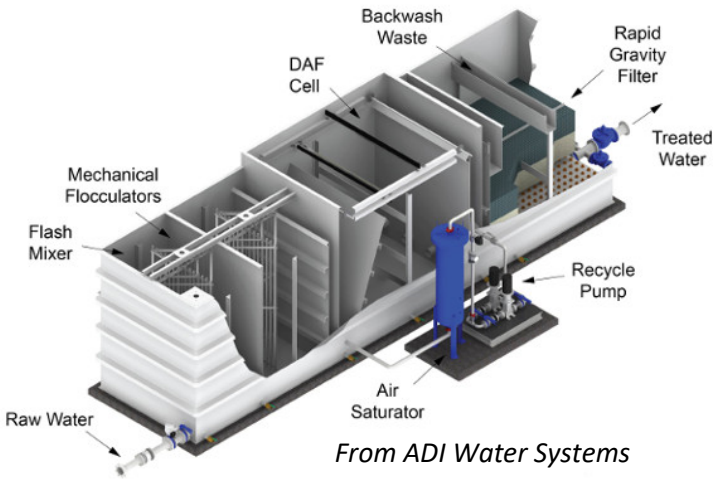
3.1 DAF Process Description

The DAF and multimedia process was selected in the desktop assessment effort based on its potential ability to produce high quality water using a space-efficient package treatment plant that would facilitate future expansion. The selected technologies have also been successfully used to meet drinking water standards in similarly-sized communities that treat raw water with similar characteristics. This option was calculated to offer the lowest life cycle costs of the alternatives considered in the desktop assessment effort, and judged to be well within the technical capacity of CBW's operators. According to DAF system manufacturers, the technology works well for treating raw water having turbidities between 0 and 10 NTU, with occasional spikes as high as 50 NTU, and TOC levels between 0 and 14 mg/L. CBW's raw water characteristics fall well within these parameters.

The DAF process is particularly suitable for treating cold, relatively low turbidity, high color raw water such as that which supplies the community of Wrangell. Previous attempts to improve

CBW's water quality using conventional pre-filtration (i.e. sedimentation) methods were reported to be only modestly successfully when large quantities of coagulants were used. These conditions were believed to be the result of water characteristics typically associated with high TOC and color, and particularly when turbidity levels are low.

Conventional pre-filtration processes use coagulants and quiescent basins to flocculate and settle out particles and organic matter from the process stream. Low density solids like algae and other natural organic matter that typically constitute high TOC and color are ordinarily difficult to remove by sedimentation processes, as they tend to settle very slowly. The slow settling time requires large basins and long residence times, which are both increased with colder water temperatures. Sedimentation of low density solids typically requires higher coagulant doses to increase the mass and settleability of these compounds, so that they may be removed. DAF is an effective alternative to sedimentation for low density solids because the solids are more readily floated in a stream of microscopic air bubbles instead of being settled, and are subsequently skimmed from the water surface. With the use of flotation, smaller coagulant dosages can be used to remove contaminants, and the required treatment time can be made considerably shorter than for the equivalent sedimentation process. Consequently, DAF unit area flow rates are typically higher, and the equipment can be made smaller relative to conventional sedimentation.



From ADI Water Systems

Figure 1 – DAF Package Plant

The upstream end of the DAF process (See Figure 1 above and schematic diagrams in Appendix B) resembles that of conventional sedimentation, with rapid mixing and coagulant injection, followed by flocculation basins. These steps are followed by a flotation tank into which microscopic (50 microns) air bubbles are released. The air bubbles collide with and attach to flocculated particles, carrying them to the water surface where they accumulate and are mechanically skimmed into a collection channel (Figure 2). Solids are thereafter conveyed to a hopper or dewatering bin, wherein the water content is reduced through either settling or a centrifuge. This step thickens the solids and reduces the sludge volume to facilitate disposal. The DAF process is then followed by multimedia filtration to provide further treatment and achieve the filtration credits required for CBW's surface water source. DAF is typically integrated as a pre-treatment process to multimedia filtration.

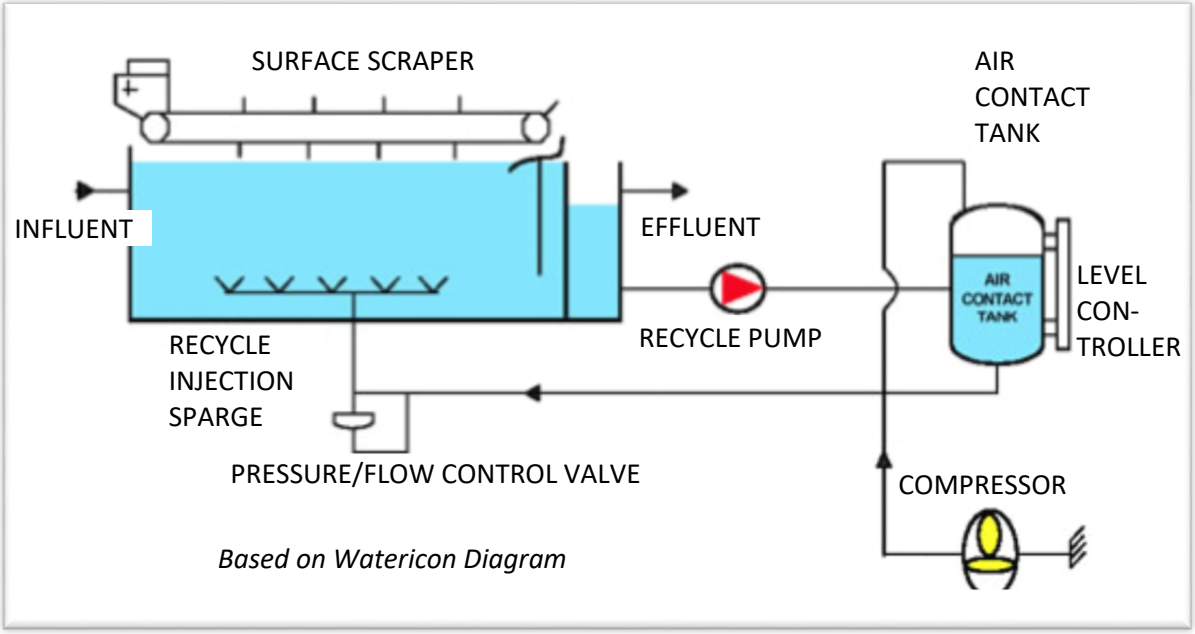


Figure 2 – DAF Process Diagram

3.2 Inclusion of Ozonation in Pilot Testing

CBW recently invested in new replacement ozone generators and wanted to determine if it was advantageous to include an ozonation process with the DAF option as part of the pilot testing effort. Although no technical literature was found at the time to explore this particular combination, it was believed that the existing system could be readily incorporated as an alternative scheme in the pilot testing plan, to be used as pre-treatment to the DAF and multimedia processes. Therefore, the use of ozonated water was used as source water (i.e. preceding the DAF and filter processes) in some of the pilot test schemes.

3.3 Pilot System Goals

The pilot plant program was planned with the treatment and performance goals for DAF effluent and filtrate shown in Table 2. These criteria were developed based on discussions with water treatment specialists at AWC (formerly Corix and ADI), industry literature regarding the capabilities of the DAF process, and treatment experience of the project team. The water quality obtained by the existing slow-sand treatment process was also considered.

Although a surrogate UV transmissivity of 0.95 was believed to be a sufficient goal for producing water with low DBP formation potential, a value of 0.97 was selected as a more conservative target for the filtrate. The filtrate goal for iron was anticipated to be achievable, but the goal for achieving manganese removal was uncertain with this process.

Table 2 – Water Treatment Goals

Parameter	DAF Goal	Filtrate Goal
Turbidity	<1.0 NTU	<0.1 NTU
Color	<10 Pt Co units	<10 Pt Co units
UVT	>95%	>97%
TOC	<2.0 mg/L	<2.0 mg/L
DOC	<2.0 mg/L	<2.0 mg/L
Iron	<0.3 mg/L	<0.3 mg/l
Manganese	<0.05 mg/L	<0.05 mg/L
pH	6.5-7.5	6.5-7.5

Key:
NTU = nephelometric turbidity units
Pt-Co = Platinum-Cobalt Color
TOC = Total organic carbon
mg/L = milligrams per liter
UVT = Ultraviolet transmittance
DOC = Dissolved organic carbon

4. Pilot Testing Plan, System Setup and Procedures

4.1 Pilot Testing Objectives and Plan

Specific objectives of the pilot study included:

- Using the existing raw water source, verifying that the DAF water treatment process produces finished water quality which meets applicable drinking water standards, particularly for turbidity and DBPs.
- Verifying process design criteria (loading rate, media depths, etc.).
- Troubleshooting any unforeseen challenges resulting from site specific and/or process-related issues.
- Identifying a coagulant for water treatment that helps the process meet treatment goals and provides best overall water quality.

The *Desktop Assessment* report identified late July to mid-September as the time period when raw water turbidity, color, and temperature are generally at peak levels. As this period also coincides with the time of peak system demands, it was deemed as an ideal timeframe for pilot testing.

Most of the pilot testing equipment and on-line instrumentation was provided by AWC, having shipped it to Wrangell by boat carrier. Portable water testing equipment was provided by CRW and CBW. CBW also provided the temporary plumbing and pumps to tie the pilot testing equipment into the existing water treatment process.

The test plan was comprised of three phases:

In Phase 1, equipment installation began in mid-July by the project team, followed by a period of initial testing to optimize coagulation chemistry, DAF and filter performance, and confirm expected treated water quality. During this time, both ozonated and non-ozonated water were initially screened, as well as different coagulants with and without pH adjustment for narrowing the field of configurations that would undergo further testing during Phase 2. In preparation for Phase 2, the CBW operators were also trained on the operation of the equipment by an AWC water treatment technician and CRW engineer.

In Phase 2, the selected treatment configurations were tested for extended, relatively stable, time periods. This phase was designed to validate the process under varying raw water conditions, chemical type and dosage, and to conduct any needed fine-tuning. Project funding allowed this phase to last about 7 weeks, with regular, 8-hour daily operations. However, due to a number of circumstances, the testing was extended an additional 2 weeks.

This phase was monitored and operated by CBW staff, with regular telephone guidance provided by the project team. The trained CBW staff's daily duties were limited to chemical solution preparation, data logging and reporting, as well as routine inspection. During the pilot testing, the data was to be collected daily from on-line instruments for key parameters, including pH, turbidity, and UVT. Samples were also collected for periodic benchtop analysis using portable equipment, and at specific times for laboratory water quality analysis.

In Phase 3, after the testing period, an AWC technician returned to the site for the decommissioning and dismantling of the pilot equipment. The final laboratory analysis was completed and reviewed after demobilization of the pilot equipment.

4.2 Equipment Description

Specific equipment selection for the DAF pilot study was based on discussions with AWC. In order to simulate the DAF process, three skids were utilized. The pilot study equipment consisted of a raw water processing and chemical injection skid, a DAF clarifier skid with sequential flocculation basins, and a multimedia filter skid. Instrumentation included on-line turbidimeters and on-line ultraviolet transmittance (UVT) monitors. Specific information on the equipment used is provided below. Select photos of the pilot arrangements are provided in Appendix A. A process flow diagram of the pilot system is shown in Appendix B.

4.2.1 Source Water Connection Point

For providing raw water to the pilot system, an existing threaded tee in the WTP raw water line was used (Appendix A, Figures 1 and 2). Ozonated water was recovered from the influent header basin at the roughing filter using a submersible pump and hose (Appendix A, Figure 3).

4.2.2 DAF Clarifier

The DAF skid contained flocculation basins and the DAF clarification step, in which microbubble distribution and solids skimming was conducted (Appendix A, Figures 5, 6 and 7).

4.2.3 Multimedia Filter

Three 4-inch diameter multimedia filters were used to evaluate post-DAF filtration. The filter media consisted of a gravel support layer overlain by 18 inches of 0.45-to-0.55 mm filter sand and 18 inches of 1.0 mm anthracite media (Appendix A, Figure 8).

4.2.4 Coagulant Injection System

The coagulant injection system used for the pilot study consisted of Grundfos DDA positive displacement pumps with adjustable pump heads. The chemicals were pumped from polyethylene tanks (Appendix A, Figure 4).

4.2.5 Coagulant Charge Analyzer (CCA)

A Chemtrac® CCA was used to analyze the charge of coagulant-treated water to determine if optimum coagulation was occurring (Appendix A, Figure 9). The coagulant dose was manually adjusted until a neutral charge was achieved.

4.2.6 On-line Turbidimeter

A Hach® 1720E turbidity sensor with a SC200 controller was used to monitor and record raw and filtered water turbidity (Appendix A, Figure 4). A rotameter was used to regulate the sidestream flow to the sensor.

4.2.7 UVT Analyzer

A Realtech® UVT analyzer was used to measure the UVT of the raw and filtered water as a surrogate for TOC (Appendix A, Figure 9). A higher UVT measurement generally correlates to a lower TOC concentration.

4.3 Treatment Configurations

Testing began on July 27, 2016, with CRW's engineer performing the initial screening of coagulants in combination with two different source waters (raw and ozonated) and the presence or absence of pH adjustment (soda ash) upstream of the DAF process. A total of seven different coagulant and treatment system configurations were tested during Phase 1 and Phase 2. At least three different configurations were used each for testing alum and aluminum chlorohydrate (ACH) as coagulants (Table 3).

During the Phase 1 start-up period, trial run periods were shortened due to the limited time frame for testing. Some trial runs were terminated early based on unsatisfactory treatment results. During the Phase 2 period, the more promising treatment configurations were tested with more extended trial runs. Due to the desire for additional testing time, which coincided with the delayed availability of the AWC technician for decommissioning the equipment, Phase 2 pilot testing was extended to October 6, 2016.

The hydraulic loading rates were established at approximately 2.3 gpm/ft^2 for the DAF clarifier basin and 2.1 gpm/ft^2 to 3.6 gpm/ft^2 for the multimedia filter. The multimedia filter loading rate fell within the range of typical design values used for similar treatment systems that have been implemented in the Pacific Northwest. The loading rates used in the pilot testing were generally lower (more conservative)

than rates typically used by AWC at other water treatment facilities using the DAF process. The filter columns were backwashed at 22 gpm/ft^2 between filter runs.

Table 3 – Treatment Configurations

Configuration	Coagulant	Water Source	pH Adjustment	Notes
1	Alum	Raw	No	1
2		Ozonated	No	1
3		Raw	Yes	1
4	PAX XL-19	Raw	No	2
5		Ozonated	No	2
6		Ozonated	Yes	1
7		Raw	Yes	1

1. These configurations were evaluated only for brief periods in Phase 1 and Phase 2, due to relatively poor treatment or process performance.
2. These configurations were evaluated more in depth in Phase 2, based on relatively good treatment or process performance.

4.4 Coagulant System Setup & Dosing

A CCA was used to determine the optimum dosage for each coagulant for the raw water. The metering pump was set to initially dose this concentration. After analyzing grab samples of coagulated water with the CCA, further iterative adjustments were made to the dosing rate during each filter run.

Based on the experience of AWC's water treatment specialists, the coagulants selected for evaluation in the pilot testing were alum and aluminum chlorohydrate (ACH). Both of these chemicals have been successfully used with the DAF process. Alum is a commonly used coagulant that is relatively inexpensive on a unit pound basis. It usually requires pH adjustment for best performance, as alum is most effective at a pH range of 5.8 to 6.5. The ACH-based coagulant selected for pilot testing was Cascade Columbia PAX XL-19. While more expensive on a unit basis than alum, PAX XL-19 typically requires a smaller dosage and less pH adjustment chemical when compared to alum, since it is effective at a higher pH range of 6.5 to 7.5. ACH also tends to yield lower chemical sludge production, lower residual aluminum, and have a low impact on pH and alkalinity.

Soda ash was used for pH adjustment in the water treatment process. Soda ash was selected for pH adjustment because it imparts more alkalinity per unit dosage relative to caustic soda, currently used by CBW. A higher alkalinity promotes corrosion control in the distribution system by improving the buffering capability of the water. Additionally, a soda ash chemical feed system is simpler and safer for operators to use, as compared to caustic soda.

Coagulant solutions were mixed in 110-liter (29-gallon) batches from neat chemical and CBW tap water using a tank-mounted mixer. The filter columns were backwashed between filter runs when using different coagulants.

4.5 Water Quality Parameters

Turbidity and UVT were monitored in real time using on-line data-logger instruments. Grab sample measurements were also taken at regular intervals during each filter run for the following parameters: pH, turbidity, temperature, UVT, and color. Temperature and pH were measured using a benchtop instrument. Color was measured using a Hach DR890 pocket colorimeter. A benchtop UVT analyzer was used to periodically check measurements in parallel to the on-line unit.

Grab sampling was also performed at specific junctures for laboratory testing, to corroborate the field testing when treatment performance appeared to be high, and to conduct water analysis not readily accomplished on-site. Generally, samples were collected for laboratory analysis of the following parameters: DOC, TOC, UVA, turbidity, color, iron, manganese, pH, alkalinity, hardness and DBP formation potentials.

Unfortunately, the on-line turbidity and UVT data was lost and not recovered from the data loggers for post-testing analysis during the Phase 3 demobilization. The only recovered data is that collected via grab samples and tested with benchtop instruments or laboratory analysis.

5. Pilot Study Results

Table 4 below summarizes the best field-measured results from each of the seven pilot testing configurations. These testing results are summarized in more detail in Appendix C.

Table 4 – Treatment Configuration Best Performance

Config	Coagulant	Water Source	pH Adjust	Coagulant Dose L/hr (mg/L)	Soda Ash Dose L/hr (mg/L)	Filtrate pH	Color (Co/Pt Units)	Filtrate Turbidity (NTU)	Filtrate UVT (%)
1	Alum [1]	Raw	No	0.93 (9.6)	0	4.37	22	0.04	90
2		Ozonated	No	1.2 (52.8)	0	4.44	24	0.08	83
3		Raw	Yes	0.9 (39.6)	0.8 (35)	6.75	30	0.03	92
4 (Ph. 1)	PAX XL-19	Raw	No	2.3 (20.2)	0	7.2	5	0.06	93
4 (Ph. 2)		Raw	No	4.47 (39.5)	0	--	0	0.065	94.7
5 (Ph. 1)		Ozonated	No	6 (52.8)	0	7.5	11	0.131	94.7
5 (Ph. 2)		Ozonated	No	4.1 (36.2)	0	--	--	0.047	95.2
6 (Ph. 2)		Ozonated	Yes [2]	5.35 (47.1)	0	6.25	0	0.110	93.6
7 (Ph. 2)		Raw	Yes	4.75 (42.0)	1.5 (66)	--	--	0.099	91.4
7 (Ph. 2)		Raw	Yes	6.25 (55.0)	2.50 (110)	--	--	--	94.3

Key:
NTU = nephelometric turbidity units.
-- = Not Recorded
L/hr = liters per hour
mg/L = milligrams per liter
UVT = Ultraviolet transmittance
Pt-Co = Platinum-Cobalt Color

1 - Configurations 1, 2 and 3 were tested in Phase 1 only.

2 - Ozonated water was pH-adjusted using caustic soda in existing plant water treatment process for this configuration.

5.1 Alum Test Results

Alum was tested during Phase 1 only, as its use as a coagulant provided significantly lower UVT and pH levels in the filtrate, relative to using PAX XL-19. Filter color levels were comparatively higher with the use of alum. Alum dosages were varied from 0.9 L/hour (39.8 mg/L) to 1.2 L/hour (53 mg/L). Soda ash dosages used with alum were varied from 0.4 L/hour (17.7 mg/L) to 1.0 L/hour (44.2 mg/L). Both alum and soda ash stock solutions were mixed to 10% concentration using dry chemical and potable plant water.

5.1.1 Configuration 1

Alum produced water with very good turbidity at a relatively low dosage. However, pH levels in the filtrate measured low (between 4 and 5) and would require post-filtration pH adjustment. UVT was measured at moderate levels (80 to 90%), indicating the likelihood of moderate DBP precursor removal and excessive DBP formation potential. Fh7iltrate color levels were moderate (15 to 25 units).

5.1.2 Configuration 2

Alum with ozonated source water produced filtrate with very low turbidity, but required increased coagulant dosages. Similar to Configuration 1 results, UVT and color levels were moderate and pH levels were fairly low. Floc did not appear to be floatable in the DAF basin.

5.1.3 Configuration 3

Alum with soda ash for pH adjustment improved the filtrate pH. However, turbidity levels were moderately high (generally 0.10 to 0.30 NTU). UVT levels were generally poor to moderate (75 to 90%). In the best reading (7-29-16), turbidity = 0.03 NTU, UVT = 92 and pH = 6.75, but color = 30 units. UVT levels thereafter dropped in the filtrate during the course of the run as pH increased (with modest adjustments to the soda ash dosage). Color increased as well during this timeframe.

5.2 Cascade Columbia PAX XL-19 Test Results

PAX XL-19 was tested during Phase 1 and Phase 2, as its use as a coagulant provided generally better water quality, relative to using alum. PAX XL-19 dosages were varied from 2.0 L/hour (17.6 mg/L) to 6.25 L/hour (55.0 mg/L). Stock solution was mixed to 2% concentration using neat emulsion and potable plant water. Soda ash dosages used with PAX XL-19 were varied from 1.25 L/hour (55.2 mg/L) to 2.5 L/hour (110.4 mg/L). The soda ash stock solution was mixed to 10% concentration using dry chemical and potable plant water.

5.2.1 Configuration 4

PAX XL-19 with raw water and no pH adjustment produced filtrate with low turbidity and color and moderate-to-high UVT. Filtrate pH levels ranged between 7.0 and 7.4 when measured during Phase 1, and 6.3 to 6.4 in Phase 2. During Phase 1 testing, UVT levels ranged between 90% and 93%. The highest UVT level was measured at 94.7% during Phase 2 testing, but at a much higher coagulant dosage than used in Phase 1. The lowest turbidities ranged between 0.045 and 0.065 NTU. In Phase 2 testing, visible floc was consistently observed in the DAF chamber and good foam production was achieved with this configuration. This configuration produced the best overall treatment performance.

5.2.2 Configuration 5

PAX XL-19 with ozonated water and no pH adjustment produced filtrate with good turbidity, UVT, and filtrate pH. However, in both Phase 1 and Phase 2 testing, prolonged efforts were needed to optimize the coagulant dose to achieve a near-neutral charge. Further, floc and foam production was observed to be generally poor. However, the highest UVT value (95.2%) was measured in one round of testing,

as well as low turbidity (<0.05 NTU) and excellent color (<5 units). In a subsequent testing period, the aforementioned treatment performance was not repeated. Turbidities were relatively high in this subsequent period (0.134 to 0.296 NTU), probably as a result of poor floc formation and flotation.

5.2.3 Configuration 6

PAX XL-19 with ozonated water and pH adjustment produced filtrate with variable turbidity, likely due to poor floc formation. Instead of soda ash being used, the caustic soda feed in the main treatment process was left operating to provide the pH adjustment step. The first round of testing was terminated early due to coagulation instability and poor DAF performance. During the 2nd round of testing, relatively high UVT (93.5%) and excellent color (zero) levels were measured. However, filtrate turbidity levels were moderate (0.088 to 0.195 NTU).

5.2.4 Configuration 7

PAX XL-19 with raw water and pH adjustment using soda ash produced filtrate with moderate turbidity (0.099 to 0.111 NTU) and moderate-to-high UVT (91.4 to 94.3%). This configuration was not tested in Phase 1. In Phase 2, it was initially used to assess the effects of the use of soda ash on coagulant dosage. As the soda ash dosage increased, so did the required PAX XL-19 dosage to accomplish a near-neutral charge. The 94.3% UVT value was measured when the coagulant dosage was at its highest (6.25 L/hr or 55.0 mg/L). Operator's observations indicated that the soda ash appeared to be detrimental to the coagulant performance.

5.3 Laboratory Test Results

To corroborate field testing and provide testing that wasn't practical in the field, water sampling for laboratory testing was conducted on three dates during Phase 2 testing: August 9, September 15 and October 6. For all three sampling efforts, Configuration 4 was being pilot tested. These results are summarized in Appendix C.

DBP formation potential testing was performed on the first and third sample sets. In the first sample set, the standard test procedure was followed, with a chlorine dosage of 7.1 mg/L (3.6 mg/L end free chlorine residual) and a holding temperature of 25° C. This procedure used chlorine concentrations that are substantially higher than that typically used by CBW. The test resulted in DBP formation potentials that were slightly higher than the MCLs (TTHM FP = 93.5 µg/L and HAA_5 FP = 71.3 µg/L). Filtrate DOC level for this testing was 1.7 mg/L. In the third sample set, testing was performed on filtrate (DOC = 2.0 mg/L) at two lower chlorine dosages (4 mg/L and 1.5 mg/L). Because CBW typically uses a dosage of 1 mg/L or less, these lower test dosages were still considered conservative[1]. End free chlorine residuals for these dosages were 0.72 mg/L and 0.10 mg/L, respectively. Unfortunately, TTHM FP testing was not performed by the lab as intended. Nevertheless, HAA_5 FP testing was performed, with resulting formation potential values of 91.8 µg/L and 16.6 µg/L, respectively. The HAA_5 FP value for the 1.5 mg/L chlorine dosage was 18% of the FP value at the 4.0 mg/L dosage. Based on this testing, it is believed that DBP levels less than

[1] Actual CBW water temperatures also range around 10° C, which would tend to inhibit DBP formation.

the MCL are achievable for both TTHM and HAA_5 using the Configuration 4 testing scheme and a realistic chlorine dosage in the relatively colder water used by CBW.

A graphical compilation of the turbidity, UVT, and color results from using PAX XL-19 during the Phase 2 field testing period are provided in Figures 3 - 5.

Based on the laboratory test data shown in Appendix C, relative contaminant reductions using Configuration 4 were as follows:

- True Color: 87% to 94%.
- TOC: 75% to 76%.
- DOC: 73% to 80%.
- Turbidity: 94% to 98%.
- UVT: 91%.
- SUVA: 64%.
- Relative increases in UVT ranged between 84% and 107%.

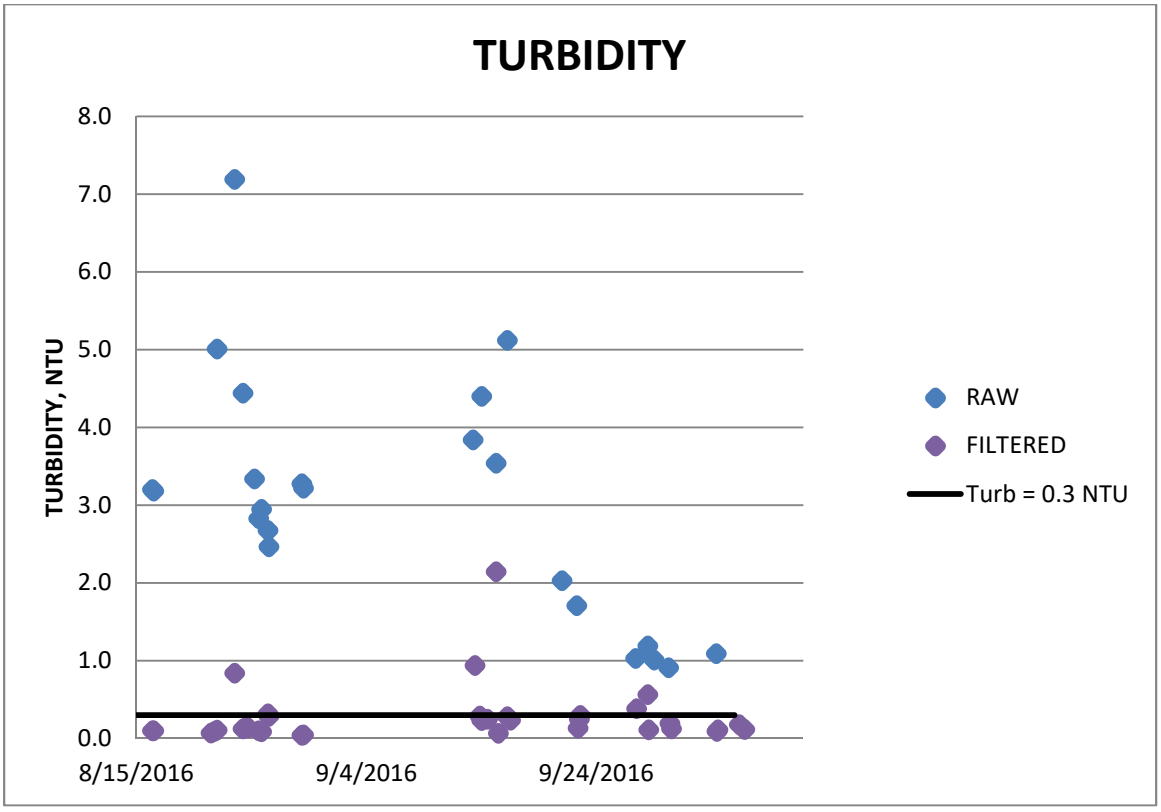


Figure 3 – Phase 2 Testing Turbidity Levels

Note: Temporary operational issues were encountered (that were resolved) on the days where filtered water turbidity exceeded 0.3 NTU.

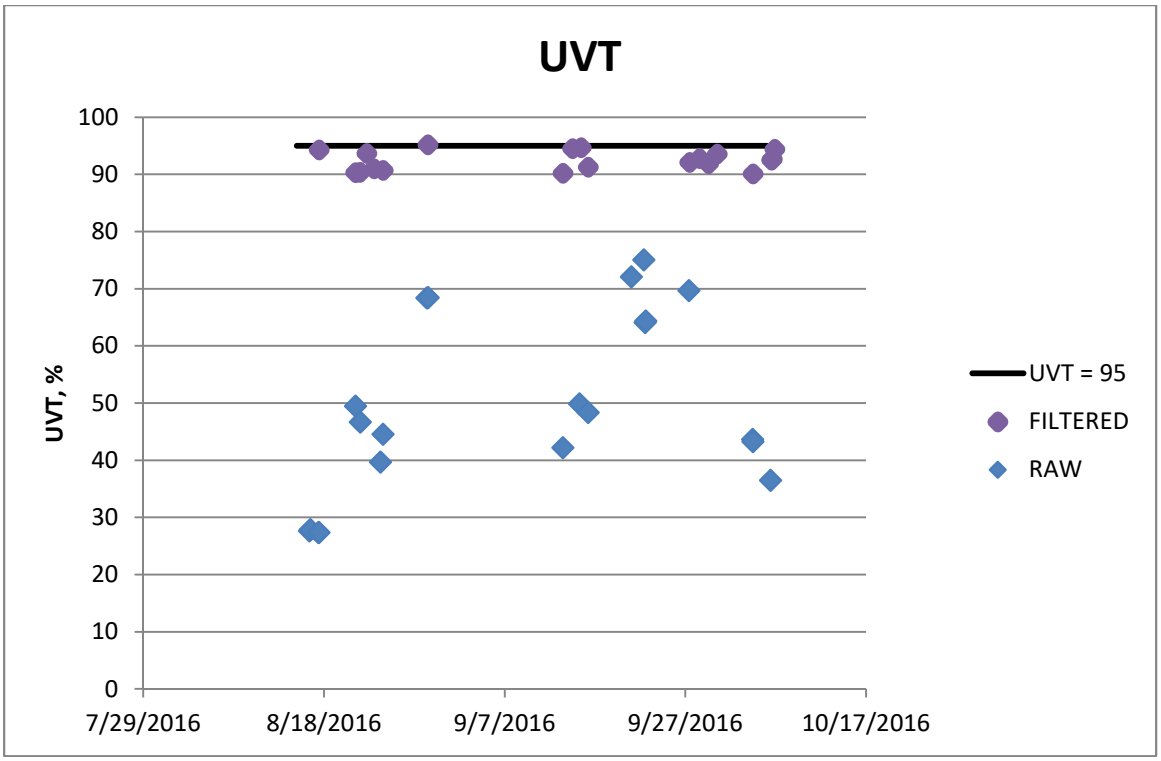


Figure 4 – Phase 2 Testing UVT Levels

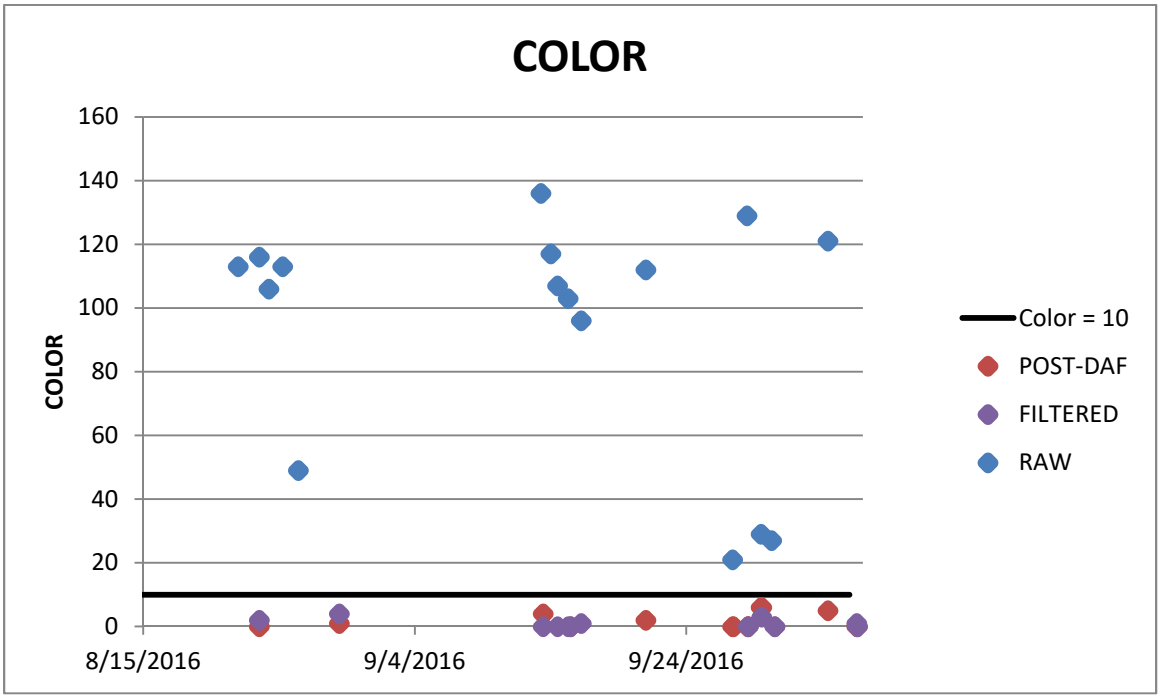


Figure 5 – Phase 2 Testing Color Levels

5.4 Discussion of Results

DAF performed well for UVT, color, and turbidity reduction. Alum produced filtrate with low turbidity, but UVT measurements were consistently lower relative to UVT's produced when PAX XL-19 was used. The use of PAX XL-19 produced the filtrate with the highest UVT, best filtrate pH, and very good turbidity. The pH of filtrate using alum was lower than the filtrate pH of PAX XL-19. Results for Configuration 4 (PAX XL-19 with no ozone) are presented in the table below.

Table 5 – DAF Pilot Test Results (Configuration 4)

Parameter	Filtrate Goal	Best Result
Turbidity	<0.1 NTU	0.06 NTU
Color	<10 Pt Co units	5 Pt Co
UVT	>97%	95%
TOC	<2.0 mg/L	1.6 mg/L
DOC	<2.0 mg/L	1.5 mg/L
Iron	<0.3 mg/l	0 mg/L
Manganese	<0.05 mg/L	0.11 mg/L

Key:
NTU = nephelometric turbidity units. mg/L = milligrams per liter
Pt-Co = Platinum-Cobalt Color UVT = Ultraviolet transmittance
TOC = Total organic carbon DOC = Dissolved organic carbon

The pilot testing did not achieve the UVT goal of 97%, but nearly achieved 95% in a number of tests. With filtrate DOC concentrations ranging between 1.5 and 2.0 mg/L, the resulting SUVA values (1.12 to 1.49 L/mg-m) would indicate a fairly low reactivity with natural organic material. Achieving the UVT goal of 97% would have given increased confidence that the regulated DBP MCLs would not likely be exceeded with CBW's typical chlorine doses of less than 1 mg/L. To improve the UVT values above 95%, further optimization of organics removal would be needed, in which other blends of ACH would be evaluated along with PAX XL-19. However, the low filtrate SUVA values suggest that further improvements in UVT may be modest.

The Langelier Saturation Index for the filtrate was measured at -3.6. Since this value is considered to indicate a tendency to dissolve calcium, thereby inferring corrosive water, a post-filtration pH adjustment step will be needed to reduce the water's corrosive tendency, as well as increase the alkalinity.

The use of ozonated water produced variable (positive and negative) results. With alum as coagulant, turbidity measurements were low (positive), and UVT values were also relatively low (negative). With PAX XL-19, turbidities were relatively high (negative), as were UVT values (positive). The highest field measurement of UVT was attained with ozonated water (95.2% on 8/29/16). However, floc formation

was reported as being poor, and the operator noted difficulties in stabilizing the coagulant dosage. Coagulant dosages were also variable in producing results generally comparable to that generated with non-ozonated water. With these operational challenges, and with the limited timeframe for testing, this treatment scheme was not explored in depth.

Ozone is known to benefit coagulation processes, although it has been shown in some studies to produce opposite effects (such as poor floc agglomeration and poor NOM adsorption to floc)[2], as it may have done in this testing. Nevertheless, with CBW's recent investment in upgraded ozone equipment, and considering the potential water treatment benefits that ozonation offers in terms of color, disinfection, organics removal and DBP formation, the use of ozone with DAF merits further evaluation. Further, with the apparent presence of iron bacteria in CBW's raw water, the continued use of ozone is expected to be advantageous in the control of this particular contaminant. Since the slow sand filters would be replaced, continued use of ozone would warrant a review of implementing biofiltration downstream of the DAF process, which may be accomplished by configuring the multimedia filter to operate as a biofilter.

The DAF and multimedia filtration process was not effective in removing manganese in this testing effort. However, with the primary focus being on turbidity, organics and color removal, the pilot testing process was not optimized for manganese removal. Manganese removal will likely require an additional unit process for its removal, which could be accomplished by providing a layer of greensand in the filter and a potassium permanganate (or combination with chlorine) regenerant feed upstream of the filter to maintain an oxidized state in the greensand media.

Although no speciation was performed on this contaminant, it is possible that the manganese in CBW's surface water source exists in both dissolved (Mn^{2+}) and solid (MnO_2) forms, depending on seasonal oxygen levels and other factors. If mostly in solid form, manganese would need to be removed via filtration. With no ozone used, any dissolved manganese remaining in the process stream could be removed by sorption in the greensand media. With the use of ozone, no dissolved manganese would be expected to be present in the DAF influent stream. However, the use of ozone can produce colloidal manganese solids that are not well retained in filters, which may necessitate the use of a coagulant aid upstream of the filters.

6. Conclusions and Recommendations

Primary goals of the pilot study were to confirm the ability of the DAF process to meet drinking water standards and to evaluate various coagulants for best overall removal of turbidity, color, organics and effects on pH. A summary of the primary water quality parameters for the DAF effluent based on the pilot testing are presented in Table 6 below.

[2] Reckhow, *Control of Disinfection By-Product Formation using Ozone*, (as compiled in AWWA Formation and Control of Disinfection By-Products in Drinking Water, Singer, editor, 1999, page 191.

Table 6 – DAF Effluent Water Quality Parameters

Contaminant or Property	Units	Value
Turbidity	NTU	<0.2
TOC	mg/L	75% reduction
Color	Pt-Co units	<6
pH	-	6.5 – 8.5
UVT	%	>94

6.1 Coagulant Selection

PAX XL-19 with no pre-coagulation pH adjustment produced the best overall filtrate quality of the coagulants evaluated during the pilot study. PAX XL-19 is recommended for use in the proposed CBW DAF WTP, with consideration for further optimization of the dosage rate. This or other ACH products may provide better performance in the removal of organics, and may be considered for testing as part of the design phase of the facility. The use of PAX XL-19 will require the addition of a post-filtration pH adjustment step. Soda ash is the selected method for raising the filtrate pH and providing a relatively simple corrosion control measure that will also increase finished water alkalinity and stabilize the water.

6.2 DBP Formation

Standard DBP formation testing, with elevated chlorine levels, produced DBP levels 17% to 18% above the MCLs for TTHM and HAA_5. A final round of DBP formation potential testing with a moderately high chlorine dosage indicated that results below the MCLs were achievable for both TTHM and HAA_5. Based on the reduction in TOC observed during the DAF pilot testing, it is anticipated that the chlorine dose for the full scale DAF plant will be less than the current dosing for the slow sand filters.

6.3 Treatment Design Criteria

DAF followed by multimedia filtration was demonstrated to meet the desired water quality goals. As a result, it remains the recommended alternative. Design loading rates for the proposed DAF system are presented below in Table 7. Loading rates are based upon previous experience at plants in the Pacific Northwest.

Table 7 – DAF Treatment System Design Criteria

System Component & Criteria	Units	Value
DAF loading rate	gpm/ft^2	3
Multimedia filter loading rate	gpm/ft^2	2.0-3.6
1.0 mm anthracite media layer	Inches	18
0.45-0.55 mm silica sand layer	Inches	18
0.30-0.35 mm manganese greensand layer	Inches	12

6.4 Further Testing During Design

PAX XL-19 was identified as the preferred coagulant in a comparison between ACH and alum. The dosage rate should undergo further optimization for providing the best overall water quality. Alternate ACH chemicals may be tested to determine if there is any performance improvement or cost savings that could be realized by use of a different ACH. Further consideration should be given for more testing conducted with ozonated water to potentially determine an optimum chemical regimen that might be implemented with DAF in full scale plant operations.

6.5 Conclusion for Forsta Mechanical Filter Pilot Testing

From March to May 2018, as a separate engineering effort, self-cleaning Forsta mechanical filters were pilot-tested using 5 µm and 10 µm cartridge filters as a potentially simple and interim way to improve the roughing filtration process without the use of coagulants until the new WTP improvements could be built. The pilot testing was conducted by CBW using a pressurized sidestream flow parallel to the main process flow passing through roughing filters. All filtered and backwash flow was discharged to waste. These filters were found to be ineffective in removing a significant amount of suspended solids from the raw water during this time period. Coagulants or polymers were considered necessary to improve the performance of these filters. However, with a chemical feed system involved, this approach was judged to not be cost effective as an interim solution. Because the suspended solids were substantially comprised of low-density bacteria (Appendix D), the future DAF process was considered to more suitable for removing these solids from the water treatment stream. Therefore, the mechanical filtration approach was not pursued further.

END

Appendix A – Pilot Study Photos

Appendix A – Pilot Study Photos

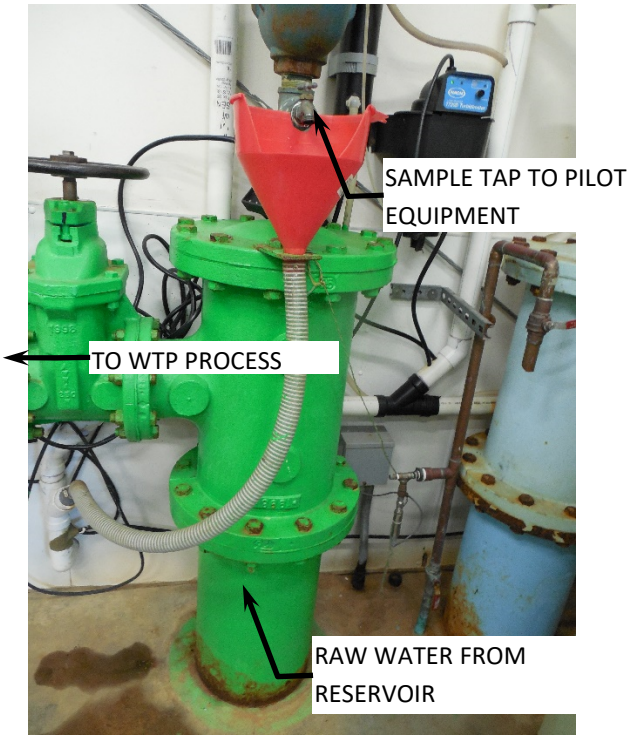


Figure 1 - Raw Water Connection

Figure 2 - Raw Water Connection

Figure 3 - Ozonated Water Connection

Figure 4 - Pilot Plant Chemical Injection Equipment

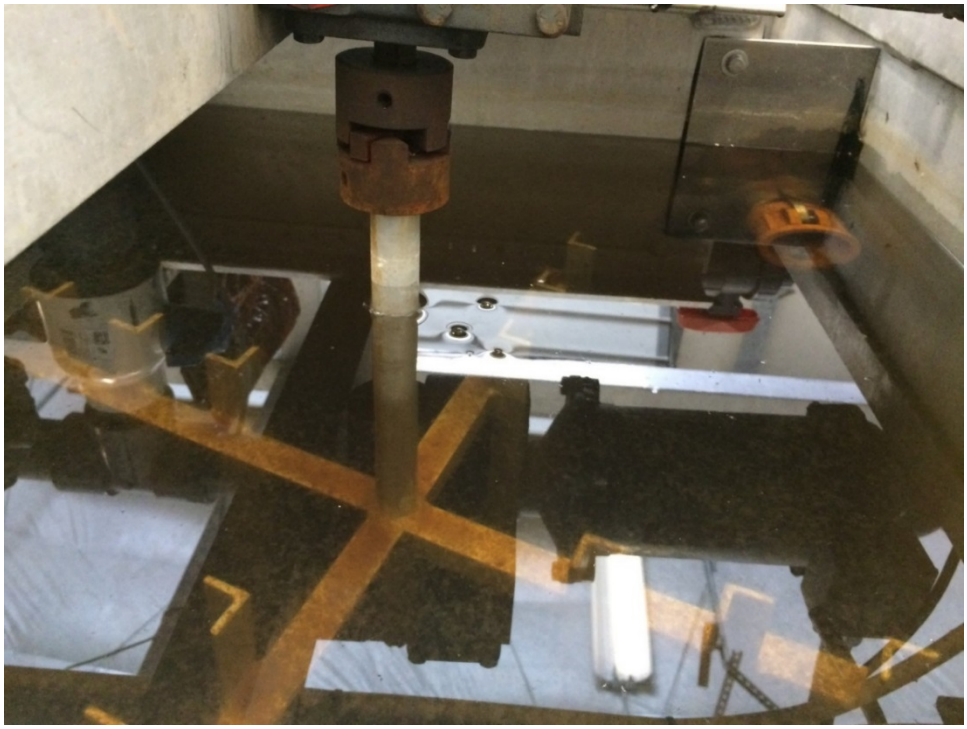


Figure 5 - Pilot Plant Flocculation Basin

Figure 6 - Pilot Plant DAF Unit

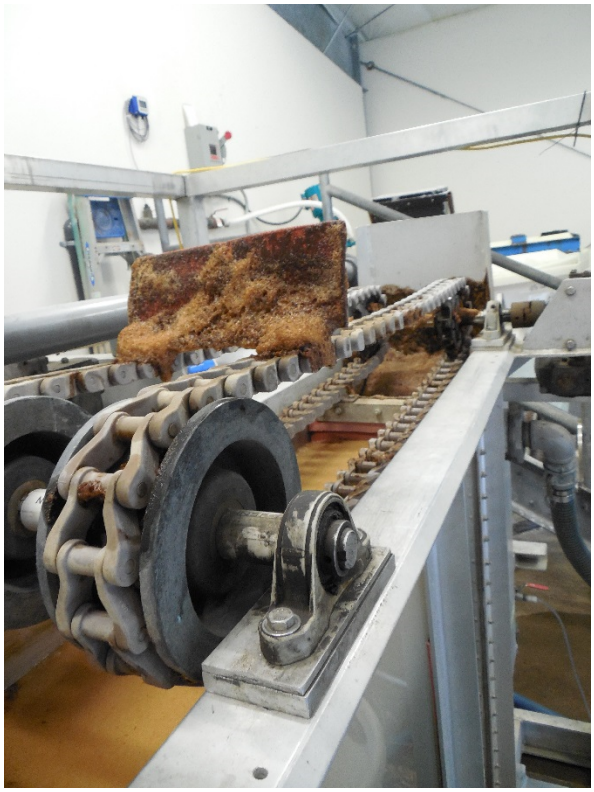


Figure 7 - Pilot Plant DAF Unit

Figure 8 - Pilot Plant Control Panel and Multimedia Filters

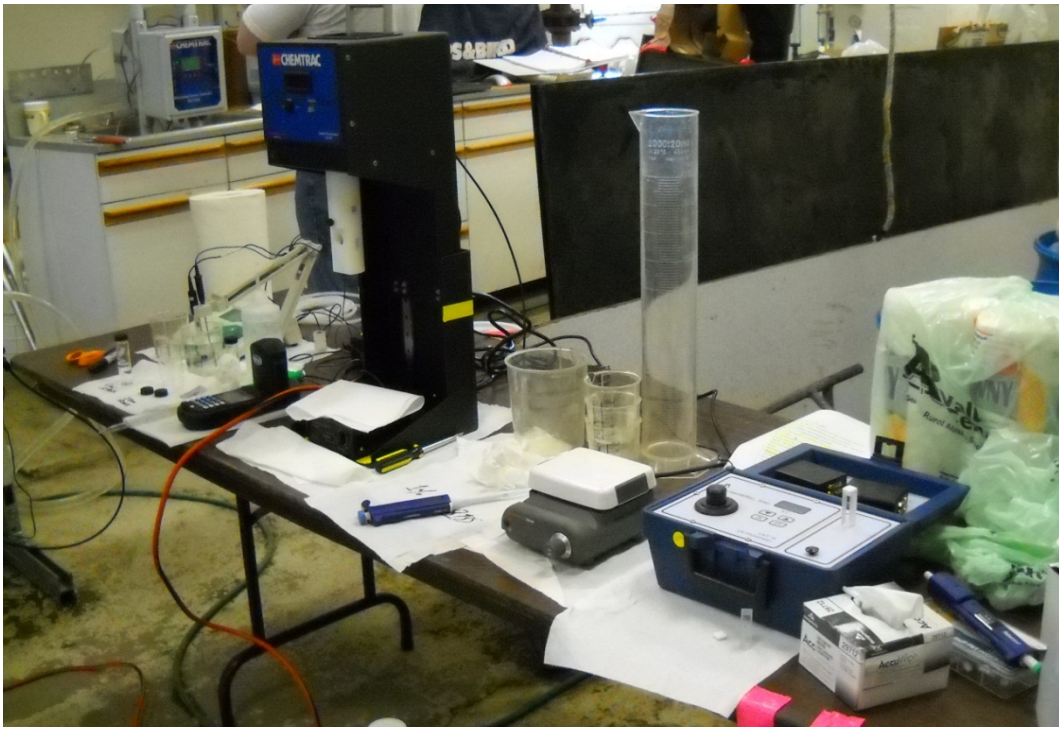
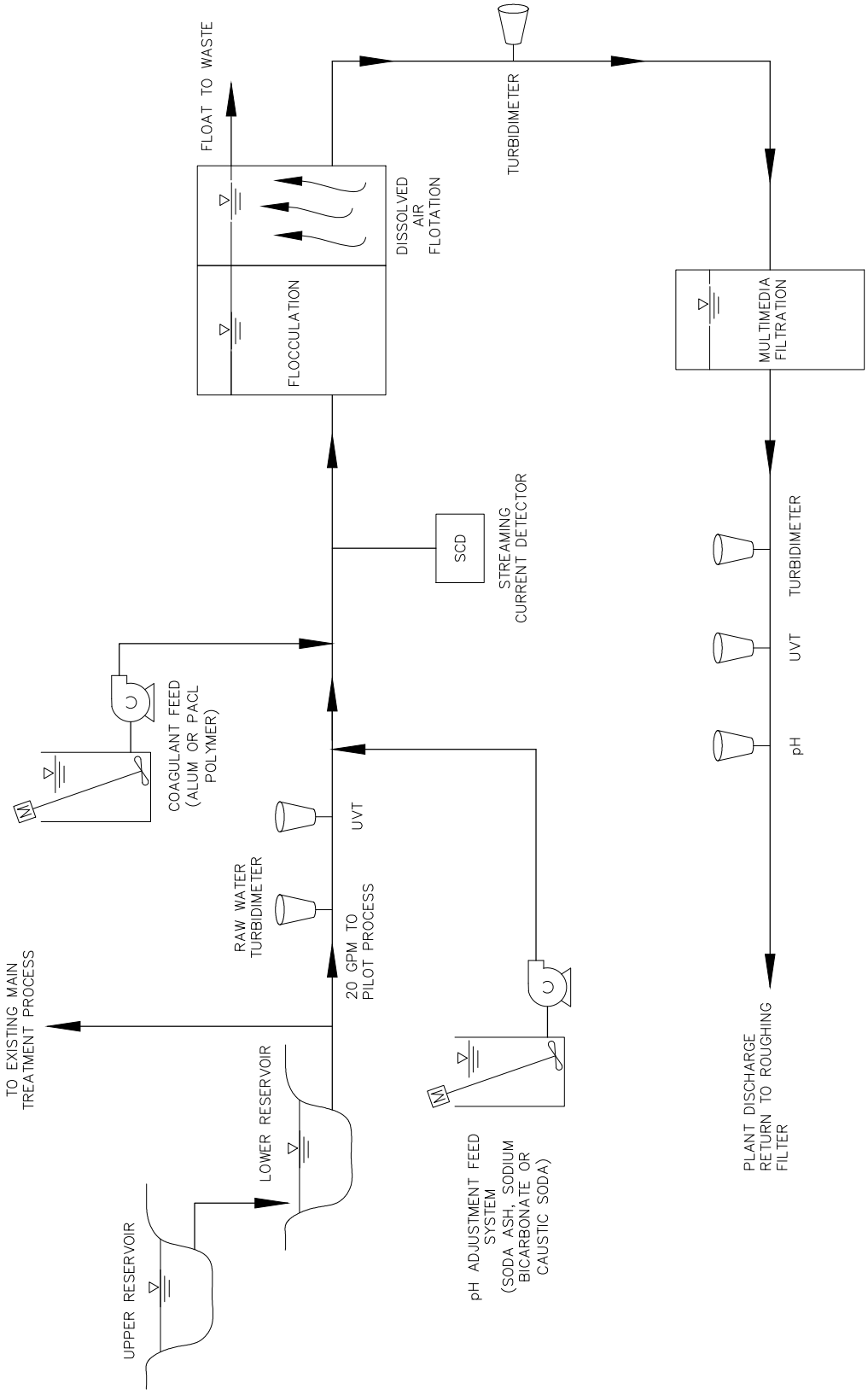


Figure 9 - Benchtop Testing Equipment

Appendix A – Pilot Study Photos

Figure 10 Pilot Plant Overview

Appendix B – Pilot Study Process Schematics and Design Criteria



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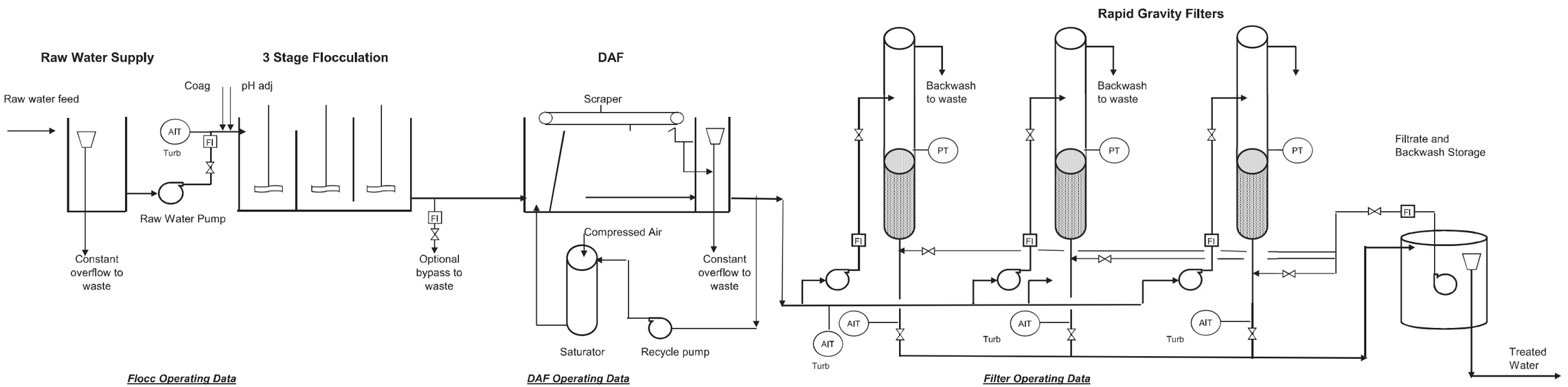
CRW ENGINEERING GROUP, LLC

Project:

CITY OF WRANGELL
WATER TREATMENT PLANT
PROPOSED DAF PILOT
PROCESS SCHEMATIC

Project No:	20901
Drawn By:	TRT
Scale:	NONE
Date:	5/2/2016
Figure:	1



Flocc Operating Data

Volume per stage	660 L	174 USgalls	
Normal flocc time	15-30 mins		
Normal # of stages	3		

Total Flocculation Retention Time (mins)				
Inlet flow		Stages in Use		
L/min	USgpm	1	2	3
70	18.5	9	19	28
60	15.9	11	22	33
68	18.0	10	19	29
68	18.0	10	19	29
68	18.0	10	19	29
68	18.0	10	19	29
68	18.0	10	19	29

97.14286

DAF Operating Data

DAF Surface area	0.441 m2	4.75 ft2	
Normal Loading Rate	8 to 12 m/hr	3.3 to 5 USgpm/ft2	
Normal recycle rate	8 to 12 %		
Saturator Pressure	50-75 psi	h=	4.666667

Inlet flow		Surface Loading	
L/min	USgpm	m/hr	USgpm/ft2
68	18.0	9.3	3.78
60	15.9	8.2	3.34
0	0.0	0.0	0.00
8.1	2.1	1.1	0.45
0	0.0	0.0	0.00
0	0.0	0.0	0.00
0	0.0	0.0	0.00

11.91176

t 8.720943

Filter Operating Data

Filter Diameter	0.10 m	4.00 in	
Filter Surface area	0.01 m2	0.0873 ft2	
Normal Loading Rate	8 to 12 m/hr	3.3 to 5 USgpm/ft2	
Backwash Rate	39.11 m/hr	16 gpm/ft2	
Backwash Flow	5.28 L/min	1.40 gpm	

Inlet flow		Surface Loading	
L/min	USgpm	m/hr	USgpm/ft2
1	0.3	7.4	3.03
1.2	0.3	0.2	3.63
1.1	0.3	0.1	3.33
	0.0	0.0	0.00
	0.0	0.0	0.00

0.2642 3.02750191

Chemical Dosage	
Alum	20-60 mg/L
Caustic	as required to adjust pH to 7
PAC	20-60 mg/L

Operational setting

Flocculation surface loading 3.3 -3.7 gpm/ft2

DAF cell surface loading 3.3 - 5 gpm/ft2

Air loading 12 mg/L to 6 mg/L

One filter column

Sand 18"
Anthrasite 18"

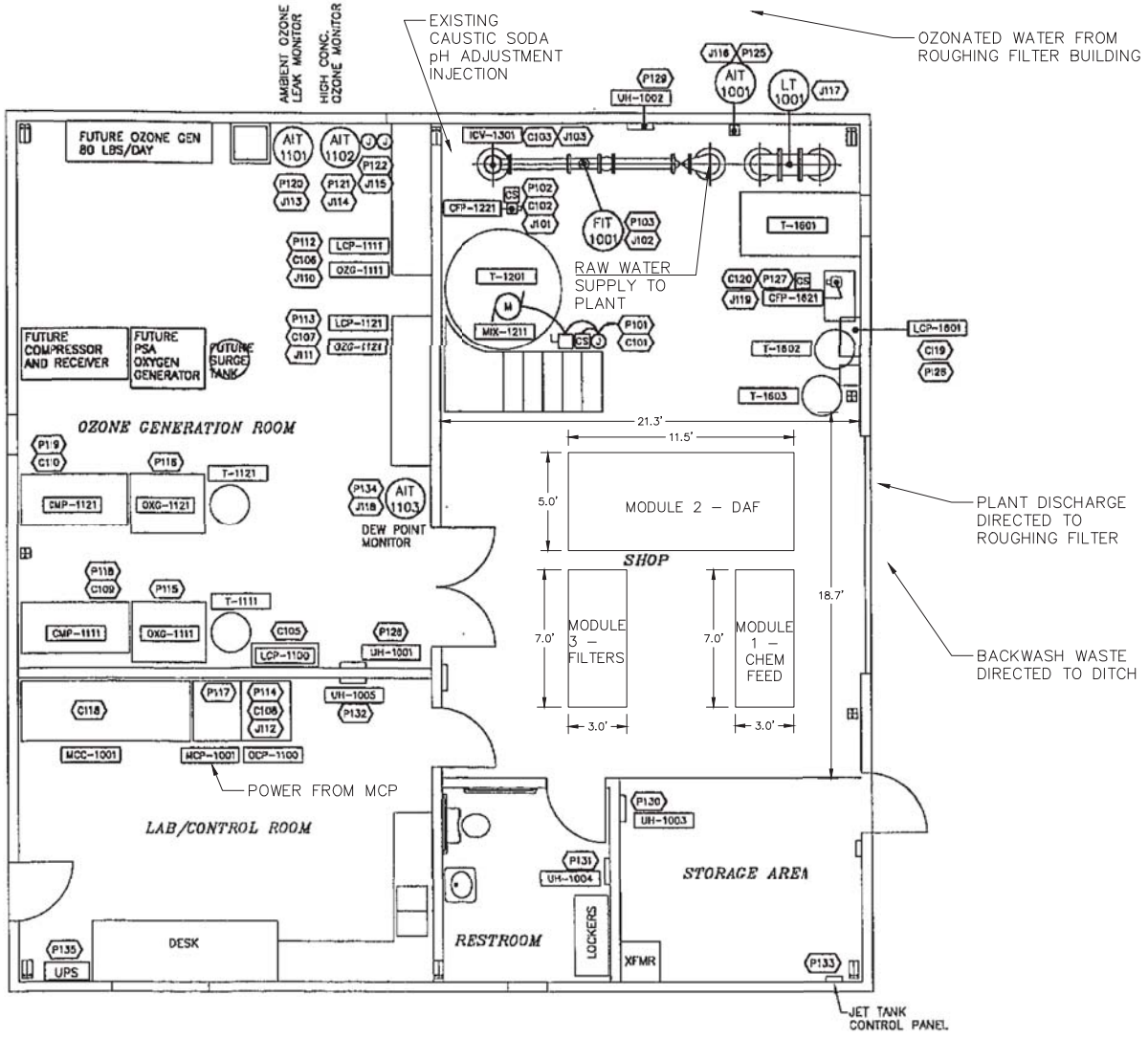
ADIWS Pilot Testing

DAF - Rapid Gravity Filtration

Simplified Pilot Schematic and Typical Operational Settings

ADI WATER SOLUTIONS LTD.

Figure 3



CRW ENGINEERING GROUP, LLC

PROJECT: 20901.00	
STATUS:	

CITY OF WRANGELL
WATER TREATMENT PLANT

PROPOSED PILOT EQUIPMENT LAYOUT

DATE	4/29/2016
SCALE	1" = 6'
FIGURE	3

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Normal flow	75	L/min	20	USgpm
Min flow	38	L/min	10	USgpm
Max flow	115	L/min	30	USgpm

S

Head tank volume	400	L	100	USgalls
Raw water pump	115	L/min	30	USgpm

I S SI

3 chemical storage and dosing systems each comprising:
75 L polyethylene solution tank and mixer
LMI dosing pump (2 @ 1 gph, 1 @ 0.58 gph)
All dose rates manually set
3 stage mixing zone with 3 separate static mixers and dosing ports

I

Flocculation Retention time

At Normal Flow	28	min	18.9	min
At min flow	57	min	37.8	min
At Max flow	18	mins	12.3	mins
Number of stages	3		2	
Volume per stage	710	L	187	USgalls

ISS I I

Surface loading

At Normal Flow	11.08	m/hr	4.53	USgpm/ft2
At Min Flow	5.54	m/hr	2.27	USgpm/ft2
At Max flow	17.00	m/hr	6.95	USgpm/ft2
Clarifier width	0.28	m	11	in
Clarifier length	1.45	m	57	in
Cell water depth	1.5	m	59	in
Max. Air Loading (gm/m3)	12.0			
Max. recycle rate, at max. flow, max temp. (%)	11.4			
Number of Saturators	1.0			
Saturator dia. (m)	0.13	m	5	in
Max. recycle flow	0.14	L/s	2.34	Usgpm
Surface scraper	Chain and Paddle type with variable speed drive Adjustable scraper run duration and interval			

Standa d ac lic filte col mn loadin							
Filter inside diameter		Filter area		Flow rate		Filter loading	
4 inch	10.16 cm	12.57 sq in	81.1 sq cm			Standard	Metric
		0.0873 sq ft	0.00811 sq M	0.7 L/min	0.185 GPM	2.12 gpm/ft2	5.18 m/hr
				0.65	0.172	1.97	4.81
				0.8	0.211	2.42	5.92
				0.9	0.238	2.72	6.66
				1	0.264	3.03	7.40
				1.2	0.317	3.63	8.88
				1.3	0.343	3.93	9.62
				1.7	0.449	5.14	12.57
Media Volume Required							
		media depth (in)	Vol. (ft3)	# of columns			
Anthracite 1.0 mm		18	0.393	3			
Sand 0.45 - 0.55mm		18	0.393	3			

Appendix C – Pilot Study Results

Pilot On-SiteTesting Summary

PHASE	CONFIG	DATE	TIME	RUN TIME	TEMPERATURE				TURBIDITY					UVT					
					RAW	POST-DAF	FILTERED #2	FILTERED #3	RAW	POST-DAF	FILTERED #1	FILTERED #2	FILTERED #3	RAW	POST-DAF INLINE	POST-DAF DESKTOP	FILTERED #1	FILTERED #2	FILTERED #3
1	1	7/27/2016	9:22						2.6		0.04						90		
		7/27/2016	10:40						1.7		0.038						89		
		7/27/2016	15:20						1.35		0.04						88		
	2	7/27/2016	17:20						1.3		0.08						83		
		7/28/2016	9:49						1.192		0.054			45			85		
	3	7/28/2016	16:00						1.154		0.17			44			87		
		7/28/2016	17:41						1.14		0.311						88		
		7/28/2016	18:30						1.139		0.172						81		
		7/29/2016	9:25						1.141		0.045						81		
		7/29/2016	12:07						1.08				0.03						92
		7/29/2016	16:15						1.07				0.135						88
		7/29/2016	18:15						1.1		0.75		1.5						75
	4	7/30/2016	10:45							0.8	0.045		0.43				90		
		7/30/2016	11:22								0.08						92		
		7/31/2016	10:30						3.0	0.3	0.16			40		85	92		
		7/31/2016	12:00						1.0	0.5	0.06						93		
		7/31/2016	14:00						0.9	0.282	0.053						92		
	5	7/31/2016	18:10						1.5	0.695	0.131						94.7		
2	7	8/15/2016	0:00																
		8/16/2016	9:05		14.80				3.2	0.2		0.100	0.100	27.7	70.7				
		8/16/2016	12:04						3.2	0.2		0.100	0.100	27.9	70.6				
		8/17/2016	9:00		14.40	15.70								27.4	66.7				
		8/17/2016	11:00											27.4		92.0		94.3	94.3
	4	8/18/2016	0:00																
		8/20/2016	0:00																
		8/21/2016	11:30							0.5		0.081	0.072	49.5		89.5		90.3	90.3
		8/21/2016	18:40							0.4		0.079	0.091						
		8/22/2016	0:00		14.60				5.0	0.4		0.074	0.108	46.7		86.6		90.4	90.4
		8/22/2016	18:00												23.2			93.7	93.7
		8/23/2016	12:49		15.20				7.2			0.780	0.840			91.5		91.9	91.0
		8/24/2016	6:00		14.90				4.4	0.5		0.265	0.123	39.7	83.2				
		8/24/2016	12:34							0.4		0.138	0.150	44.6		89.7		91.4	90.7
		8/24/2016	17:05									0.106	0.135						
	6	8/25/2016	6:28		15.00				3.34						79.5				
		8/25/2016	15:00						2.828	0.6		0.100	0.100						
		8/25/2016	21:00						2.947	0.555		0.088	0.088						
		8/26/2016	10:00	20.30					2.677	0.901		0.317	0.317						
		8/26/2016	12:32						2.466	0.832		0.286	0.286						
	5	8/29/2016	8:50		15.50				3.277	0.666		0.043	0.043	68.4					
		8/29/2016	10:27																
		8/29/2016	12:05						3.219	0.718		0.047	0.047	68.5					
		8/29/2016	12:10													94.5		95.2	95.2
		8/30/2016	0:00																
	4	9/13/2016	6:30		13.40				3.8										
		9/13/2016	10:27			14.7	15.70	15.40				0.950	0.940	42.2	59.7	90.0		90.5	90.2
		9/13/2016	20:15							0.854		0.176	0.287						
		9/14/2016	0:00	21.70	13.50				4.4	0.854		0.282	0.229						
		9/14/2016	12:00	24.40						0.844		0.321	0.249		49.1			94.4	94.5
		9/15/2016	6:35		13.50				3.54	2.421		2.221	2.143	49.9					
		9/15/2016	11:11							0.528		0.086	0.065			94.9		93.5	94.7
		9/16/2016	5:42		13.20				5.12	1.03		0.260	0.281	48.4				91.1	91.3
		9/16/2016	12:26							0.764		0.258	0.235						
	5	9/19/2016	0:00																
		9/21/2016	0:00		11.80				2.03					72.1		90.8			
		9/22/2016	6:30		12.00				1.71										
		9/22/2016	9:13							1.551		0.203	0.134	75.1	79.8				
		9/22/2016	12:15							1.837		0.147	0.246	64.1	75.6				
		9/22/2016	13:55							1.275		0.198	0.296	64.4	77.8				
		9/26/2016	0:00																
		9/27/2016	9:20		10.80				1.03					69.7		91.7			
		9/27/2016	11:10										0.382			89.5		92.1	92.1
	4	9/28/2016	11:10		10.30				1.19	1.8		0.192	0.564						
		9/28/2016	12:01													93.1			
		9/28/2016	13:04							0.594		0.091	0.111			93.1		93.0	92.8
		9/29/2016	0:00		10.30				1.01										
		9/29/2016	11:48							0.5						92.3			
		9/29/2016	12:50													92.4		91.7	91.9
	6	9/30/2016	6:30		10.00				0.91										
		9/30/2016	8:42							0.669		0.088	0.195						
		9/30/2016	12:00							0.659		0.110	0.125			92.8		93.5	93.6
	7	10/4/2016	7:35		9.70					0.622									
		10/4/2016	10:00						1.09	0.459				43.7		91.6			
		10/4/2016	11:10																
		10/4/2016	11:15							0.474		0.099	0.093	43.3		92.4		91.4	90.1
		10/4/2016	11:47													90			
		10/4/2016	13:15							0.44		0.099	0.111		57.2				
	4	10/6/2016	10:00							0.578		0.162	0.177	36.5	52.8				
		10/6/2016	13:00													92.2		92.3	92.5
		10/6/2016	14:14							0.348						92.5		92.9	92.7
		10/6/2016	20:50							0.349		0.122	0.117			94.3		94.3	94.4

Pilot On-SiteTesting Summary

DATE	TIME	CONFIG	pH					COLOR					ALKALINITY					COAGULANT			pH ADJUSTMENT	
			RAW	POST-DAF	FILTERED #1	FILTERED #2	FILTERED #3	RAW	POST-DAF	FILTERED #1	FILTERED #2	FILTERED #3	RAW	POST-DAF	FILTERED #1	FILTERED #2	FILTERED #3	TYPE	PUMPING RATE	PUMPING RATE (L/hr)	PUMPING RATE	PUMPING RATE (L/hr)
7/27/2016	9:22				4.37					22								Alum	0.9	0.9		
7/27/2016	10:40	1			4.26					18								Alum	0.9	0.9		
7/27/2016	15:20				4.26					14								Alum	0.9	0.9		
7/27/2016	17:20	2			4.44					24								Alum	1.2	1.2		
7/28/2016	9:49		6.25		4.65			148		24								Alum	1.2	1.2		
7/28/2016	16:00		6.58		4.67			167		19								Alum	1.2	1.2	0.45	0.45
7/28/2016	17:41				4.98					25								Alum	1.2	1.2	0.55	0.55
7/28/2016	18:30				5.13					25								Alum	1.2	1.2	0.55	0.55
7/29/2016	9:25	3			5.63					60								Alum	0.9	0.9	0.4	0.4
7/29/2016	12:07						6.75					30						Alum	0.9	0.9	0.8	0.8
7/29/2016	16:15						7.2					12					20	Alum	0.9	0.9	1.0	1.0
7/29/2016	18:15						7.5					55						Alum	0.9	0.9	0.9	0.9
7/30/2016	10:45				7.0			158		19								PAX XL19	3.85	3.85		
7/30/2016	11:22				7.1					12								PAX XL19	2.85	2.85		
7/31/2016	10:30	4			7.54					23								PAX XL19	2.00	2.00		
7/31/2016	12:00				7.2					5								PAX XL19	2.3	2.3		
7/31/2016	14:00				7.36					13								PAX XL19	2.3	2.3		
7/31/2016	18:10	5			7.5					11								PAX XL19	6.0	6.0		
8/15/2016	0:00																		2.25 initial	2.25	2.00	2.00
8/16/2016	9:05	7	6.9	7.4															4.25	4.25	1.85	1.85
8/16/2016	12:04		6.9	7.3															5.75	5.75	2.00	2.00
8/17/2016	9:00		6.8	7.5															6.25	6.25	2.50	2.50
8/17/2016	11:00																		6.25	6.25	2.50	2.50
8/18/2016	0:00																		2.88-3.25	3.25	0.00	
8/20/2016	0:00																		0		none	
8/21/2016	11:30																		3.6 -3.70	3.70	none	
8/21/2016	18:40																					
8/22/2016	0:00	4	5.8					113											3.84	3.84	none	
8/22/2016	18:00																					
8/23/2016	12:49		6.2					116	0		0	2							3.85 - 4.15	4.15	none	
8/24/2016	6:00		6.2					106					15.0	15.0		15.0	15.0		4.07 start	4.07	none	
8/24/2016	12:34																					
8/24/2016	17:05																					
8/25/2016	6:28		6.61					113											4.25 - 5.75	5.75	none	
8/25/2016	15:00																					
8/25/2016	21:00	6																				
8/26/2016	10:00		6.25					49											5.35	5.35	none	
8/26/2016	12:32																					
8/29/2016	8:50		5.76																4.5-3.65	4.50	0.00	
8/29/2016	10:27								1		4	4										
8/29/2016	12:05	5	5.82																			
8/29/2016	12:10																					
8/30/2016	0:00		5.75																3.65	3.65	none, r/f inlet	
9/13/2016	6:30		6.3					136											3.75-4.35	4.35	none	
9/13/2016	10:27			6.12		6.4	6.3		4		0	0	15	15		15.0	15.0					
9/13/2016	20:15																					
9/14/2016	0:00		6.13					117											4.35 - 4.5	4.50	none	
9/14/2016	12:00	4						107			0	0										
9/15/2016	6:35		6.33					103			0	0							4.45 - 4.47	4.47	none	
9/15/2016	11:11								0		0	0										
9/16/2016	5:42		6.45					96			3	1							4.47 - 4.7	4.70	none	
9/16/2016	12:26																					
9/19/2016	0:00																		0		0.00	
9/21/2016	0:00		6.26					112	2										3.6 - 4.3	4.30	0.00	
9/22/2016	6:30		6.61																4.30 - 4.10	4.30	0.00	
9/22/2016	9:13																					
9/22/2016	12:15	5																				
9/22/2016	13:55																					
9/26/2016	0:00																		3.75 - 4.35	4.35	0.00	
9/27/2016	9:20							21	0										4.35 - 4.75	4.75	0.00	
9/27/2016	11:10								0													
9/28/2016	11:10							129											4.85 - 4.75	4.85	0.00	
9/28/2016	12:01								0													
9/28/2016	13:04	4							0		1	0										
9/29/2016	0:00		6.22																4.70 - 6.0	6.00	0.00	
9/29/2016	11:48							29	6													
9/29/2016	12:50								6		5	3										
9/30/2016	6:30		6.27					27											6.00 - 5.75	6.00	0.00	0
9/30/2016	8:42	6																		5.69		0
9/30/2016	12:00								0		0	0								5.75		0
10/4/2016	7:35																		4.75 - 5.50	4.75	1.25 - 1.5	1.25
10/4/2016	10:00		6.22	5.52				121	5											4.75		1.25
10/4/2016	11:10	7	6.38	5.58																4.75		1.25
10/4/2016	11:15												10							4.75		1.5
10/4/2016	11:47			6.38									20							4.90		1.5
10/4/2016	13:15																			5.50		1.5
10/6/2016	10:00																		4.95 - 4.85	4.85	none	0
10/6/2016	13:00	4							0		2	1								4.85		0
10/6/2016	14:14								0		0	0								4.85		0
10/6/2016	20:50																			4.85		0

DAF Pilot Laboratory Testing Results

		Analysis Performed by -->		ARS			ARS			ARS		
		Lab Sample No. -->		1608224			1609269			1610137		
		Sampling Date -->		8/9/2016			9/15/2016			10/6/2016		
		Sample Description -->		Raw	DAF	Filtrate	Raw	DAF	Filtrate	Raw	DAF	Filtrate
Contaminant	**Units**	**MRL**	**MCL**									
Alkalinity	mg/l	5.0	--	9.4	8.0	7.2	9.8	8.2	7.8	7.6	6.0	6.0
Calcium	ug/l	2.5	--	3000	2910	2900			3400	2800	2800	2800
Color, True	PCU	5.0	15	90	5	5	70	5	5	70	5	5
On-site Color	PCU	1.0	15	60*						89	0	0
DOC	mg/l	0.10	--	6.2	1.6	1.7	7.4	1.9	1.5	7.9	1.9	2.0
HAA_5 Formation Potential (7.1 mg/l dose)	ug/l	1.0	60			71.3						
HAA_5 Formation Potential (4.0 mg/l dose)	ug/l	1.0	60							134.0	109.3	91.8
HAA_5 Formation Potential (1.5 mg/l dose)	ug/l	1.0	60							27.9	31.0	16.6
Hardness as $CaCO_3$	mg/l	1.0	--	9.1	8.9	8.8			8.9			
Iron	ug/l	2.0	300	1460	85	0	1200	150	<MRL			
LSI at 50F	C units	-1.0	--			-3.6				-3.7	-3.8	-4.0
Magnesium	ug/l	1.0	--	397	392	388						
Manganese	ug/l	1.0	50	137	120	124	120	110	110			
pH	pH units	0.1	6.5-8.5			6.27				6.26	6.29	6.08
SUVA	L/mg-m	--	--		2.13	1.82				4.53	1.68	1.60
TDS	mg/l	3.4	500			<MRL			42.5	36	<MRL	<MRL
TOC	mg/l	0.10	--	6.8	2.0	1.6	7.3	2.3	1.8	8.3	2.1	2.0
TTHM Formation Potential (7.1 mg/l dose)	ug/l	0.5	80			93.5						
Turbidity - onsite	NTU	0	0.3	1.88	0.493	0.057	3.56	0.528	0.065	1.89	0.349	0.117
UV_{254}	cm^{-1}	0.01	--		0.0340	0.0310				0.358	0.032	0.032
UVT - onsite	%	0	--	50.2	89.9	92.2	50.1	94.6	94.8	45.7	94.3	94.4

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/15/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	54*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	2.25 initial**	200 ml/hr*		
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)				
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY				
STATUS	RAW	POST-DAF	FILTERED	READING TIME
TEMPERATURE				
TURBIDITY				
UVT				
pH				
COLOR	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
ALKALINITY				

FILTER PERFORMANCE			
	STATUS	READING	READING TIME
0	DIFFERENTIAL PRESSURE		
	DID YOU BACKWASH TODAY?	no, spend day adjusting coag	
0	AIR SCOUR START		
1	AIR SCOUR STOP		
2	BACKWASH START		
3	BACKWASH STOP		
4	BACKWASH FLOW RATE		
5	FILTER TO WASTE START		
0	FILTER TO WASTE STOP		
1			
2			
3			
4			
5			
0			
1			
2			
3			
4			
5			
0			
1			
2			
3			
4			
5			
0			

NOTES AND OBSERVATIONS:

Testing filter 3, commence testing with p/h adjustment (soda ash)

* soda p/h too high (9) lowered to 2ml/hr, still high at 8+. Lower to 185 ml/hr

**Learn proper use of CCA, now start all over. After proper use of CCA, dose of coag found to be way low, reading heavy negative. 225 - 250, then to 2.75 l/hr, CCA=-3.13 Raise dose to 3.25 l/hr, CCA then lower @ -2.79. Raise dose to 4.25 l/hr. end day there.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm, 40 l/m

DATE	8/16/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	54*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.25 l/hr	185 ml/hr		09:05
	5.75 l/hr	200 ml/hr		12:04
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0	10.0		
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED	READING TIME	
TEMPERATURE	14.8				0
TURBIDITY	3.2	0.2	0.129	09:05	0
	3.2	0.2	0.052	12:04*	1
					2
					3
					4
					5
UVT	27.7	70.7		09:05	0
	27.9	70.6		12:04*	1
					2
					3
					4
					5
pH	6.9	7.35 (-2.36 CCA)		09:05	0
	6.9	7.3		12:04*	1
					2
					3
					4
					5
COLOR	-	-	-	09:05	0
	-	-	-		1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE			
STATUS	READING	READING TIME	
DIFFERENTIAL PRESSURE			0
DID YOU BACKWASH TODAY?	n		
AIR SCOUR START			0
AIR SCOUR STOP			1
BACKWASH START			2
BACKWASH STOP			3
BACKWASH FLOW RATE			4
FILTER TO WASTE START			5
FILTER TO WASTE STOP			0

NOTES AND OBSERVATIONS:

*: dose @ 12:04, 5.75 l/hr coag and 200ml/hr soda

spent day adjusting p/h and coag. Ended day with coag @ 6.25 l/hr and soda @200 ml/hr. CCA= + 1.22

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/17/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	52*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	6.25 l/hr	250 ml/hr		09:00
REMAINING SOLUTION IN TANK (GAL)	62 l	lots		09:00
SOLUTION STRENGTH (%)	2.0	10.0		09:00
DATE MIXED	8/16			
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)	1 l			
GALLONS OF WATER ADDED	70 l			

WATER QUALITY				
STATUS	RAW	POST-DAF	FILTERED	READING TIME
TEMPERATURE	14.4	15.7	offline for l hr	09:00
TURBIDITY				
UVT	27.4	66.7	offline for l hr	09:00
6.25 l/hr coag, 250 ml/hr soda:	27.4	92.0	94.3	11:00
pH	6.8	7.5	offline for l hr	09:00
COLOR	-	-	offline for l hr	09:00
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
ALKALINITY				

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?		
AIR SCOUR START		
AIR SCOUR STOP		
BACKWASH START		
BACKWASH STOP		
BACKWASH FLOW RATE		
FILTER TO WASTE START		
FILTER TO WASTE STOP		

NOTES AND OBSERVATIONS:

Addition of soda is destructive to coagulant, dose must be increased by a good margin to compensate. Spent day chasing coag dose. Shut off soda at one point for 1.25 hour to see what effect it had. CCA skyrocketed to = 2.75, DAF ntu climbed to 9.915 ntu from 0.197. Ntu went as high as 14.31, the started back down after turning soda back on.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/18/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	54*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	2.88-3.25 l/hr			
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0	none		
DATE MIXED	8/18/16			
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)	1 l			
GALLONS OF WATER ADDED	70 l			

WATER QUALITY				
STATUS	RAW	POST-DAF	FILTERED	READING TIME
TEMPERATURE				
TURBIDITY				
UVT				
pH				
COLOR	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
ALKALINITY				

FILTER PERFORMANCE			
	STATUS	READING	READING TIME
0	DIFFERENTIAL PRESSURE		
	DID YOU BACKWASH TODAY?	y	
0	AIR SCOUR START	1 min.	
1	AIR SCOUR STOP	2.5 min	
2	BACKWASH START	0 min	
3	BACKWASH STOP	10.00 min	
4	BACKWASH FLOW RATE	14 l/m	
5	FILTER TO WASTE START	10.00 min plus	
0	FILTER TO WASTE STOP	1 inch of head	

NOTES AND OBSERVATIONS:

Addition of soda is destructive to coagulant, dose must be increased by a good margin to compensate. Spent day chasing coag dose back down from yesterday addition of soda.
Start day with coag dose @ 2.88 l/hr and cca @ -1.27. End day with dose @ 3.25 l/hr, excellent floc, but low uvt of 47.9, with color of 0 (daf).

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/20/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP		DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE		none		
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)				
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY				
STATUS	RAW	POST-DAF	FILTERED	READING TIME
TEMPERATURE				
TURBIDITY				
UVT				
pH				
COLOR	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
ALKALINITY				

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?		
AIR SCOUR START		
AIR SCOUR STOP		
BACKWASH START		
BACKWASH STOP		
BACKWASH FLOW RATE		
FILTER TO WASTE START		
FILTER TO WASTE STOP		

NOTES AND OBSERVATIONS:

Start two filters at two speeds: #2 = 0.7l/m, #3= 1.2 l/m. Whole day a bust, as influent daf valve plugged up, and reduced flow through plant, causing total upset before found problem. Also issue with ntu lines (needle valves) plugging and giving false readings.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/21/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP		DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	3.6 -3.70 l/hr	none		
REMAINING SOLUTION IN TANK (GAL)	74.0			
SOLUTION STRENGTH (%)	2.0			
DATE MIXED	8/20			
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED	READING TIME	
TEMPERATURE					0
TURBIDITY		0.5	#2: 0.081,* #3:0.072 *	11:30	0
		0.4	#2: 0.079 **, #3: 0.091 **	18:40	1
					2
					3
					4
					5
UVT	49.5*	89.5*	90.3*	11:30	0
					1
					2
					3
					4
					5
pH					0
					1
					2
					3
					4
					5
COLOR	-	-	-		0
	-	-	-		1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?	y	
AIR SCOUR START	1 min.	
AIR SCOUR STOP	2.5 min	
BACKWASH START	0 min	
BACKWASH STOP	10.00 min	
BACKWASH FLOW RATE	14 l/m	
FILTER TO WASTE START	10.00 min plus	
FILTER TO WASTE STOP	1 inch of head	

NOTES AND OBSERVATIONS:

Two filters, #2, #3. Flow same as previous day, #2= 0.7l/m, #3= 1.2 l/m.
*= 3.60 l/hr, cca = +0.01
**= 3.70 l/hr, cca = -0.15

Throttling inf with large ball valve instead of gate valve by rotometer

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/22/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	50*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	3.8	none		
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)				
DATE MIXED	8/20			
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY				
STATUS	RAW	POST-DAF	FILTERED	READING TIME
TEMPERATURE	14.6			
TURBIDITY	5.0	0.441*	#2: 0.074*, #3: 0.108*	
UVT	46.7	86.6*	90.4*	
		23.2**	93.7**	
pH	5.8			
COLOR	113.0	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
ALKALINITY				

FILTER PERFORMANCE			
	STATUS	READING	READING TIME
0	DIFFERENTIAL PRESSURE		
	DID YOU BACKWASH TODAY?		
0	AIR SCOUR START		
1	AIR SCOUR STOP		
2	BACKWASH START		
3	BACKWASH STOP		
4	BACKWASH FLOW RATE		
5	FILTER TO WASTE START		
0	FILTER TO WASTE STOP		

NOTES AND OBSERVATIONS: * The readings above were taken at 3.84 l/m and CCA of -0.88 **Readings taken at day's end at dose of 4.25 l/hr, CCA od +2, combined filtrate.

Day 2 of 0.7 / 1.2 l/m, two filters. Upon opening drain valves to start filtration, both filters drained below sand rather than remained headed up to where they were upon stopping yesterday. Both valves needed to be readjusted to continue. This caused ntu spikes for a short while whilst things stabilized. Raw ntu and color up from yesterday. ntu went from 4.49 - 5.01, color up 7 points from 106 - 113, causing increased coag demand.

Something went astray toward end of day, causing upset, hence the upset (23.2 uvt) in the daf tank.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/23/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	57*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	3.85 l/hr - 4.15 l/hr	none		
REMAINING SOLUTION IN TANK (GAL)	35 l			
SOLUTION STRENGTH (%)	2.0			
DATE MIXED	8/23			
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)	0.5 l			
GALLONS OF WATER ADDED	35 l			

WATER QUALITY				
STATUS	RAW	POST-DAF	FILTERED	READING TIME
TEMPERATURE	15.2			
TURBIDITY	7.2		#2 = 0.78, #3 = 0.84	12:49 (4l/hr)
UVT		91.5 @ 4 l/hr	#2 =91.9, #3 = 91	12:49 (4l/hr)
pH	6.2			
COLOR	116.0	0 @ 4 l/hr	#2 = 0, #3 = 2	12:49 (4l/hr)
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
ALKALINITY				

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?	n	
AIR SCOUR START		
AIR SCOUR STOP		
BACKWASH START		
BACKWASH STOP		
BACKWASH FLOW RATE		
FILTER TO WASTE START		
FILTER TO WASTE STOP		

NOTES AND OBSERVATIONS:

Clean / cal inline uvt meters, better reads. Start day @ 3.85 l/hr. End day @ 4.07 l/hr. Leave plant running all night.

CCA 10:10, @ 3.85 l/hr = -0.53. CCA 11:11 @ 4 l/hr = -0.46, @ 11:51 = -0.50, @ 12:31 = -0.38. CCA 13:32 @ 4.15 l/hr = -0.06 CCA , 13:55 = +0.01

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/24/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	55*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.07 l/hr start	none		06:00
REMAINING SOLUTION IN TANK (GAL)	10 l	70 l used since yesterday am		
SOLUTION STRENGTH (%)	2.0			06:00
DATE MIXED	8/24			06:00
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)	1 l			06:00
GALLONS OF WATER ADDED	70 l			06:00

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED	READING TIME	
TEMPERATURE	14.9				0
TURBIDITY	4.4	0.5	#2 = 0.265, #3 = 0.123	06:00 *	0
		0.4	#2 = 0.138, #3 = 0.150	12:34**	1
			#2 = 0.106, #3 = 0.135	17:05***	2
					3
					4
					5
UVT	39.7 (inline)	83.2 (inline)		06:00 *	0
	44.6 (filtered)	89.7 (filtered)	#2 = 91.4 (f), #3 = 90.7	12:34**	1
					2
					3
					4
					5
pH	6.2			06:00 *	0
					1
					2
					3
					4
					5
COLOR	106.0	-	-	06:00 *	0
	-	-	-		1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY	15.0	15.0	15	12:34**	0

FILTER PERFORMANCE			
STATUS	READING	READING TIME	
DIFFERENTIAL PRESSURE			0
DID YOU BACKWASH TODAY?	y		
AIR SCOUR START	2.0		0
AIR SCOUR STOP	3.0		1
BACKWASH START	1.0		2
BACKWASH STOP	5.0		3
BACKWASH FLOW RATE	****		4
FILTER TO WASTE START	5.0		5
FILTER TO WASTE STOP	at 1" head		0

NOTES AND OBSERVATIONS: * = 4.07 l/hr, ** = 4.15 l/hr, * = 4.25 l/hr. **** backwash rate = 1 min @ 8l/m, 1 min air, 14 l/m for 3 minutes. No P/H adjustment.**

Plant still running in morning.Oddly enough, filter three @ 1.2 l/m is headed up less than filter 2 @ 0.7 l/m.? Curent run time as of 06:00 = approx 46 hrs.

initial CCA @ 4.07 l/hr = -0.15 (06:00). CCA @ 4.15 l/hr @ 13:32 = -0.67. CCA @ 17:05 @ 4.25 l/hr = +0.13.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/25/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	57*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.25 - 5.75 l/hr	none		
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED	8/25			
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED	READING TIME	
TEMPERATURE	15			06:28	0
TURBIDITY	3.34				0
	2.828	0.625	0.054	15:00	1
	2.947	0.555	0.088	21:00	2
					3
					4
					5
UVT		79.5			0
					1
					2
					3
					4
					5
pH	6.61				0
					1
					2
					3
					4
					5
COLOR	113	-	-		0
	-	-	-		1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE			
STATUS	READING	READING TIME	
DIFFERENTIAL PRESSURE			0
DID YOU BACKWASH TODAY?	y		
AIR SCOUR START	2.0		0
AIR SCOUR STOP	3.0		1
BACKWASH START	1.0		2
BACKWASH STOP			3
BACKWASH FLOW RATE			4
FILTER TO WASTE START			5
FILTER TO WASTE STOP			0

NOTES AND OBSERVATIONS: Test run ozonated water spend day trying to stabilize CCA. One filter. Raw water is now roughing filter influent water. P/H. added

Initial settings from previous day were 4.25 l/hr coag. CCA was +0.34 1/2 hr into test run with ozone. 1 hour in, CCA was +3.06. Coag then lowered by half to 2.13 l/hr. At 10:08 (about two hrs later), CCA = -0.29. Dose then raised to 2.20 l/hr. At 10:56 and 2.20 l/hr, CCA = +0.06. Coag then lowered to 2.19 l/hr, and filtering commenced. CCA check @ 12:11showed -2.79. Coag then raised to 3 l/hr. At this time there was no visible flock in DAF chamber. CCA check @ 12:53 showed -2.79. Coag raised to 5.00 l/hr. CCA check @ 14:20 showed -0.59. Coag dose elevated to 5.25 l/hr. At 15:00 hrs Andrew tested CCA (5.25 l/hr) at -1.53. It is unclear if piston pump was on on CCA machine. At 21:00, CCA = -1.34. Coag was elevated again to 5.75 l/hr.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/26/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	61*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	5.4	none		
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED	8/24			
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED	READING TIME	
TEMPERATURE					0
TURBIDITY	2.677	0.901	0.317	10:00 (20.3 hrs run)	0
	2.466	0.832	0.286	12:32	1
					2
					3
					4
					5
UVT					0
					1
					2
					3
					4
					5
pH	6.25				0
					1
					2
					3
					4
					5
COLOR	49	-	-		0
	-	-	-		1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE			
STATUS	READING	READING TIME	
DIFFERENTIAL PRESSURE			0
DID YOU BACKWASH TODAY?	n		
AIR SCOUR START			0
AIR SCOUR STOP			1
BACKWASH START			2
BACKWASH STOP			3
BACKWASH FLOW RATE			4
FILTER TO WASTE START			5
FILTER TO WASTE STOP			0

NOTES AND OBSERVATIONS: Test run ozonated water, one filter. P/H adjustment. Raw water is now roughing filter influent water.

CCA test first thing @ 5.75 l/hr = +1.63. Lower to 5.35 l/hr. Flow through main plant is low (182 gpm) and ozone presence is heavy in influent water. Flow elevated to 800 gpm to more replicate avg flow and less ozone. CCA @ 10:00 and 5.35 l/hr coag = -0.01. Start new run @ 12:32.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/29/2016	
DAY (UMTWRFS)		
OPERATOR	AS	
OUTSIDE TEMP	54*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.5-3.65 l/hr			
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED	READING TIME	
TEMPERATURE	15.5				0
TURBIDITY	3.277	0.666	0.043	8:50*	0
					1
	3.219	0.718	0.047	12:05**	2
					3
					4
					5
UVT	68.4			8:50*	0
					1
	68.5			12:05**	2
		94.5	95.2	12:10**	3
					4
					5
pH	5.76			8:50*	0
					1
	5.82			12:05	2
					3
					4
					5
COLOR	-	-	-		0
	-	1	4	10:27**	1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE			
STATUS	READING	READING TIME	
DIFFERENTIAL PRESSURE			0
DID YOU BACKWASH TODAY?	n		
AIR SCOUR START			0
AIR SCOUR STOP			1
BACKWASH START			2
BACKWASH STOP			3
BACKWASH FLOW RATE			4
FILTER TO WASTE START			5
FILTER TO WASTE STOP			0

NOTES AND OBSERVATIONS: Test run ozonated water, one filter. No P/H adjustment. Raw water is now roughing filter influent water.

* = 4.4 l/hr, CCA +1.01. ** 4 l/hr, CCA+0.56. 08:10, 4.5 l/hr, CCA= +0.49. 09:30, 4.1 l/hr, CCA=+0.30. 13:00, 3.85 l/hr, CCA= +0.12. 13:40, 3.8 l/hr, CCA= +0.10. 14:20,3.78 l/hr, CCA=+0.30. 15:14, 3.65 l/hr, CCA= +0.10 reduce to 3.65 l/hr @ 15:14

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	8/30/2016	
DAY (UMTWRFS)		
OPERATOR	AS	
OUTSIDE TEMP	54*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	3.65 (CCA+0.06)	none, r/f inlet		
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY				
STATUS	RAW	POST-DAF	FILTERED	READING TIME
TEMPERATURE				
TURBIDITY				
UVT				
pH	5.75			
COLOR	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
ALKALINITY				

FILTER PERFORMANCE			
	STATUS	READING	READING TIME
0	DIFFERENTIAL PRESSURE		
	DID YOU BACKWASH TODAY?		
0	AIR SCOUR START		
1	AIR SCOUR STOP		
2	BACKWASH START		
3	BACKWASH STOP		
4	BACKWASH FLOW RATE		
5	FILTER TO WASTE START		
0	FILTER TO WASTE STOP		

NOTES AND OBSERVATIONS: Test run ozonated water, one filter. No P/H adjustment. Raw water is now roughing filter influent water.

This is all the data for this day.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/13/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	46*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	3.75-4.35 l/hr	none		06:00
REMAINING SOLUTION IN TANK (GAL)	14l			06:00
SOLUTION STRENGTH (%)	2.0			06:00
DATE MIXED	9/13			06:00
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)	1l / 0.75l			06:00 / 20:11
GALLONS OF WATER ADDED	70l / 52.5l			06:00 / 2011

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED	READING TIME	
TEMPERATURE	13.4 (06:30)				0
		14.7	#2: 15.7, #3: 15.4	10:27*	
TURBIDITY	3.84 (06:30)				0
			#2: 0.95, #3: 0.94	10:27*	1
		0.854	#2: 0.176, #3: 0.287	20:15**	2
					3
					4
					5
UVT					0
	71.1(inline messed up) 42.2(desk top)	59.7(inline) 90.0 (desktop)	90.5 #2, 90.2 #3	10:27*	1
					2
					3
					4
					5
pH	6.25 (06:30)				0
		6.12	#2: 6.41, #3: 6.33	10:27*	1
					2
					3
					4
					5
COLOR	136 (06:30)	-	-		0
	-	4	#2: 0, #3: 0	10:27*	1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0
	15	15	#2: 15, #3:15	10:27*	1

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?	y	
AIR SCOUR START	1:00	
AIR SCOUR STOP	2:00	
BACKWASH START	0:00	
BACKWASH STOP	10:00	
BACKWASH FLOW RATE	14l/m after scour	
FILTER TO WASTE START	from overflow	
FILTER TO WASTE STOP	until 1" head	

NOTES AND OBSERVATIONS: Backwash #2, #3, prepare for extended run running on raw water (reservoir).

* = 10:27 CCA @ 4.0 l/hr = -0.10. 12:20 CCA @ 4 l/hr = -0.73. 13:15 CCA @ 4.15 l/hr = -0.21. 13:55 Raw ntu @ 13:55 = 5.04, CCA = -0.40, raise dose to 4.34 l/hr.
** = CCA -0.12 @ 4.35 l/hr. 10.7 hrs into run, filter 2 @0.7, and #3 @ 1.4 (reduced back to 1,2), filter 2 was headed to 22.250", and 3 was headed to 31.5".

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/14/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	54*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.35 - 4.5 l/hr	none		
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED	READING TIME	
TEMPERATURE	13.5			21.7 hrs*	0
TURBIDITY	4.40	0.854	#2: 0.282, #3: 0.229	21.7 hrs*	0
		0.844	#2: 0.321, #3: 0.249	24.4 hrs**	1
					2
					3
					4
					5
UVT					0
		49.1	#2: 94.4, #3: 94.5	24.4 hrs**	1
					2
					3
					4
					5
pH	6.13			21.7 hrs*	0
					1
					2
					3
					4
					5
COLOR	117*	-	-		0
	107**	-	#2: 0**, #3:0**	24.4 hrs**	1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE			
STATUS	READING	READING TIME	
DIFFERENTIAL PRESSURE			0
DID YOU BACKWASH TODAY?	y (at end of day)		
AIR SCOUR START	1:00		0
AIR SCOUR STOP	2:00		1
BACKWASH START	0:00		2
BACKWASH STOP	10:00		3
BACKWASH FLOW RATE	14 l/m after initial scour		4
FILTER TO WASTE START	at overflow		5
FILTER TO WASTE STOP	1" head		0

NOTES AND OBSERVATIONS: extended run run on raw water. Filter three exceeded ntu @ 14:00 (28.4 hr run). Shut down, flush and restart.

* = 4.35 l/hr, CCA = -0.39, and 21.7 hrs run time. Filter head at 21.7 hrs = #2: 41", #3: 48". ** 24.4 hrs, CCA = +0.02 @ 4.5 l/hr. 17:51, CCA +0.10 @4.45 l/hr

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/15/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	57*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.45 - 4.47	none		
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)	0.5 l			
GALLONS OF WATER ADDED	35 l			

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME	
TEMPERATURE	13.5				0
TURBIDITY	3.54	2.421	2.221 / 2.143	06:35*	0
		0.528	0.086 / 0.065	11:11	1
					2
					3
					4
					5
UVT	49.9			06:35*	0
		94.9	93.5 / 94.7	11:11	1
					2
					3
					4
					5
pH	6.33			06:35*	0
					1
					2
					3
					4
					5
COLOR	103	-	-	06:35*	0
	-	0	0 / 0	11:11	1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE			
STATUS	READING	READING TIME	
DIFFERENTIAL PRESSURE			0
DID YOU BACKWASH TODAY?	y		
AIR SCOUR START	1:00		0
AIR SCOUR STOP	2:00		1
BACKWASH START	0:00		2
BACKWASH STOP	10:00		3
BACKWASH FLOW RATE	14l/m after scour		4
FILTER TO WASTE START	at overflow		5
FILTER TO WASTE STOP	1" freeboard		0

NOTES AND OBSERVATIONS: * This was an attempted continued run, but issue cropped up with coag injection, causing total upset. CCA was -1.17
Restart at 10:00 after restabilizing DAF and backwashing filters. CCA -0.01. CCA @ 11:12 = -0.07 @ 4.45 l/hr.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/16/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	55*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.47 - 4.7 l/hr	none		
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED	9/16			
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)	1 l			
GALLONS OF WATER ADDED	70 l			

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME	
TEMPERATURE	13.2				0
TURBIDITY	5.12	1.030	0.311 / 0.281 (bumped ntu for #2, before = 0.260)	05:42*	0
		0.764	0.258 / 0.235	12:26**	1
					2
					3
					4
					5
UVT	48.4		91.1 / 91.3	05:42*	0
					1
					2
					3
					4
					5
pH	6.45				0
					1
					2
					3
					4
					5
COLOR	96	-	3 / 1		0
	-	-	-		1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?		
AIR SCOUR START		
AIR SCOUR STOP		
BACKWASH START		
BACKWASH STOP		
BACKWASH FLOW RATE		
FILTER TO WASTE START		
FILTER TO WASTE STOP		

NOTES AND OBSERVATIONS:
* 4.47 l/hr, CCA = -0.08 (ran out of coag). 11:00 CCA -0.60, raise dose to 4.6 l/hr. ** 12:26 4.6 l/hr, CCA = -0.82, raise dose to 4.70 l/hr. 13:50 4.7 l/hr, CCA= -0.71? Clean CCA and re-read, = -0.07

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/19/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	48*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE				
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)				
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME	
TEMPERATURE					0
TURBIDITY					0
					1
					2
					3
					4
					5
UVT					0
					1
					2
					3
					4
					5
pH					0
					1
					2
					3
					4
					5
COLOR	-	-	-		0
	-	-	-		1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?	y	
AIR SCOUR START	1:00	
AIR SCOUR STOP	2:00	
BACKWASH START	0:00	
BACKWASH STOP	10:00	
BACKWASH FLOW RATE	14 l/m after initial scour	
FILTER TO WASTE START	at overflow	
FILTER TO WASTE STOP	1' head	

NOTES AND OBSERVATIONS: **Break and repair sump pump. Commence stabilization of no p/h adjusted ozonated water.**

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/21/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	43*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	3.6 - 4.3			
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY				
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME
TEMPERATURE	11.8			
TURBIDITY	2.03			
UVT	72.1*	90.8**		
pH	6.26			
COLOR	112	2**	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
ALKALINITY				

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?		
AIR SCOUR START		
AIR SCOUR STOP		
BACKWASH START		
BACKWASH STOP		
BACKWASH FLOW RATE		
FILTER TO WASTE START		
FILTER TO WASTE STOP		

NOTES AND OBSERVATIONS: *** restart ozonated trial (no p/h adjustment) 11:30 CCA @ 3.60 l/hr = -0.23, raise to 4.00 l/hr. ** @ 4.00 l/hr.**
Spend day stabilizing

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/22/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	50*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.30 - 4.10			
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME	
TEMPERATURE	12			06:30	0
TURBIDITY	1.71			06:30	0
		1.551	0.203 / 0.134	09:13*	1
		1.837	0.147 / 0.246	12:15**	2
		1.275	0.198 / 0.296	13:55***	3
					4
					5
UVT					0
	75.1 (inline)	79.78 (inline)		09:13*	1
	64.1 (inline)	75.6 (inline)		12:15**	2
	64.4 (inline)	77.8 (inline)		13:55***	3
					4
					5
pH	6.61			06:30	0
					1
					2
					3
					4
					5
COLOR	0	-	-	06:30	0
	-	-	-		1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE			
STATUS	READING	READING TIME	
DIFFERENTIAL PRESSURE			0
DID YOU BACKWASH TODAY?			
AIR SCOUR START			0
AIR SCOUR STOP			1
BACKWASH START			2
BACKWASH STOP			3
BACKWASH FLOW RATE			4
FILTER TO WASTE START			5
FILTER TO WASTE STOP			0

NOTES AND OBSERVATIONS: No p/h, ozonated. Shut down @ 14:00
* 4.30 l/hr, CCA @9:12 +0.52, 500 gpm through plant. 9:50 CCA @ 800 gpm = +0.19. 10:50 CCA @ 800 gpm = +0.09. 12:14 CCA @ 980 gpm = +0.22, lower dose to 4.10. ** 4.30 l/hr. *** 4.10, CCA -0.09

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/26/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	48*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	3.75 - 4.35			
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY				
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME
TEMPERATURE				
TURBIDITY				
UVT				
pH				
COLOR	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
	-	-	-	
ALKALINITY				

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?		
AIR SCOUR START		
AIR SCOUR STOP		
BACKWASH START		
BACKWASH STOP		
BACKWASH FLOW RATE		
FILTER TO WASTE START		
FILTER TO WASTE STOP		

NOTES AND OBSERVATIONS: No p/h, ozonated. Attempt to stabilize CCA. End day at -1.48 @ 3.75 l/hr readjust to 4.35 l/hr and shut down.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/27/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	48*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.35 - 4.75			
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME	
TEMPERATURE	10.8				0
TURBIDITY	1.03			9:20*	0
			? / 0.382		1
					2
					3
					4
					5
UVT	69.7	91.7		09:20*	0
		89.5	92.1 / 92.1	11:10**	1
					2
					3
					4
					5
pH					0
					1
					2
					3
					4
					5
COLOR	21	0	-	9:20*	0
	-	0	-	11:10**	1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE			
STATUS	READING	READING TIME	
DIFFERENTIAL PRESSURE			0
DID YOU BACKWASH TODAY?	y		
AIR SCOUR START	1:00		0
AIR SCOUR STOP	2:00		1
BACKWASH START	0:00		2
BACKWASH STOP	10:00		3
BACKWASH FLOW RATE	14 l/m after air		4
FILTER TO WASTE START	at overflow		5
FILTER TO WASTE STOP	at 1" freeboard		0

NOTES AND OBSERVATIONS: No p/h, ozonated.
* 4.35 l/hr, CCA = -0.22. 9:50 CCA @ 4.5 l/hr -0.97 raise to 4.6 l/hr. ** 11:10 CCA @ 4.6 l/hr = -0.20. 13:22 CCA @ 4.75 l/hr = -0.17, raise to 4.85 l/hr. Coagulation not happening in settling basins. Flock is very small and can be seen settling in DAF chamber. 13:22, change back over to raw water with same setting to see if clears up. !6:42 CCA @ 4.85 l/hr = -0.12 (raw water) Daf ntu @ 0.786, filter ntu dropping as well. terminate ozonated, no p/h test.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/28/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	46*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.85 - 4.75			
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME	
TEMPERATURE	10.3				0
TURBIDITY	1.19	1.762*	0.192 / 0.564	*11:10	0
					1
		0.594	0.091 / 0.111	13:04***	2
					3
					4
					5
UVT					0
		93.1		12:01**	1
		93.1	93.0 / 92.8	13:04***	2
					3
					4
					5
pH					0
					1
					2
					3
					4
					5
COLOR	129	-	-		0
	-	0	-	12:01**	1
	-	0	1 / 0	13:04	2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?	n	
AIR SCOUR START		
AIR SCOUR STOP		
BACKWASH START		
BACKWASH STOP		
BACKWASH FLOW RATE		
FILTER TO WASTE START		
FILTER TO WASTE STOP		

NOTES AND OBSERVATIONS: **Back to raw water, no p/h. Initial CCA @ 4.85 l/hr = -0.39. Excellent dark floating sludge again. * 11:10 CCA @ 4.85 l/hr = -0.01. Having trouble with high ntu in DAF basin. Reset water level to overflow at a slow rate to cause a natural tendency to flush. Paced skimmer to match water flow, and on continuous. Fixed spray nozzle to break up foam at effluent. **12:01 CCA = +0.11, lower dose to 4.80 l/hr. *** 13:04 CCA @ 4.80 l/hr = +0.03, lower to 4.75 l/hr. 13:40 = +0.04, lower to 4.70 l/hr.**

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/29/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	46*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.70 - 6.0			
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME	
TEMPERATURE	10.3				0
TURBIDITY	1.01				0
		0.469		11:48*	1
					2
					3
					4
					5
UVT					0
		92.3		11:48*	1
		92.4	91.7 / 91.9	12:50**	2
					3
					4
					5
pH	6.22				0
					1
					2
					3
					4
					5
COLOR	-	-	-		0
	29	6	-	11:48*	1
	-	6	5 / 3	12:50**	2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?	n	
AIR SCOUR START		
AIR SCOUR STOP		
BACKWASH START		
BACKWASH STOP		
BACKWASH FLOW RATE		
FILTER TO WASTE START		
FILTER TO WASTE STOP		

Retry ozonated, water after process changes from previous day (p/h included). Initial CCA @11:45 and 4.70 l/hr = -0.17. * = 4.70 l/hr. 12:12 CCA -0.91 @ 4.85 l/hr. **12:50 @ 5.5 l/hr. 13:37 CCA @5.5 l/hr = -0.20, @ 14:00 = -0.71, run to 6.00 l/hr. !4:20 @ 6.00 l/hr, CCA = -0.33.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	9/30/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	48*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	6.00 - 5.75			
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME	
TEMPERATURE	10.0			06:30	0
TURBIDITY	0.91			06:30	0
		0.669	0.088 / 0.195	08:42*	1
		0.659	0.110 / 0.125	**	2
					3
					4
					5
UVT					0
					1
		92.8	93.5 / 93.6	**	2
					3
					4
					5
pH	6.27			06:30	0
					1
					2
					3
					4
					5
COLOR	27	-	-	06:30	0
	-	-	-		1
	-	0	0 / 0	**	2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?	n	
AIR SCOUR START		
AIR SCOUR STOP		
BACKWASH START		
BACKWASH STOP		
BACKWASH FLOW RATE		
FILTER TO WASTE START		
FILTER TO WASTE STOP		

Day 2 ozonated / p/h adjusted. Start at 6.0 l/hr, * CCA @ 08:42= +0.11, lower to 5.690 l/hr. 10:00 CCA @ 5.75 l/hr = +0.30. ** @ 5.75 l/hr , CCA = +0.17.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	10/4/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP	46*	DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.75 - 5.50	1.25 - 1.5 l/hr		
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED				
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)				
GALLONS OF WATER ADDED				

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME	
TEMPERATURE	9.7* C			10:00 (2)	0
TURBIDITY		0.622		07:35 (1)	0
	1.09	0.459		10:00 (2)	1
					2
		0.474	0.099 / 0.093	11:15 (4)	3
					4
		0.440	0.099 / 0.111	(6)	5
UVT					0
	43.7	91.6		10:00 (2)	1
					2
	43.3	92.4	91.4 / 90.1	11:15 (4)	3
		90.0		11:47 (5)	4
		57.2 (inline)		(6)	5
pH					0
	6.22	5.52		10:00 (2)	1
	6.38	5.58		11:10 (3)	2
					3
		6.38		11:47 (5)	4
					5
COLOR	-	-	-		0
	121	5	-	10:00 (2)	1
	-	-	-		2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0
					1
					2
	10			11:15 (4)	3
	20			11:47 (5)	4
					5

FILTER PERFORMANCE			
STATUS	READING	READING TIME	
DIFFERENTIAL PRESSURE			0
DID YOU BACKWASH TODAY?	y		
AIR SCOUR START	1:00		0
AIR SCOUR STOP	2:00		1
BACKWASH START	0:00		2
BACKWASH STOP	10:00		3
BACKWASH FLOW RATE	14 l/m after initial scour		4
FILTER TO WASTE START	at overflow		5
FILTER TO WASTE STOP	1' freeboard		0

Restart with raw water for formation potential testing. Backwash both filters, reset coag to 4.75 l/hr. added soda to bring p/h up to test for improved quality. Start @ 1.25 mg/l. (1) 07:35 Initial CCA @ 4.75 l/hr (no soda) = +0.02 (2) 10:00 CCA @ 4.75 l/hr = -0.18. Raise to 4.90 (also pre soda), excellent heavy, dark foam in DAF. 11:00 CCA @ 4.75 l/hr = -0.04. (3) Added @ 10:50, soda to bring p/h / alkalinity to see if quality can be bettered. Dosing @ 1.25 l/hr. (4) Dosing @ 1.50 l/hr. (5) 11:47 CCA = -1.71 (4.90 l/hr coag, 1.5 l/hr soda) raise coag to 5.50 l/hr. Losing ground, daf turning yellow, ntu climbing turn off soda. (6) After 1.5 hrs (soda off) CCA = -0.10. Raise to 4.95 l/hr.

WRANGELL WATER TREATMENT PLANT PILOT STUDY
DAILY OPERATING LOG

GENERAL	
RAW WATER PUMP INLET PRESSURE (PSI)	
RAW WATER PUMP DISCHARGE PRESSURE (PSI)	
RAW WATER FLOW RATE (GPM)	10 gpm / 40 l/m

DATE	10/6/2016	
DAY (UMTWRFS)		
OPERATOR	wm	
OUTSIDE TEMP		DEG F

CHEMICAL SYSTEMS				
PARAMETER	(COAGULANT)	(pH ADJUSTMENT)	(OTHER)	READING TIME
PUMP SPEED				
PUMP STROKE				
PUMPING RATE	4.95 - 4.85	n		
REMAINING SOLUTION IN TANK (GAL)				
SOLUTION STRENGTH (%)	2.0			
DATE MIXED	10/5			
CHEMICAL ADDED (LBS)				
CHEMICAL ADDED (GALLONS)	1 l			13:00
GALLONS OF WATER ADDED	70 l			13:00

WATER QUALITY					
STATUS	RAW	POST-DAF	FILTERED 2 / 3	READING TIME	
TEMPERATURE					0
TURBIDITY		0.578	0.162 / 0.177	10:00*	0
					1
		0.348		14:14*	2
		0.349	0.122 / 0.117	20:50*	3
					4
					5
UVT	36.5 (inline)	52.8 (inline)		10:00*	0
		92.2	92.3 / 92.5	13:00*	1
		92.5	92.9 / 92.7	14:14*	2
		94.3	94.3 / 94.4	20:50*	3
					4
					5
pH					0
					1
					2
					3
					4
					5
COLOR	-	-	-		0
	-	0	2 / 1	13:00*	1
	-	0	0 / 0	14:14*	2
	-	-	-		3
	-	-	-		4
	-	-	-		5
ALKALINITY					0
					1

FILTER PERFORMANCE		
STATUS	READING	READING TIME
DIFFERENTIAL PRESSURE		
DID YOU BACKWASH TODAY?	n	
AIR SCOUR START		
AIR SCOUR STOP		
BACKWASH START		
BACKWASH STOP		
BACKWASH FLOW RATE		
FILTER TO WASTE START		
FILTER TO WASTE STOP		

07:30 CCA @ 4.95 l/hr = +0.07, lower to 4.90. 10:00 CCA @ 4.90 l/hr = +0.05, lower dose to 4.85 l/hr. 13:36 CCA @ 4.85 l/hr = +0.03. 20:50 CCA @ 4.85 l/hr = +0.08.
*** all taken at coag dose of 4.85 l/hr. ** Samples for testing taken at this time and set aside in case troubles occurred overnight.**

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10/19/2016

CRW Engineering
Accounts Payable
3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
Attn: Trevor Trasky

Work Order #: A1608224
Date: 10/19/2016
Work ID: Pilot Study
Date Received: 8/10/2016

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
A1608224-01	Raw Water	A1608224-02	DAF Water
A1608224-03	Filtrate	A1608224-04	Filtrate
A1608224-05	Filtrate	A1608224-06	Filtrate

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Mary Curry

Mary Curry
Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

ARS Aleut Analytical, LLC
Work Order: A1608224

*AAA has discovered an error in the Langlier Index calculation spreadsheet, therefore we have reevaluated all LI values. The revised LI values are provided in the attached report.

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Standard Methods for the Examination of Water and Wastewater, 22nd Edition, 2012.

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, May 1994.

Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88/039, December 1988, Revised July 1991.

SAMPLE RECEIPT:
Two (2) samples were received on 8/10/2016 8:19:00 AM at a temperature of 4.3°C at AAA - Anchorage. The samples were received in good condition and in order per chain of custody.

**Please see the attached report for the Chlorine Demand, method 5710B.

DOC samples were preserved with phosphoric acid upon receipt to meet method holding conditions.

REVIEW FOR COMPLIANCE WITH AAA QA PLAN
A summary of our review is shown below.

All analytical results contained in this report have been reviewed under AAA's internal quality assurance and quality control program. Any deviations in quality control parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries, is kept on file in our office and is available upon request.

All method specifications were met for the following tests, unless otherwise noted:

Test Method: SM 2320B - Total Alkalinity - Aqueous

Test Method: SM5910B Ultraviolet Absorption Method - UV254-UVA - Aqueous

Test Method: SM4500-H-B Electrometric pH Method - pH - Aqueous
COMMENT:
pH is a field test requiring immediate analysis. This analysis was performed as soon as possible upon laboratory receipt.

Test Method: SM2120B - Color, Visual Comparison Method - True Color

Test Method: Hardness, Hardness by Calculation - Hardness by Calculation

Test Method: Calcium Carbonate Saturation - Langelier Index

Test Method: SM2540C - Total Dissolved Solids dried at 180°C - TDS
COMMENT:
The Laboratory Fortified Blank (LFB) was recovered outside of control limits due to elevated dissolved solids in the RO water. Results may be biased high.
All other QC met acceptable method criteria.

The following are subcontracted tests and have been represented to us as having met criteria:

Test Method: SM 5310C - 5310 DOC - Aqueous

Test Method: 200. 7 - Metals by ICP - 200.7 metals
COMMENT:
The matrix spike associated with this batch exceeded the control limits for Calcium. The Concentration of Calcium in the DMSO is significantly higher than the spike that was added. Recovery calculations are not required, however, if the concentration of the analyte added is less than 30% of the sample background concentration.

Test Method: SM 5310C - TOC-persulfate - Aqueous

Test Method: 552.2 Haloacetic Acids in Drinking Water - Haloacetic Acids

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Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Raw Water

Sampling Location: **Raw Water**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:05:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-01A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2120B/2120B (Aqueous) - True Color							*Test was conducted by: ARS Aleut Analytical,LLC*		
Color, true	90	Color Unit	H	1.0	***15***	2	8/10/2016	8/10/16 17:32	IS

Lab#: A1608224-01B

Sample Comment: Ca, Fe, Mn, Mg

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
200.7 (Aqueous) - 200.7 metals								*Test was conducted by: Eurofins Eaton Analytical*		
pH on receipt: < 2										
Calcium	3000	ug/L		2.5	1.5		1	9/2/2016	9/2/16 0:00	CBAILEY
Iron	1460	ug/L	H	2.0	1.0	***300***	1	9/2/2016	9/2/16 0:00	CBAILEY
Magnesium	397	ug/L		1.0	4.0		1	9/2/2016	9/2/16 0:00	CBAILEY
Manganese	137	ug/L	H	1.0	4.0	***50***	1	9/2/2016	9/2/16 0:00	CBAILEY

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Fax: 907-562-2273
Client Sample ID: Raw Water

Sampling Location: **Raw Water**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:05:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-01C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2320B/2320B (Aqueous) - Total Alkalinity									*Test was conducted by: ARS Aleut Analytical,LLC*
Alkalinity, Total	9.40	mg/L CaCO3		5.0		1	8/17/2016	8/17/16 9:38	SAR

Lab#: A1608224-01D

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2340B (Aqueous) - Hardness by Calculatio									*Test was conducted by: ARS Aleut Analytical,LLC*
pH on receipt: < 2									
Hardness, Total	9.1	mg/L CaCO3		1.0		1	9/15/2016	9/15/16 9:23	CC

Lab#: A1608224-01E

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310C/5310C (Aqueous) - 5310 DOC									*Test was conducted by: TestAmerica - Irvine*
pH on receipt: < 2									
Dissolved Organic Carbon	6.2	mg/L		0.10		1	8/17/2016	8/17/16 14:13	YZ

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Anchorage, AK 99503
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Fax: 907-562-2273
Client Sample ID: Raw Water

Sampling Location: **Raw Water**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:05:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-01F

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310C (Aqueous) - TOC-persulfate							*Test was conducted by: TestAmerica - Irvine*		
pH on receipt:	< 2								
Total Organic Carbon	6.8	mg/L		0.10		1	8/17/2016	8/17/16 10:38	YZ

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Fax: 907-562-2273
Client Sample ID: DAF Water

Sampling Location: **DAF Water**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:07:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-02A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2120B/2120B (Aqueous) - True Color							*Test was conducted by: ARS Aleut Analytical,LLC*		
Color, true	5.0	Color Unit		5.0	***15***	1	8/10/2016	8/10/16 17:32	IS

Lab#: A1608224-02B

Sample Comment: Ca, Fe, Mn, Mg

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
200.7 (Aqueous) - 200.7 metals								*Test was conducted by: Eurofins Eaton Analytical*		
pH on receipt: < 2										
Calcium	2910	ug/L		2.5	1.5		1	9/2/2016	9/2/16 0:00	CBAILEY
Iron	85.1	ug/L	J	2.0	1.0	***300***	1	9/2/2016	9/2/16 0:00	CBAILEY
Magnesium	392	ug/L		1.0	4.0		1	9/2/2016	9/2/16 0:00	CBAILEY
Manganese	120	ug/L	H	1.0	4.0	***50***	1	9/2/2016	9/2/16 0:00	CBAILEY

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Fax: 907-562-2273
Client Sample ID: DAF Water

Sampling Location: **DAF Water**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:07:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-02C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2320B/2320B (Aqueous) - Total Alkalinity									*Test was conducted by: ARS Aleut Analytical,LLC*
Alkalinity, Total	8.00	mg/L CaCO3		5.0		1	8/17/2016	8/17/16 9:38	SAR

Lab#: A1608224-02D

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2340B (Aqueous) - Hardness by Calculatio									*Test was conducted by: ARS Aleut Analytical,LLC*
pH on receipt: < 2									
Hardness, Total	8.9	mg/L CaCO3		1.0		1	9/15/2016	9/15/16 9:23	CC

Lab#: A1608224-02E

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310C/5310C (Aqueous) - 5310 DOC									*Test was conducted by: TestAmerica - Irvine*
pH on receipt: < 2									
Dissolved Organic Carbon	1.6	mg/L		0.10		1	8/17/2016	8/17/16 14:25	YZ

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907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: DAF Water

Sampling Location: **DAF Water**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:07:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-02F

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310C (Aqueous) - TOC-persulfate							*Test was conducted by: TestAmerica - Irvine*		
pH on receipt:	< 2								
Total Organic Carbon	2.0	mg/L		0.10		1	8/17/2016	8/17/16 10:50	YZ

Lab#: A1608224-02G

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5910B/5910B (Aqueous) - UV254-UVA							*Test was conducted by: ARS Aleut Analytical,LLC*		
UV 254 Ultraviolet Absorption	0.0340	cm-1		0.0100		1	8/10/2016	8/10/16 17:30	JR

ARS Aleut Analytical, LLC
4307 Arctic Boulevard
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Phone: 907-258-2155
Fax: 907-258-6634

CRW Engineering
Attn: Trevor Trasky
Accounts Payable
3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:00:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-03A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2120B/2120B (Aqueous) - True Color							*Test was conducted by: ARS Aleut Analytical,LLC*		
Color, true	5.0	Color Unit		5.0	***15***	1	8/10/2016	8/10/16 17:32	IS

Lab#: A1608224-03B

Sample Comment: Ca, Fe, Mn, Mg

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
200.7 (Aqueous) - 200.7 metals								*Test was conducted by: Eurofins Eaton Analytical*		
pH on receipt: < 2										
Calcium	2900	ug/L		2.5	1.5		1	9/2/2016	9/2/16 0:00	CBAILEY
Iron	<MDL	ug/L		2.0	1.0	***300***	1	9/2/2016	9/2/16 0:00	CBAILEY
Magnesium	388	ug/L		1.0	4.0		1	9/2/2016	9/2/16 0:00	CBAILEY
Manganese	124	ug/L	H	1.0	4.0	***50***	1	9/2/2016	9/2/16 0:00	CBAILEY

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Fax: 907-562-2273
Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:00:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
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M = Matrix Interference
J = Estimated Value
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TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-03C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2320B/2320B (Aqueous) - Total Alkalinity									*Test was conducted by: ARS Aleut Analytical,LLC*
Alkalinity, Total	7.20	mg/L CaCO3		5.0		1	8/17/2016	8/17/16 9:38	SAR

Lab#: A1608224-03D

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2340B (Aqueous) - Hardness by Calculatio									*Test was conducted by: ARS Aleut Analytical,LLC*
pH on receipt: < 2									
Hardness, Total	8.8	mg/L CaCO3		1.0		1	9/15/2016	9/15/16 9:23	CC

Lab#: A1608224-03E

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310C/5310C (Aqueous) - 5310 DOC									*Test was conducted by: TestAmerica - Irvine*
pH on receipt: < 2									
Dissolved Organic Carbon	1.7	mg/L		0.10		1	8/17/2016	8/17/16 14:37	YZ

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Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:00:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
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B = Present also in Method Blank
H = Exceeds Regulatory Limit
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J = Estimated Value
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TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-03F

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310C (Aqueous) - TOC-persulfate							*Test was conducted by: TestAmerica - Irvine*		
pH on receipt:	< 2								
Total Organic Carbon	1.6	mg/L		0.10		1	8/17/2016	8/17/16 11:02	YZ

Lab#: A1608224-03G

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5910B/5910B (Aqueous) - UV254-UVA							*Test was conducted by: ARS Aleut Analytical,LLC*		
UV 254 Ultraviolet Absorption	0.0310	cm-1		0.0100		1	8/10/2016	8/10/16 17:30	JR

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3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:00:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
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J = Estimated Value
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TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-04A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
552.2 (Aqueous) - Haloacetic Acids							*Test was conducted by: Eurofins Eaton Analytical*		
pH on receipt: < 2									
Dibromoacetic acid	<MRL	ug/L		1.0		1	9/2/2016	9/7/16 20:04	JLB
Dichloroacetic acid	27.0	ug/L		1.0		1	9/2/2016	9/7/16 20:04	JLB
Monobromoacetic acid	<MRL	ug/L		1.0		1	9/2/2016	9/7/16 20:04	JLB
Monochloroacetic acid	2.30	ug/L		2.0		1	9/2/2016	9/7/16 20:04	JLB
Total Haloacetic Acids	71.3	ug/L	H	1.0	***60***	1	9/2/2016	9/7/16 20:04	JLB
Trichloroacetic acid	42.0	ug/L		1.0		1	9/2/2016	9/7/16 20:04	JLB

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3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:00:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
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TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-05A

Sample Comment: Ca

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2320B/2320B (Aqueous) - Total Alkalinity							*Test was conducted by: ARS Aleut Analytical,LLC*		
Alkalinity, Total	7.60	mg/L CaCO3		5.0		1	8/17/2016	8/17/16 9:38	SAR
4500-H-B/4500-H-B (Aqueous) - pH							*Test was conducted by: ARS Aleut Analytical,LLC*		
pH	6.27	pH		0.0		1	8/10/2016	8/10/16 17:05	SAR
2540C/2540C (Aqueous) - TDS							*Test was conducted by: ARS Aleut Analytical,LLC*		
Total Dissolved Solids	<MRL	mg/L		3.4	***500***	1	8/16/2016	8/23/16 17:13	SAR
2340B (Aqueous) - Hardness by Calculatio							*Test was conducted by: ARS Aleut Analytical,LLC*		
Hardness, Total	8.8	mg/L CaCO3		1.0		1	9/15/2016	9/15/16 11:20	MC

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
200.7 (Aqueous) - 200.7 metals								*Test was conducted by: Eurofins Eaton Analytical*		

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907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:00:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
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TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-05A

Sample Comment: Ca

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
200.7 (Aqueous) - 200.7 metals							*Test was conducted by: Eurofins Eaton Analytical*			
Calcium	2900	ug/L		2.5	1.5		1	9/2/2016	9/2/16 0:00	CBAILEY
Magnesium	388	ug/L		1.0	4.0		1	9/2/2016	9/2/16 0:00	CBAILEY

Lab#: A1608224-05B

Sample Comment: Ca

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2330B (Aqueous) - Langelier Index							*Test was conducted by: ARS Aleut Analytical,LLC*			
Langelier Index/Corrosivity	-3.6	C Units		-1.0	-1.0		1	9/27/2016	9/27/16 12:22	MC

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3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/19/2016
Receipt Date: 8/10/2016
Sample Date: 8/9/2016
Sample Time: 7:00:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
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TCNG = Turbid Culture No Growth - rejected

Lab#: A1608224-06A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date		Analyst
2320B/2320B (Aqueous) - Total Alkalinity							*Test was conducted by: ARS Aleut Analytical,LLC*			
pH on receipt: < 2										
Alkalinity, Total	7.40	mg/L CaCO3		5.0		1	8/17/2016	8/17/16	9:38	SAR
2540C/2540C (Aqueous) - TDS							*Test was conducted by: ARS Aleut Analytical,LLC*			
pH on receipt: < 2										
Total Dissolved Solids	<MRL	mg/L		3.4	***500***	1	8/16/2016	8/23/16	17:13	SAR

LABORATORY REPORT

If you have any questions concerning this report, please do not hesitate to call us at (800) 332-4345 or (574) 233-4777.

S I I I IS

State	e tification	State	e tification
Alabama	40700	Montana	CERT0026
Alaska	IN00035	Nebraska	E87775
Arizona	AZ0432	Nevada	IN00035
Arkansas	IN00035	New Hampshire*	2124
California	2920	New Mexico	IN00035
Colorado	IN035	New Jersey*	IN598
Colorado Radiochemistry	IN035	New York*	11398
Connecticut	PH-0132	North Carolina	18700
Delaware	IN035	North Dakota	R-035
Florida*	E87775	Ohio	87775
Georgia	929	Oklahoma	D9508
Hawaii	IN035	Oregon (Primary AB)*	4074-001
Idaho	IN00035/E87775	Pennsylvania*	68-00466
Illinois*	200001	Puerto Rico	IN00035
Illinois Microbiology	200001	Rhode Island	LAO00343
Indiana Chemistry	C-71-01	South Carolina	95005
Indiana Microbiology	M-76-07	South Dakota	IN00035
Iowa	098	Tennessee	TN02973
Kansas*	E-10233	Texas*	T104704187-15-8
Kentucky	90056	Texas/TCEQ	TX207
Louisiana*	LA160002	Utah*	IN00035
Maine	IN00035	Vermont	VT-8775
Maryland	209	Virginia*	460275
Massachusetts	M-IN035	Washington	C837
Michigan	9926	West Virginia	9927 C
Minnesota*	018-999-338	Wisconsin	999766900
Mississippi	IN035	Wyoming	IN035
Missouri	880		

*NELAP/TNI Recognized Accreditation Bodies

eurofins | Eaton Analytical

110 South Hill Street
South Bend, IN 46617
Tel: (574) 233-4777
Fax: (574) 233-8207
1 800 332 4345

Laboratory Report

Client: Analytica Group

Attn: Carissa Cumine
4307 Arctic Boulevard
Anchorage, AK 99503

Report: 369953
Priority: Standard Written
Status: Final
PWS ID: Not Supplied
Alaska Lab ID # IN00035

Sample Information

EEA ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
3518944	A1608162-04A	5710 B	08/09/16 07:00	Client	08/11/16 08:45
3518945	A1608162-04A	552.2	08/23/16 15:31	EEA	08/11/16 08:45
3518946	A1608162-04A	524.2	08/23/16 15:31	EEA	08/11/16 08:45

Report Summary

Note: Sample containers were provided by the client.

Note: The sample submitted for Method 525.2 analysis was received with the presence of residual chlorine. The sample was preserved by laboratory personnel prior to analysis.

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call Traci Chlebowski at (574) 233-4777.

Note: This report may not be reproduced, except in full, without written approval from EEA.

Traci Chlebowski ASM — 09/13/2016

Authorized Signature | Title | Date

Client Name: Analytica Group
Report #: 369953

Client Name: Analytica Group Report #: 369953

Sampling Point: A1608162-04A PWS ID: Not Supplied

Formation Potential Incubation

pH (pH units)		Method	Chlorine Demand	Chlorine Demand Time	Chlorine Dose	Residual Chlorine		Incubation Period	Temperature	Incubation Start Date	EEA ID #
(Initial)	(Adjusted)					(Total)	(Free)				
6.3	7.0	5710 B	2.1 mg/L	24 hours	7.1 mg/L	3.6 mg/L	3.6 mg/L	7.0 days	25 °C	08/16/16 15:31	3518944

*NR = The chlorine demand was not performed for this analytical sample, at the request of the client.

Disinfection Byproducts

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	EEA ID #
75-27-4	Bromodichloromethane	524.2	---	0.5	**3.5**	ug/L	---	08/27/16 03:13	3518946
75-25-2	Bromoform	524.2	---	0.5	< 0.5	ug/L	---	08/27/16 03:13	3518946
67-66-3	Chloroform	524.2	---	0.5	**90**	ug/L	---	08/27/16 03:13	3518946
124-48-1	Dibromochloromethane	524.2	---	0.5	< 0.5	ug/L	---	08/27/16 03:13	3518946
---	Total Trihalomethanes	524.2	80 *	0.5	**93.5**	ug/L	---	08/27/16 03:13	3518946
631-64-1	Dibromoacetic acid	552.2	---	1.0	< 1.0	ug/L	09/02/16 07:16	09/07/16 20:04	3518945
79-43-6	Dichloroacetic acid	552.2	---	1.0	**27**	ug/L	09/02/16 07:16	09/07/16 20:04	3518945
79-08-3	Monobromoacetic acid	552.2	---	1.0	< 1.0	ug/L	09/02/16 07:16	09/07/16 20:04	3518945
79-11-8	Monochloroacetic acid	552.2	---	2.0	**2.3**	ug/L	09/02/16 07:16	09/07/16 20:04	3518945
76-03-9	Trichloroacetic acid	552.2	---	1.0	**42**	ug/L	09/02/16 07:16	09/07/16 20:04	3518945
---	Total HAA5	552.2	60 *	1.0	**71.3**	ug/L	09/02/16 07:16	09/07/16 20:04	3518945

† EEA has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Lab Definitions

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis. CCL, CCM, and CCH are the CCC standards at low, mid, and high concentration levels, respectively.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control. FBL, FBM, and FBH are the LFB samples at low, mid, and high concentration levels, respectively.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample al6iquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix. SDL, SDM, and SDH / LFSMDL, LFSMDM, and LFSMDH are the MSD or LFSMD at low, mid, and high concentration levels, respectively.

Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results. MSL, MSM, and MSH / LFSML, LFSMM, and LFSMH are the MS or LFSM at low, mid, and high concentration levels, respectively.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

ANALYTICA CHAIN OF CUSTODY FOR EXTERNAL LAB ANALYSIS COC Number: 181562-4

ARS Aleut Analytical, LLC
4307 Arctic Boulevard
Anchorage, AK 99503
Report to: Mary Curry
phone: 907-258-2155

303306

PO Number: 5442

Requested Turnaround: 8/15/16

369953

Testing Laboratory:

Eurofins Eaton Analytical
750 Royal Oaks Drive #100
Monrovia, CA 91016
phone: 626-386-1100 x1104

Client Identifier:

Analytica ID	Test Method	Method Description	(IL)	Sample Date	Matrix	Comments
A1608162-04A	2350B	2350B (Aqueous) - Chlorine Demand-Sub	3518944	8/9/2016 7:00	Aqueous	
			THM 3518946			
			HAA 3518945			

Analytica Relinquished by:	Date/Time:	Received by:	Date/Time:
	8/10/16 1250		
Relinquished by:	**Date/Time:**	**Received by:**	**Date/Time:**
		KD [illegible]	8-11-16 0845

Attn: Jim

Client Provided Sample Container

Blue 3.2°C

Eurofins Eaton Analytical
SHIP-Method Conditions for Formation Potential (SM 5710 B)

Client Name: City of Wrangell Date: 8/10/16

Sample Site: filtrate Project Name: Pilot Plant

Analyses Required:

- ☑ THAA (Total Haloacetic Acids)
- ☑ TTHM (Total Trihalomethanes)
- ☐ Chloramines

Volume Provided: (1 Liter Minimum for THM & HAAs) ✓
(2 Liter Minimum for THM, HAA and Chloramines) _____

	Routine Conditions	Client Specific Conditions
pH	7 +/- 0.2	_____
Temperature	25° C +/- 2° C	4.3
Incubation Time	7 days	_____
Target Residual Chlorine	3 –5 mg/L	_____
Initial Chlorine Dose	TBD*	_____
Chlorine Demand (if known)		_____ mg/L

*To Be Determined

Use all standard conditions including temp @ 25C per Mary Curry @ Analytica. TC 8/16/16

Additional Comments or Dosing Instructions:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Eurofins Eaton Analytical

Run Log

Run ID: **219851** Method: **524.2**

Type	Sample Id	Sample Site	Matrix	Instrument ID	Analysis Date	Calibration File
CCC	3532395		RW	PW2	08/26/2016 10:53	524 2-082316-PW2.mth
CCL	3532396		RW	PW2	08/26/2016 11:35	524 2-082316-PW2.mth
LMB	3532974		RW	PW2	08/26/2016 13:18	524 2-082316-PW2.mth
CCC	3533280		RW	PW2	08/26/2016 20:36	524 2-082316-PW2.mth
LMB	3533283		RW	PW2	08/26/2016 22:16	524 2-082316-PW2.mth
FS	3518946	A1608162-04A	FP	PW2	08/27/2016 03:13	524 2-082316-PW2.mth
CCC	3533284		RW	PW2	08/27/2016 04:19	524 2-082316-PW2.mth

QC Summary Report

Sample Type	Analyte	Method	MRL	Client ID	Result Flag	Amount	Target	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Dil Factor	Extracted	Analyzed	EEA ID #
CCC	IS-1,4-Difluorobenzene	524.2	N/A	---		484875	484875	ug/L	100	50 - 150	---	---	1.0	---	08/26/2016 10:53	3532395
CCC	SS-Bromofluorobenzene	524.2	N/A	---		4.7360	5.0	ug/L	95	70 - 130	---	---	1.0	---	08/26/2016 10:53	3532395
CCC	SS-1,2-Dichlorobenzene-d4	524.2	N/A	---		8.9800	10.0	ug/L	90	70 - 130	---	---	1.0	---	08/26/2016 10:53	3532395
CCC	SS-1,2-Dichloroethane-d4	524.2	N/A	---		9.0550	10.0	ug/L	91	70 - 130	---	---	1.0	---	08/26/2016 10:53	3532395
CCC	SS-Toluene-d8	524.2	N/A	---		9.8160	10.0	ug/L	98	70 - 130	---	---	1.0	---	08/26/2016 10:53	3532395
CCC	Bromodichloromethane	524.2	0.5	---		4.4990	5.0	ug/L	90	70 - 130	---	---	1.0	---	08/26/2016 10:53	3532395
CCC	Bromoform	524.2	0.5	---		4.1930	5.0	ug/L	84	70 - 130	---	---	1.0	---	08/26/2016 10:53	3532395
CCC	Chloroform	524.2	0.5	---		4.5930	5.0	ug/L	92	70 - 130	---	---	1.0	---	08/26/2016 10:53	3532395
CCC	Dibromochloromethane	524.2	0.5	---		4.2040	5.0	ug/L	84	70 - 130	---	---	1.0	---	08/26/2016 10:53	3532395
CCL	IS-1,4-Difluorobenzene	524.2	N/A	---		474567	474567	ug/L	100	50 - 150	---	---	1.0	---	08/26/2016 11:35	3532396
CCL	SS-Bromofluorobenzene	524.2	N/A	---		4.5750	5.0	ug/L	92	70 - 130	---	---	1.0	---	08/26/2016 11:35	3532396
CCL	SS-1,2-Dichlorobenzene-d4	524.2	N/A	---		8.9550	10.0	ug/L	90	70 - 130	---	---	1.0	---	08/26/2016 11:35	3532396
CCL	SS-1,2-Dichloroethane-d4	524.2	N/A	---		9.3720	10.0	ug/L	94	70 - 130	---	---	1.0	---	08/26/2016 11:35	3532396
CCL	SS-Toluene-d8	524.2	N/A	---		9.7890	10.0	ug/L	98	70 - 130	---	---	1.0	---	08/26/2016 11:35	3532396
CCL	Bromodichloromethane	524.2	0.5	---		0.4480	0.5	ug/L	90	50 - 150	---	---	1.0	---	08/26/2016 11:35	3532396
CCL	Bromoform	524.2	0.5	---		0.4370	0.5	ug/L	87	50 - 150	---	---	1.0	---	08/26/2016 11:35	3532396
CCL	Chloroform	524.2	0.5	---		0.4760	0.5	ug/L	95	50 - 150	---	---	1.0	---	08/26/2016 11:35	3532396
CCL	Dibromochloromethane	524.2	0.5	---		0.4770	0.5	ug/L	95	50 - 150	---	---	1.0	---	08/26/2016 11:35	3532396
LMB	IS-1,4-Difluorobenzene	524.2	N/A	---		474749	474567	ug/L	100	70 - 130	---	---	1.0	---	08/26/2016 13:18	3532974
LMB	SS-Bromofluorobenzene	524.2	N/A	---		4.6060	5.0	ug/L	92	70 - 130	---	---	1.0	---	08/26/2016 13:18	3532974
LMB	SS-1,2-Dichlorobenzene-d4	524.2	N/A	---		8.2420	10.0	ug/L	82	70 - 130	---	---	1.0	---	08/26/2016 13:18	3532974
LMB	SS-1,2-Dichloroethane-d4	524.2	N/A	---		9.1810	10.0	ug/L	92	70 - 130	---	---	1.0	---	08/26/2016 13:18	3532974
LMB	SS-Toluene-d8	524.2	N/A	---		9.7980	10.0	ug/L	98	70 - 130	---	---	1.0	---	08/26/2016 13:18	3532974
LMB	Bromodichloromethane	524.2	0.5	---	<	0.5		ug/L	---	---	---	---	1.0	---	08/26/2016 13:18	3532974
LMB	Bromoform	524.2	0.5	---	<	0.5		ug/L	---	---	---	---	1.0	---	08/26/2016 13:18	3532974
LMB	Chloroform	524.2	0.5	---	<	0.5		ug/L	---	---	---	---	1.0	---	08/26/2016 13:18	3532974
LMB	Dibromochloromethane	524.2	0.5	---	<	0.5		ug/L	---	---	---	---	1.0	---	08/26/2016 13:18	3532974
CCC	IS-1,4-Difluorobenzene	524.2	N/A	---		459230	459230	ug/L	100	50 - 150	---	---	1.0	---	08/26/2016 20:36	3533280
CCC	SS-Bromofluorobenzene	524.2	N/A	---		4.9910	5.0	ug/L	100	70 - 130	---	---	1.0	---	08/26/2016 20:36	3533280
CCC	SS-1,2-Dichlorobenzene-d4	524.2	N/A	---		9.8280	10.0	ug/L	98	70 - 130	---	---	1.0	---	08/26/2016 20:36	3533280
CCC	SS-1,2-Dichloroethane-d4	524.2	N/A	---		9.4940	10.0	ug/L	95	70 - 130	---	---	1.0	---	08/26/2016 20:36	3533280
CCC	SS-Toluene-d8	524.2	N/A	---		10.0600	10.0	ug/L	101	70 - 130	---	---	1.0	---	08/26/2016 20:36	3533280
CCC	Bromodichloromethane	524.2	0.5	---		9.5790	10.0	ug/L	96	70 - 130	---	---	1.0	---	08/26/2016 20:36	3533280
CCC	Bromoform	524.2	0.5	---		9.4070	10.0	ug/L	94	70 - 130	---	---	1.0	---	08/26/2016 20:36	3533280
CCC	Chloroform	524.2	0.5	---		9.5900	10.0	ug/L	96	70 - 130	---	---	1.0	---	08/26/2016 20:36	3533280
CCC	Dibromochloromethane	524.2	0.5	---		9.1770	10.0	ug/L	92	70 - 130	---	---	1.0	---	08/26/2016 20:36	3533280
LMB	IS-1,4-Difluorobenzene	524.2	N/A	---		446300	459230	ug/L	97	70 - 130	---	---	1.0	---	08/26/2016 22:16	3533283
LMB	SS-Bromofluorobenzene	524.2	N/A	---		4.7180	5.0	ug/L	94	70 - 130	---	---	1.0	---	08/26/2016 22:16	3533283
LMB	SS-1,2-Dichlorobenzene-d4	524.2	N/A	---		9.0930	10.0	ug/L	91	70 - 130	---	---	1.0	---	08/26/2016 22:16	3533283
LMB	SS-1,2-Dichloroethane-d4	524.2	N/A	---		9.6840	10.0	ug/L	97	70 - 130	---	---	1.0	---	08/26/2016 22:16	3533283

QC Summary Report (cont.)

Sample Type	Analyte	Method	MRL	Client ID	Result Flag	Amount	Target	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Dil Factor	Extracted	Analyzed	EEA ID #
MB	SS-Toluene-d8	524.2	N/A	---		9.9070	10.0	ug/L	99	70 - 130	---	---	1.0	---	08/26/2016 22:16	3533283
MB	Bromodichloromethane	524.2	0.5	---	<	0.5		ug/L	---	---	---	---	1.0	---	08/26/2016 22:16	3533283
MB	Bromoform	524.2	0.5	---	<	0.5		ug/L	---	---	---	---	1.0	---	08/26/2016 22:16	3533283
MB	Chloroform	524.2	0.5	---	<	0.5		ug/L	---	---	---	---	1.0	---	08/26/2016 22:16	3533283
MB	Dibromochloromethane	524.2	0.5	---	<	0.5		ug/L	---	---	---	---	1.0	---	08/26/2016 22:16	3533283
FS	IS-1,4-Difluorobenzene	524.2	N/A	A1608162-04A		452667	459230	ug/L	99	70 - 130	---	---	1.0	---	08/27/2016 03:13	3518946
FS	SS-Bromofluorobenzene	524.2	N/A	A1608162-04A		4.7450	5.0	ug/L	95	70 - 130	---	---	1.0	---	08/27/2016 03:13	3518946
FS	SS-1,2-Dichlorobenzene-d4	524.2	N/A	A1608162-04A		8.8630	10.0	ug/L	89	70 - 130	---	---	1.0	---	08/27/2016 03:13	3518946
FS	SS-1,2-Dichloroethane-d4	524.2	N/A	A1608162-04A		9.5860	10.0	ug/L	96	70 - 130	---	---	1.0	---	08/27/2016 03:13	3518946
FS	SS-Toluene-d8	524.2	N/A	A1608162-04A		9.7370	10.0	ug/L	97	70 - 130	---	---	1.0	---	08/27/2016 03:13	3518946
FS	Bromodichloromethane	524.2	0.5	A1608162-04A		3.5		ug/L	---	---	---	---	1.0	---	08/27/2016 03:13	3518946
FS	Bromoform	524.2	0.5	A1608162-04A	<	0.5		ug/L	---	---	---	---	1.0	---	08/27/2016 03:13	3518946
FS	Chloroform	524.2	0.5	A1608162-04A		90		ug/L	---	---	---	---	1.0	---	08/27/2016 03:13	3518946
FS	Dibromochloromethane	524.2	0.5	A1608162-04A	<	0.5		ug/L	---	---	---	---	1.0	---	08/27/2016 03:13	3518946
FS	Total Trihalomethanes	524.2	0.5	A1608162-04A		93.5		ug/L	---	---	---	---	1.0	---	08/27/2016 03:13	3518946
CCC	IS-1,4-Difluorobenzene	524.2	N/A	---		429752	429752	ug/L	100	50 - 150	---	---	1.0	---	08/27/2016 04:19	3533284
CCC	SS-Bromofluorobenzene	524.2	N/A	---		4.9740	5.0	ug/L	99	70 - 130	---	---	1.0	---	08/27/2016 04:19	3533284
CCC	SS-1,2-Dichlorobenzene-d4	524.2	N/A	---		10.5800	10.0	ug/L	106	70 - 130	---	---	1.0	---	08/27/2016 04:19	3533284
CCC	SS-1,2-Dichloroethane-d4	524.2	N/A	---		9.7570	10.0	ug/L	98	70 - 130	---	---	1.0	---	08/27/2016 04:19	3533284
CCC	SS-Toluene-d8	524.2	N/A	---		9.9370	10.0	ug/L	99	70 - 130	---	---	1.0	---	08/27/2016 04:19	3533284
CCC	Bromodichloromethane	524.2	0.5	---		17.3340	18.0	ug/L	96	70 - 130	---	---	1.0	---	08/27/2016 04:19	3533284
CCC	Bromoform	524.2	0.5	---		17.5530	18.0	ug/L	98	70 - 130	---	---	1.0	---	08/27/2016 04:19	3533284
CCC	Chloroform	524.2	0.5	---		17.4540	18.0	ug/L	97	70 - 130	---	---	1.0	---	08/27/2016 04:19	3533284
CCC	Dibromochloromethane	524.2	0.5	---		17.1450	18.0	ug/L	95	70 - 130	---	---	1.0	---	08/27/2016 04:19	3533284

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Run Log

Run ID: **220144** Method: **552.2**

Type	Sample Id	Sample Site	Matrix	Instrument ID	Analysis Date	Calibration File
CCL	3538259		RW	BF	09/07/2016 04:21	552_2-090116BF
LMB	3538249		RW	BF	09/07/2016 04:57	552_2-090116BF
CCC	3538254		RW	BF	09/07/2016 13:24	552_2-090116BF
FS	3518945	A1608162-04A	FP	BF	09/07/2016 20:04	552_2-090116BF
CCC	3538255		RW	BF	09/07/2016 20:40	552_2-090116BF

QC Summary Report

Sample Type	Analyte	Method	MRL	Client ID	Result Flag	Amount	Target	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Dil Factor	Extracted	Analyzed	EEA ID #
LCL	SS-2-Bromopropionic acid	552.2	N/A	---		4.4879	5.0	ug/L	90	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 04:21	3538259
LCL	Dibromoacetic acid	552.2	1.0	---		1.3032	1.0	ug/L	130	50 - 150	---	---	1.0	09/02/2016 07:16	09/07/2016 04:21	3538259
LCL	Dichloroacetic acid	552.2	1.0	---		1.3099	1.0	ug/L	131	50 - 150	---	---	1.0	09/02/2016 07:16	09/07/2016 04:21	3538259
LCL	Monobromoacetic acid	552.2	1.0	---		1.2371	1.0	ug/L	124	50 - 150	---	---	1.0	09/02/2016 07:16	09/07/2016 04:21	3538259
LCL	Monochloroacetic acid	552.2	2.0	---		1.8560	2.0	ug/L	93	50 - 150	---	---	1.0	09/02/2016 07:16	09/07/2016 04:21	3538259
LCL	Trichloroacetic acid	552.2	1.0	---		1.5027	1.0	ug/L	150	50 - 150	---	---	1.0	09/02/2016 07:16	09/07/2016 04:21	3538259
LCL	IS-1,2,3-Trichloropropane	552.2	N/A	---		68375	60316	ug/L	113	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 04:21	3538259
LMB	SS-2-Bromopropionic acid	552.2	N/A	---		4.3273	5.0	ug/L	87	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 04:57	3538249
LMB	Dibromoacetic acid	552.2	1.0	---	<	1.0		ug/L	---	---	---	---	1.0	09/02/2016 07:16	09/07/2016 04:57	3538249
LMB	Dichloroacetic acid	552.2	1.0	---	<	1.0		ug/L	---	---	---	---	1.0	09/02/2016 07:16	09/07/2016 04:57	3538249
LMB	Monobromoacetic acid	552.2	1.0	---	<	1.0		ug/L	---	---	---	---	1.0	09/02/2016 07:16	09/07/2016 04:57	3538249
LMB	Monochloroacetic acid	552.2	2.0	---	<	2.0		ug/L	---	---	---	---	1.0	09/02/2016 07:16	09/07/2016 04:57	3538249
LMB	Trichloroacetic acid	552.2	1.0	---	<	1.0		ug/L	---	---	---	---	1.0	09/02/2016 07:16	09/07/2016 04:57	3538249
LMB	IS-1,2,3-Trichloropropane	552.2	N/A	---		68229	60316	ug/L	113	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 04:57	3538249
CCC	SS-2-Bromopropionic acid	552.2	N/A	---		4.3462	5.0	ug/L	87	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 13:24	3538254
CCC	Dibromoacetic acid	552.2	1.0	---		16.4267	20.0	ug/L	82	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 13:24	3538254
CCC	Dichloroacetic acid	552.2	1.0	---		14.3733	20.0	ug/L	72	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 13:24	3538254
CCC	Monobromoacetic acid	552.2	1.0	---		15.5836	20.0	ug/L	78	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 13:24	3538254
CCC	Monochloroacetic acid	552.2	2.0	---		31.0947	40.0	ug/L	78	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 13:24	3538254
CCC	Trichloroacetic acid	552.2	1.0	---		14.4160	20.0	ug/L	72	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 13:24	3538254
CCC	IS-1,2,3-Trichloropropane	552.2	N/A	---		70811	60316	ug/L	117	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 13:24	3538254
FS	SS-2-Bromopropionic acid	552.2	N/A	A1608162-04A		4.6983	5.0	ug/L	94	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 20:04	3518945
FS	Dibromoacetic acid	552.2	1.0	A1608162-04A	<	1.0		ug/L	---	---	---	---	1.0	09/02/2016 07:16	09/07/2016 20:04	3518945
FS	Dichloroacetic acid	552.2	1.0	A1608162-04A		27		ug/L	---	---	---	---	1.0	09/02/2016 07:16	09/07/2016 20:04	3518945
FS	Monobromoacetic acid	552.2	1.0	A1608162-04A	<	1.0		ug/L	---	---	---	---	1.0	09/02/2016 07:16	09/07/2016 20:04	3518945
FS	Monochloroacetic acid	552.2	2.0	A1608162-04A		2.3		ug/L	---	---	---	---	1.0	09/02/2016 07:16	09/07/2016 20:04	3518945
FS	Trichloroacetic acid	552.2	1.0	A1608162-04A		42		ug/L	---	---	---	---	1.0	09/02/2016 07:16	09/07/2016 20:04	3518945
FS	IS-1,2,3-Trichloropropane	552.2	N/A	A1608162-04A		68975	60316	ug/L	114	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 20:04	3518945
FS	Total HAA5	552.2	1.0	A1608162-04A		71.3		ug/L	---	---	---	---	1.0	09/02/2016 07:16	09/07/2016 20:04	3518945
CCC	SS-2-Bromopropionic acid	552.2	N/A	---		4.3473	5.0	ug/L	87	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 20:40	3538255
CCC	Dibromoacetic acid	552.2	1.0	---		16.4338	20.0	ug/L	82	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 20:40	3538255
CCC	Dichloroacetic acid	552.2	1.0	---		14.3049	20.0	ug/L	72	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 20:40	3538255
CCC	Monobromoacetic acid	552.2	1.0	---		15.5509	20.0	ug/L	78	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 20:40	3538255
CCC	Monochloroacetic acid	552.2	2.0	---		31.5576	40.0	ug/L	79	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 20:40	3538255
CCC	Trichloroacetic acid	552.2	1.0	---		14.2245	20.0	ug/L	71	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 20:40	3538255
CCC	IS-1,2,3-Trichloropropane	552.2	N/A	---		69463	60316	ug/L	115	70 - 130	---	---	1.0	09/02/2016 07:16	09/07/2016 20:40	3538255

Sample Type Key

Type (Abbr.)	Sample Type	Type (Abbr.)	Sample Type
CCC	Continuing Calibration Check		
CCL	Continuing Calibration Low		
FS	Field Sample		
LMB	Laboratory Method Blank		

END OF REPORT

ARS Aleut Analytical
formerly Analytica Group

AAA Chain of Custody

Custody form MUST be signed
Please provide as much information as possible

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Wasilla, AK 99654
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475 Hall Street
Fairbanks, AK 99701
907.456.3116
907.456.3125 fax

ARS Corporate
2609 North Rive
Port Allen, LA
225.381.29
225.381.2996

Client/Company Name & Address:
City of Wrangell
PO Box 531
Wrangell, AK 99929

Contact Person: Wayne McMahand
Phone No: 907 660 7093
Fax No:
E-mail: wrg.wtp@aptalaska.net

Public Water System (PWS) ID: 120143
Project Name: Pilot Plant

Turnaround Time (TAT) for Results
☑ Standard ☐ **Expedited** (prior authorization required for < 10 days) *please specify due date below; additional charges may apply*

Requested Date for Results:

Results to STATE: ☐ Yes ☑ No ☐ Routine ☐ Non-Routine

Sampling Event ID:

Section To Be Completed by AAA

Quote Number:
Account #:
LGN: A160816 7 A16081
Check
Credit

Invoice Contact Name & Address & Phone:

Special Instructions/Requirements:
These are not Regulatory Samples. They are Special Purpose
pH adjusted in Lab so pH<2 is

PO/Contract No.:

Kit Preparation/Shipping Charge:

Requested Analysis/Method

#	Client Sample Identification (Name, Designation, Location, etc.)	Date Sampled	Time Sampled	Matrix (Aqueous, DW-Drinking Water, WW-Waste Water, Soil/Solid, Other)	No. of Containers	True Color Preservative Lot#	Iron/Manganese Preservative Lot#	Hardness Preservative Lot#	Alk/Inf Preservative Lot#	Preservative Lot#	Preservative Lot#	Preservative Lot#	Field Preserved	Field Filtered	Use for MS/MSD	Comments
1	Raw water	8-9	07:05	O	1	X										
2	~~Raw~~ water DAF water	8-9	07:07	O	1	X										
3	Filtrate	8-9	07:00	O	1	X										
4	Raw water	8-9	07:05	O	1		X									
5	DAF water	8-9	07:07	O	1		X									
6	Filtrate	8-9	07:00	O	1		X									
7	Raw water	8-9	07:05	O	1			X								
8	DAF water	8-9	07:07	O	1			X								
9	Filtrate	8-9	07:00	O	1			X								
10	Raw Water	8-9	07:05	O	1				X							

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	08/09/16	09:41	[signature]	08/09	9:44
Relinquished by:	Date	Time	Received by:	Date	Time
			[signature]	08/10	0814
Relinquished by:	Date	Time	Received by:	Date	Time

Name of Sampler: (printed) CRW Engineering Group, LLC

Section To Be Completed by AAA

Condition of Custody Seal: Intact Broken Absent
Receiving location: ANC
Temperature on arrival: 4.3 °C
Thermometer ID # 61109 °C
Shipping method/Tracking number: Alert
Measurement method: Temp Blank Other

Version 4.0 April 2016 Dec 2016

*Doc Swere preserved with H2SO4 @ The labupon receipt
Run TDS + DOCS As PW Samples 8/10/16 MSF

Analytica Chain of Custody Form

ANALYTICA GROUP

12189 Pennsylvania St. Thornton, CO 80241 (303) 469-8868 (303) 469-5254 fax
4307 Arctic Boulevard Anchorage, AK 99503 (907) 258-2155 (907) 258-8634 fax
475 Hall St. Fairbanks, AK 99701 (907) 456 - 3116 (907) 456-3125 Fax
5438 Shaune Drive Juneau, AK 99801 (907) 780-6668 (907) 780-6670 fax

Chain of Custody No: 60868

Client Name & Address:
City of Wrangell
Box 531
Wrangell, AK 99929

Public Water System (PWS) ID#: 1025629

Project Name: Wrangell Pilot Plant

Section To be Completed by Analytica
Quote ID:
LGN: A1608224 ~~A1608162~~ SAF 8/15/16
Account #:
Cash
Credit Card

Report to: Amy Mc McHALAND
Phone No: 907 660 7083
Fax No: 907 874 4207
E-mail: wrgwtf@aptalaska.net

Turnaround Time for Results (TAT)
✓ Standard ___ Expedited (< 10 days, prior authorization required)
(please specify due date below; add'l charges may apply)
Requested Due Date for Results:

Invoice to Name & Address:

Special Instructions/Comments:
These are not Regulatory Samples, pH adjusted so pH < 2
Rather They are special purpose

P.O. or Contract No:

Requested Analysis/Method

Kit Prep/Shipping Charge: $

Client Sample Identification / Location	Date Sampled	Time Sampled	Matrix (S-DW-WW-Other)	No. of Containers	Al/Ke/Antty Lot # / Pres.	Hardness Lot # / Pres.	DOC Lot # / Pres.	TOC Lot # / Pres.	Lot # / Pres.	Lot # / Pres.	Lot # / Pres.	Field Preserved	Field Filtered	MS/MSD ?
DAF Water	8-9	07:07	0	1	X		EXPEDITE							
Filtrate	8-9	07:00	0	1	X									
Raw water	8-9	07:05	0	1		X		EXPEDITE						
Daf Water	8-9	07:07	0	1		X								
Filtrate	8-9	07:00	0	1		X								
Raw water	8-9	07:05	0	1			X							
Daf Water	8-9	07:07	0	1			X							
Filtrate	8-9	07:00	0	1			X							
Raw water	8-9	07:05	0	1				X						
~~Filtrate~~ Daf water	8-9	07:07	0	1				X						

Relinquished by:	Date	Time	Received by:	Date	Time
				8/10	0819
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Name of Sampler: (printed)

Section To Be Completed by Analytica

Condition of	THO	ANC	JNU	FBKS
Custody Seal?:		Yes		
Initialed By:		IS		
Temp/Loc:		4.3		
Thermo ID#:		61109		
Shipped Via:		Courier		

Version 2.0

ARS Aleut Analytical
formerly Analytica Group

3/

AAA Chain of Custody

Custody form MUST be signed
Please provide as much information as possible

Client/Company Name & Address: City of Wrangell, Box 531, Wrangell, AK 99929
Contact Person: Wayne McHolland
Phone No: 907 660 7093
Fax No: 907 874 4207
E-mail: wrg wtf@aptalaska.net

Public Water System (PWS) ID:
Project Name: Wrangell Pilot Plant

Turnaround Time (TAT) for Results: ✓ Std / ☐ Expedited
Requested Date for Results:
Results to STATE: ☐ Yes ✓ No — ☐ Routine ☐ Non-Routine

Sampling Event ID:
Section To Be Completed: A1608224 ~~A1608816~~

Special Instructions/Requirements: These are special purpose samples

Preparation/Shipping Charge:

Client Sample Identification (Name, Designation, Location, etc.)	Date Sampled	Time Sampled	Matrix	No. of Containers	TOC pH<2	UVA	DBP, Cl2 Demand ~~Langelier Index~~	Langelier index	ALK/TDS
Filtrate	8-9	07:00	0	1	X				
~~UVA~~ Daf water	8-9	07:07	0	1		X			
Filtrate	8-9	07:00	0	1		X			
~~DBP~~ Filtrate	8-9	07:00	0	1			X		
Filtrate	8-9	07:00		1				X	
Filtrate	8-9	07:00		1					X

EXPEDITE — EXPEDITE

Relinquished by	Date	Time	Received by	Date	Time
			[signature]	8/10/16	0819

ANC, 4.3C 61109

Name of Sampler (printed):

ARS Aleut Analytical, LLC
4307 Arctic Boulevard
Anchorage, AK 99503
907-258-2155
Fax: 907-258-6634

10/5/2016

CRW Engineering
Accounts Payable
3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
Attn: Trevor Trasky

Work Order #: A1609269
Date: 10/5/2016
Work ID: Pilot Study
Date Received: 9/16/2016

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
A1609269-01	Raw Water	A1609269-02	DAF
A1609269-03	Filtrate		

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Jerry Baker
Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

ARS Aleut Analytical, LLC
Work Order: A1609269

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, May 1994.

Standard Methods for the Examination of Water and Wastewater, 21st Edition, 2005.

SAMPLE RECEIPT:

Three (3) samples were received 9/16/2016 4:53 PM at ARS Aleut Analytical – Anchorage. The samples were received in good condition and in order per chain of custody.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN:

A summary of our review is shown below.

All analytical results contained in this report have been reviewed under Analytica's internal quality assurance and quality control program. Any deviations in quality control parameters for specific analyses are noted in the following text.

All method specifications were met for the following tests, unless otherwise noted:

Test Method: Hardness, Hardness by Calculation - Hardness by Calculatio - Aqueous
Test Method: SM 2320B - Total Alkalinity - Aqueous
Test Method: SM2540C - Total Dissolved Solids dried at 180°C - TDS - Aqueous

Test Method: SM2120B - Color, Visual Comparison Method - True Color - Aqueous
The sample was received and analyzed outside the method specified holding time. This analysis was performed as soon as possible upon laboratory receipt.
HOLDING TIMES:
HOLD TIMES MISSED:
Sample ,A1609269-01A
Sampled: 9/15/2016 2:50:00 PM, Prepped: 9/16/2016 5:25:00 PM
Missed HT by 3 Hrs
Sampled: 9/15/2016 2:50:00 PM, Analyzed: 9/16/2016 5:25:00 PM
Missed Analytical HT by 3 Hrs

Sample ,A1609269-02A
Sampled: 9/15/2016 2:45:00 PM, Prepped: 9/16/2016 5:25:00 PM
Missed HT by 3 Hrs
Sampled: 9/15/2016 2:45:00 PM, Analyzed: 9/16/2016 5:25:00 PM
Missed Analytical HT by 3 Hrs

Sample ,A1609269-03A
Sampled: 9/15/2016 3:10:00 PM, Prepped: 9/16/2016 5:25:00 PM
Missed HT by 1.9992 Hrs
Sampled: 9/15/2016 3:10:00 PM, Analyzed: 9/16/2016 5:25:00 PM
Missed Analytical HT by 1.9992 Hrs

The following is a subcontracted test and has been represented to us as having met criteria:

Test Method: 200.7 - Metals by ICP - 200.7 metals – Aqueous

The instrument blank for analytical batch 280-344235 contained Fe greater than one-half the reporting limit (RL), and was not re-analyzed because Fe is a common laboratory contaminant and is therefore controlled to the full value of the RL. The data have been qualified and
reported.

Test Method: SM5310B - Diss. Organic Carbon - Aqueous
Test Method: SM5310B - Total Organic Carbon - Aqueous

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Attn: Trevor Trasky
Accounts Payable
3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273

Client Sample ID: Raw Water

Sampling Location: **Raw Water**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/5/2016
Receipt Date: 9/16/2016
Sample Date: 9/15/2016
Sample Time: 2:50:00PM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1609269-01A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2120B/2120B (Aqueous) - True Color							*Test was conducted by: ARS Aleut Analytical,LLC*		
Color, true	70	Color Unit	H	1.0	***15***	2	9/16/2016	9/16/16 17:25	JR

Lab#: A1609269-01B

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310B (Aqueous) - Total Organic Carbon							*Test was conducted by: TestAmerica - Denver*		
pH on receipt:	< 2								
Total Organic Carbon	7.30	mg/L		1.0		1	9/27/2016	9/27/16 3:48	CCJ

Lab#: A1609269-01C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310B (Aqueous) - Diss. Organic Carbon							*Test was conducted by: TestAmerica - Denver*		
pH on receipt:	< 2								

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3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273

Client Sample ID: Raw Water

Sampling Location: **Raw Water**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/5/2016
Receipt Date: 9/16/2016
Sample Date: 9/15/2016
Sample Time: 2:50:00PM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1609269-01C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date		Analyst
5310B (Aqueous) - Diss. Organic Carbon							*Test was conducted by: TestAmerica - Denver*			
pH on receipt:	< 2									
Dissolved Organic Carbon	7.40	mg/L		1.0		1	9/26/2016	9/27/16	3:30	CCJ

Lab#: A1609269-01D

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date		Analyst
2320B/2320B (Aqueous) - Total Alkalinity							*Test was conducted by: ARS Aleut Analytical,LLC*			
Alkalinity, Total	9.80	mg/L CaCO3		5.0		1	9/28/2016	9/28/16	9:15	SAR

Lab#: A1609269-01E

Sample Comment: Fe, Mn

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst

ARS Aleut Analytical, LLC
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CRW Engineering
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Accounts Payable
3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273

Client Sample ID: Raw Water

Sampling Location: **Raw Water**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/5/2016
Receipt Date: 9/16/2016
Sample Date: 9/15/2016
Sample Time: 2:50:00PM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1609269-01E

Sample Comment: Fe, Mn

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date		Analyst
200.7 (Aqueous) - 200.7 metals						*Test was conducted by: TestAmerica - Denver*				
pH on receipt:	< 2									
Iron	1200	ug/L	H	1.0	***300***	1	9/27/2016	9/28/16	20:04	CRR
Manganese	120	ug/L	H	1.0	***50***	1	9/27/2016	9/28/16	20:04	CRR

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3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273

Client Sample ID: DAF

Sampling Location: **DAF**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/5/2016
Receipt Date: 9/16/2016
Sample Date: 9/15/2016
Sample Time: 2:45:00PM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1609269-02A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2120B/2120B (Aqueous) - True Color							*Test was conducted by: ARS Aleut Analytical,LLC*		
Color, true	5.0	Color Unit		5.0	***15***	1	9/16/2016	9/16/16 17:25	JR

Lab#: A1609269-02B

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310B (Aqueous) - Total Organic Carbon							*Test was conducted by: TestAmerica - Denver*		
pH on receipt:	< 2								
Total Organic Carbon	2.30	mg/L		1.0		1	9/27/2016	9/27/16 4:25	CCJ

Lab#: A1609269-02C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310B (Aqueous) - Diss. Organic Carbon							*Test was conducted by: TestAmerica - Denver*		
pH on receipt:	< 2								

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3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273

Client Sample ID: DAF

Sampling Location: **DAF**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/5/2016
Receipt Date: 9/16/2016
Sample Date: 9/15/2016
Sample Time: 2:45:00PM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1609269-02C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310B (Aqueous) - Diss. Organic Carbon							*Test was conducted by: TestAmerica - Denver*		
pH on receipt:	< 2								
Dissolved Organic Carbon	1.90	mg/L		1.0		1	9/26/2016	9/27/16 4:06	CCJ

Lab#: A1609269-02D

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2320B/2320B (Aqueous) - Total Alkalinity							*Test was conducted by: ARS Aleut Analytical,LLC*		
Alkalinity, Total	8.20	mg/L CaCO3		5.0		1	9/28/2016	9/28/16 9:15	SAR

Lab#: A1609269-02E

Sample Comment: Fe, Mn

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst

ARS Aleut Analytical, LLC
4307 Arctic Boulevard
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Fax: 907-258-6634

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Accounts Payable
3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273

Report Date: 10/5/2016
Receipt Date: 9/16/2016
Sample Date: 9/15/2016
Sample Time: 2:45:00PM
Collected By: WM

Client Sample ID: DAF

Sampling Location: **DAF**
Client Project: Pilot Study
Sample Matrix: Aqueous

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1609269-02E

Sample Comment: Fe, Mn

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
200.7 (Aqueous) - 200.7 metals						*Test was conducted by: TestAmerica - Denver*			
pH on receipt: < 2									
Iron	150	ug/L		1.0	***300***	1	9/27/2016	9/28/16 20:06	CRR
Manganese	110	ug/L	H	1.0	***50***	1	9/27/2016	9/28/16 20:06	CRR

ARS Aleut Analytical, LLC
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907-562-3252/646-5626
Fax: 907-562-2273

Report Date: 10/5/2016
Receipt Date: 9/16/2016
Sample Date: 9/15/2016
Sample Time: 3:10:00PM
Collected By: WM

Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Aqueous

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1609269-03A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2120B/2120B (Aqueous) - True Color							*Test was conducted by: ARS Aleut Analytical,LLC*		
Color, true	5.0	Color Unit		5.0	***15***	1	9/16/2016	9/16/16 17:25	JR

Lab#: A1609269-03B

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310B (Aqueous) - Total Organic Carbon							*Test was conducted by: TestAmerica - Denver*		
pH on receipt:	< 2								
Total Organic Carbon	1.80	mg/L		1.0		1	9/27/2016	9/27/16 5:28	CCJ

Lab#: A1609269-03C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310B (Aqueous) - Diss. Organic Carbon							*Test was conducted by: TestAmerica - Denver*		
pH on receipt:	< 2								

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Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273

Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Aqueous

Report Date: 10/5/2016
Receipt Date: 9/16/2016
Sample Date: 9/15/2016
Sample Time: 3:10:00PM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1609269-03C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date		Analyst
5310B (Aqueous) - Diss. Organic Carbon							*Test was conducted by: TestAmerica - Denver*			
pH on receipt:	< 2									
Dissolved Organic Carbon	1.50	mg/L		1.0		1	9/26/2016	9/27/16	5:09	CCJ

Lab#: A1609269-03E

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date		Analyst
2320B/2320B (Aqueous) - Total Alkalinity							*Test was conducted by: ARS Aleut Analytical,LLC*			
Alkalinity, Total	7.80	mg/L CaCO3		5.0		1	9/28/2016	9/28/16	9:15	SAR
2540C/2540C (Aqueous) - TDS							*Test was conducted by: ARS Aleut Analytical,LLC*			
Total Dissolved Solids	42.5	mg/L		3.4	***500***	1	9/19/2016	9/23/16	14:48	SAR

Lab#: A1609269-03F

Sample Comment: Fe, Mn, Ca

ARS Aleut Analytical, LLC
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3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273

Report Date: 10/5/2016
Receipt Date: 9/16/2016
Sample Date: 9/15/2016
Sample Time: 3:10:00PM
Collected By: WM

Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Aqueous

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1609269-03F

Sample Comment: Fe, Mn, Ca

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date		Analyst
200.7 (Aqueous) - 200.7 metals							*Test was conducted by: TestAmerica - Denver*			
pH on receipt: < 2										
Calcium	3400	ug/L		2.0		1	9/27/2016	9/28/16	20:09	CRR
Iron	<MRL	ug/L		1.0	***300***	1	9/27/2016	9/28/16	20:09	CRR
Manganese	110	ug/L	H	1.0	***50***	1	9/27/2016	9/28/16	20:09	CRR
2340B (Aqueous) - Hardness by Calculatio							*Test was conducted by: ARS Aleut Analytical,LLC*			
pH on receipt: < 2										
Hardness, Total	8.9	mg/L CaCO3		1.0		1	10/5/2016	10/5/16	7:00	JB

Scanned SAC 9/20/16

Analytica Chain of Custody Form

0915

ANALYTICA GROUP

12189 Pennsylvania St. Thornton, CO 80241 (303) 469-8868 (303) 469-5254 fax

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475 Hall St. Fairbanks, AK 99701 (907) 456 - 3116 (907) 456-3125 Fax

5438 Shaune Drive Juneau, AK 99801 (907) 780-6668 (907) 780-6670 fax

Chain of Custody No: 79441

Client Name & Address:
City of Wrangell
P.O. Box 531, Wrangell, AK 99929

Public Water System (PWS) ID#:

Project Name: Pilot Plant

Section To be Completed by Analytica
Quote ID:
LGN: A609269
Account #:
Cash | Credit Card

Report to: Wayne McHolland
Phone No: 907 305 1151
Fax No: 907 874 4207
E-mail: wrgwtf@aptalaska.net

Turnaround Time for Results (TAT)
___ Standard X Expedited (< 10 days, prior authorization required)
(please specify due date below; add'tl charges may apply)

Requested Due Date for Results:

Invoice to Name & Address:

Special Instructions/Comments:

P.O. or Contract No:

Requested Analysis/Method

Kit Prep/Shipping Charge: $

Client Sample Identification / Location	Date Sampled	Time Sampled	Matrix (S-DW-WW-Other)	No. of Containers	true colour Lot # / Pres.	TOC Lot # / Pres.	DOC Lot # / Pres.	total alkalinity Lot # / Pres.	200.8 Lot # / Pres.	Lot # / Pres.	Lot # / Pres.	Field Preserved	Field Filtered	MS/MSD ?
~~True~~ RAW WATER	9-15-16	14:50	0	1	X									
RAW WATER	9-15-16	14:50	0	1		X						X		
RAW WATER	9-15-16	14:50	0	1			X					X	X	
RAW WATER	9-15-16	14:50	0	1				X						
RAW WATER	9-15-16	14:50	0	1					X			X		
DAF	9-15-16	14:45	0	1	X									
DAF	9-15-16	14:45	0	1		X						X		
DAF	9-15-16	14:45	0	1			X					X	X	
DAF	9-15-16	14:45	0	1				X						
DAF	9-15-16	14:45	0	1					X			X		

Relinquished by:	Date	Time	Received by:	Date	Time
Wayne McHolland	9-16-16	08:45		9/16/16	4:53 pm
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Name of Sampler: (printed) Wayne McHolland

Section To Be Completed by Analytica

	THO	ANC	JNU	FBKS
Condition of Custody Seal?:		✓		
Initialed By:		✓		
Temp/Loc:		2.6		
Thermo ID#:		G1109		
Shipped Via:		Air		

Version 2.0

Analytica Chain of Custody Form

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Juneau, AK 99801
(907) 780-6668
(907) 780-6670 fax

Chain of Custody No: 79442

Client Name & Address:
City of Wrangell
Box 531, Wrg, AK, 99929

Public Water System (PWS) ID#:

Project Name: Pilot Plant

Section To be Completed by Analytica
Quote ID:
LGN: A1609269
Account #: Cash: Credit Card:

Report to: Wayne McHolland
Phone No: 907 305 1151
Fax No: 907 874 4207
E-mail: wrgwtf@aptalaska.net

Turnaround Time for Results (TAT)
— Standard X Expedited (< 10 days, prior authorization required)
(please specify due date below; add'l charges may apply)

Requested Due Date for Results:

Invoice to Name & Address:

Special Instructions/Comments:

P.O. or Contract No:

Requested Analysis/Method

Kit Prep/Shipping Charge: $

Client Sample Identification / Location	Date Sampled	Time Sampled	Matrix (S-DW-WW-Other)	No. of Containers	true colour Lot# Pres.	TOC Lot# Pres.	DOC Lot# Pres.	tot.alk/Alkalinity Lot# Pres.	200.8 Lot# Pres.	200.8 + Hardness Lot# Pres.	Lot# Pres.	Field Preserved	Field Filtered	MS/MSD ?
FILTRATE	9-15-16	15:10	O	1	X									
FILTRATE	9-15-16	15:10	O	1		X						X		
FILTRATE	9-15-16	15:10	O	1			X					X	X	
FILTRATE	9-15-16	15:10	O	1				X						
FILTRATE	9-15-16	15:10	O	1					X			X		
FILTRATE	9-15-16	15:10	O	1						X		X		

Relinquished by:	Date	Time	Received by:	Date	Time
Wayne McHolland	9/16/16	08:45	[illegible]	9/16/16	4:53pm
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Name of Sampler: (printed)	Wayne McHolland				

Section To Be Completed by Analytica

	THO	ANC	JNU	FBKS
Condition of Custody Seal?:		/		
Initialed By:		/		
Temp/Loc:		2.6		
Thermo ID#:		#1109		
Shipped Via:		Courier		

Version 2.0

ARS Aleut Analytical, LLC
4307 Arctic Boulevard
Anchorage, AK 99503
907-258-2155
Fax: 907-258-6634

11/2/2016

CRW Engineering
Accounts Payable
3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
Attn: Trevor Trasky

Work Order #: A1610137
Date: 11/2/2016
Work ID: Pilot Study
Date Received: 10/7/2016

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
A1610137-01	Raw Water	A1610137-02	Daf Basm
A1610137-03	Filtrate		

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Mary Curry

Mary Curry
Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

ARS Aleut Analytical, LLC
Work Order: A1610137

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Standard Methods for the Examination of Water and Wastewater, 22nd Edition, 2012.

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, May 1994.

Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88/039, December 1988, Revised July 1991.

SAMPLE RECEIPT:
Three (3) samples were received on 10/7/2016 8:10:00 AM at a temperature of 2.6°C at AAA - Anchorage. The samples were received in good condition and in order per chain of custody.

For all samples the Fe, Mn, and Mg by 200.7 and Hardness analyses were canceled by the client.
The additional Filtrate sample LI and LI 200.7 Ca were canceled by the client.

REVIEW FOR COMPLIANCE WITH AAA QA PLAN
A summary of our review is shown below.

All analytical results contained in this report have been reviewed under AAA's internal quality assurance and quality control program. Any deviations in quality control parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries, is kept on file in our office and is available upon request.

All method specifications were met for the following tests, unless otherwise noted:

Test Method: SM 2320B - Total Alkalinity - Drinking Water

Test Method: SM2540C - Total Dissolved Solids dried at 180°C - TDS - Drinking Water

Test Method: SM2120B - Color, Visual Comparison Method - True Color - Drinking Water
COMMENT:
The sample was received and analyzed outside of method specified holding time.

Test Method: SM4500-H-B Electrometric pH Method - pH - Drinking Water
COMMENT:
pH is a field test requiring immediate analysis. This analysis was performed as soon as possible upon laboratory receipt.

Test Method: SM5910B Ultraviolet Absorption Method - UV254-UVA - Drinking Water

Test Method: 2330B - Langelier Index - Drinking Water

The following is a subcontracted test and has been represented to us as having met criteria, unless otherwise noted:

Test Method: 200. 7 - Metals by ICP - 200.7 metals - Drinking Water
COMMENT:
Calcium was recovered outside of the upper control limits for the MS and MSD associated with batch 440-363767. However, the sample spiked was not associated with this project.
Calcium was recovered outside of the upper control limits for the MS associated with batch 440-362690. However, the sample spiked was not associated with this project.
All other QC met method criteria.

Test Method: 5310C/5310C - 5310 DOC - Drinking Water

Test Method: 5310C - TOC-persulfate - Drinking Water

Test Method: 552.2 Haloacetic Acids in Drinking Water - Haloacetic Acids - - Finished - Chlorinated

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3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Raw Water

Sampling Location: **Raw Water**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

Report Date: 11/2/2016
Receipt Date: 10/7/2016
Sample Date: 10/6/2016
Sample Time: 6:35:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1610137-01A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2120B/2120B (Aqueous) - True Color							*Test was conducted by: ARS Aleut Analytical,LLC*		
Color, true	70	Color Unit	H	1.0	***15***	1	10/7/2016	10/7/16 16:58	IS

Lab#: A1610137-01C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2320B/2320B (Aqueous) - Total Alkalinity							*Test was conducted by: ARS Aleut Analytical,LLC*		
Alkalinity, Total	7.60	mg/L		5.0		1	10/18/2016	10/18/16 16:37	LL
4500-H-B/4500-H-B (Aqueous) - pH							*Test was conducted by: ARS Aleut Analytical,LLC*		
pH	6.26	pH		0.0		1	10/7/2016	10/7/16 15:05	SAR
2540C/2540C (Aqueous) - TDS							*Test was conducted by: ARS Aleut Analytical,LLC*		
Total Dissolved Solids	36.3	mg/L		3.4	***500***	1	10/12/2016	10/19/16 15:17	SAR

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst

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Client Sample ID: Raw Water

Sampling Location: **Raw Water**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

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Lab#: A1610137-01C

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2330B (Aqueous) - Langelier Index								*Test was conducted by: ARS Aleut Analytical,LLC*		
Langelier Index/Corrosivity	-3.7	C Units		-1.0	-1.0		1	10/28/2016	10/28/16 4:35	EW

Lab#: A1610137-01D

Sample Comment: Ca

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
200.7 (Aqueous) - 200.7 metals							*Test was conducted by: TestAmerica - Irvine*		
pH on receipt: < 2									
Calcium	2.8	mg/L		0.10		1	10/19/2016	10/20/16 14:16	EN

Lab#: A1610137-01E

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst

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Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Raw Water

Sampling Location: **Raw Water**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

Report Date: 11/2/2016
Receipt Date: 10/7/2016
Sample Date: 10/6/2016
Sample Time: 6:35:00AM
Collected By: WM

Flag Definitions:
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MCL = Maximum Contaminant Limit
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Lab#: A1610137-01E

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date		Analyst
5310C/5310C (Aqueous) - 5310 DOC							*Test was conducted by: TestAmerica - Denver*			
pH on receipt:	< 2									
Dissolved Organic Carbon	7.9	mg/L		0.10		1	10/17/2016	10/17/16	10:21	YZ

Lab#: A1610137-01F

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date		Analyst
5310C (Aqueous) - TOC-persulfate							*Test was conducted by: TestAmerica - Denver*			
pH on receipt:	< 2									
Total Organic Carbon	8.30	mg/L		0.10		1	10/17/2016	10/17/16	8:48	YZ

Lab#: A1610137-01G

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
552.2/5710B-FP (Aqueous) - HAA5 Form Potential							*Test was conducted by: Eurofins Eaton Analytical*		

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907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Raw Water

Sampling Location: **Raw Water**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

Report Date: 11/2/2016
Receipt Date: 10/7/2016
Sample Date: 10/6/2016
Sample Time: 6:35:00AM
Collected By: WM

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TCNG = Turbid Culture No Growth - rejected

Lab#: A1610137-01G

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
552.2/5710B-FP (Aqueous) - HAA5 Form Potential									*Test was conducted by: Eurofins Eaton Analytical*
See Subcontractor Report	0.0	NA		1.0					

Lab#: A1610137-01H

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5910B/5910B (Aqueous) - UV254-UVA									*Test was conducted by: ARS Aleut Analytical,LLC*
UV 254 Ultraviolet Absorption	0.358	cm-1		0.0100		1	10/7/2016	10/7/16 12:00	JR

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3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Daf Basm

Sampling Location: **Daf Basm**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

Report Date: 11/2/2016
Receipt Date: 10/7/2016
Sample Date: 10/6/2016
Sample Time: 7:05:00AM
Collected By: WM

Flag Definitions:
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TCNG = Turbid Culture No Growth - rejected

Lab#: A1610137-02A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2120B/2120B (Aqueous) - True Color							*Test was conducted by: ARS Aleut Analytical,LLC*		
Color, true	5.0	Color Unit		5.0	***15***	1	10/7/2016	10/7/16 16:58	IS

Lab#: A1610137-02C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2320B/2320B (Aqueous) - Total Alkalinity							*Test was conducted by: ARS Aleut Analytical,LLC*		
Alkalinity, Total	6.00	mg/L		5.0		1	10/18/2016	10/18/16 16:37	LL
4500-H-B/4500-H-B (Aqueous) - pH							*Test was conducted by: ARS Aleut Analytical,LLC*		
pH	6.29	pH		0.0		1	10/7/2016	10/7/16 15:05	SAR
2540C/2540C (Aqueous) - TDS							*Test was conducted by: ARS Aleut Analytical,LLC*		
Total Dissolved Solids	<MRL	mg/L		3.4	***500***	1	10/12/2016	10/19/16 15:17	SAR

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst

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Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Daf Basm

Sampling Location: **Daf Basm**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

Report Date: 11/2/2016
Receipt Date: 10/7/2016
Sample Date: 10/6/2016
Sample Time: 7:05:00AM
Collected By: WM

Flag Definitions:
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Lab#: A1610137-02C

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2330B (Aqueous) - Langelier Index								*Test was conducted by: ARS Aleut Analytical,LLC*		
Langelier Index/Corrosivity	-3.8	C Units		-1.0	-1.0		1	10/28/2016	10/28/16 4:35	EW

Lab#: A1610137-02D

Sample Comment: Ca

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
200.7 (Aqueous) - 200.7 metals							*Test was conducted by: TestAmerica - Irvine*		
pH on receipt:	< 2								
Calcium	2.8	mg/L		0.10		1	10/19/2016	10/20/16 11:24	VS

Lab#: A1610137-02E

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst

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907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Daf Basm

Sampling Location: **Daf Basm**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

Report Date: 11/2/2016
Receipt Date: 10/7/2016
Sample Date: 10/6/2016
Sample Time: 7:05:00AM
Collected By: WM

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TCNG = Turbid Culture No Growth - rejected

Lab#: A1610137-02E

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310C/5310C (Aqueous) - 5310 DOC							*Test was conducted by: TestAmerica - Denver*		
pH on receipt:	< 2								
Dissolved Organic Carbon	1.9	mg/L		0.10		1	10/17/2016	10/17/16 10:34	YZ

Lab#: A1610137-02F

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5310C (Aqueous) - TOC-persulfate							*Test was conducted by: TestAmerica - Denver*		
pH on receipt:	< 2								
Total Organic Carbon	2.10	mg/L		0.10		1	10/17/2016	10/17/16 9:00	YZ

Lab#: A1610137-02G

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5910B/5910B (Aqueous) - UV254-UVA							*Test was conducted by: ARS Aleut Analytical,LLC*		

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Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Daf Basm

Sampling Location: **Daf Basm**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

Report Date: 11/2/2016
Receipt Date: 10/7/2016
Sample Date: 10/6/2016
Sample Time: 7:05:00AM
Collected By: WM

Flag Definitions:
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Lab#: A1610137-02G

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5910B/5910B (Aqueous) - UV254-UVA							*Test was conducted by: ARS Aleut Analytical,LLC*		
UV 254 Ultraviolet Absorption	0.0320	cm-1		0.0100		1	10/7/2016	10/7/16 12:00	JR

Lab#: A1610137-02H

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
552.2/5710B-FP (Aqueous) - HAA5 Form Potential							*Test was conducted by: Eurofins Eaton Analytical*		
See Subcontractor Report	0.0	NA		1.0					

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907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

Report Date: 11/2/2016
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Sample Date: 10/6/2016
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** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1610137-03A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2120B/2120B (Aqueous) - True Color							*Test was conducted by: ARS Aleut Analytical,LLC*		
Color, true	5.0	Color Unit		5.0	***15***	1	10/7/2016	10/7/16 16:58	IS

Lab#: A1610137-03C

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2320B/2320B (Aqueous) - Total Alkalinity							*Test was conducted by: ARS Aleut Analytical,LLC*		
Alkalinity, Total	6.00	mg/L		5.0		1	10/18/2016	10/18/16 16:37	LL
4500-H-B/4500-H-B (Aqueous) - pH							*Test was conducted by: ARS Aleut Analytical,LLC*		
pH	6.08	pH		0.0		1	10/7/2016	10/7/16 15:05	SAR
2540C/2540C (Aqueous) - TDS							*Test was conducted by: ARS Aleut Analytical,LLC*		
Total Dissolved Solids	<MRL	mg/L		3.4	***500***	1	10/12/2016	10/19/16 15:17	SAR

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst

ARS Aleut Analytical, LLC
4307 Arctic Boulevard
Anchorage, AK 99503
Phone: 907-258-2155
Fax: 907-258-6634

CRW Engineering
Attn: Trevor Trasky
Accounts Payable
3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

Report Date: 11/2/2016
Receipt Date: 10/7/2016
Sample Date: 10/6/2016
Sample Time: 7:05:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1610137-03C

Analysis Method / Parameter	Result	Units	Flags	MRL	MDL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
2330B (Aqueous) - Langelier Index								*Test was conducted by: ARS Aleut Analytical,LLC*		
Langelier Index/Corrosivity	-4.0	C Units		-1.0	-1.0		1	10/28/2016	10/28/16 4:35	EW

Lab#: A1610137-03D

Sample Comment: Ca

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
200.7 (Aqueous) - 200.7 metals							*Test was conducted by: TestAmerica - Irvine*		
pH on receipt:	< 2								
Calcium	2.8	mg/L		0.10		1	10/19/2016	10/20/16 11:26	VS

Lab#: A1610137-03E

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst

ARS Aleut Analytical, LLC
4307 Arctic Boulevard
Anchorage, AK 99503
Phone: 907-258-2155
Fax: 907-258-6634

CRW Engineering
Attn: Trevor Trasky
Accounts Payable
3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

Report Date: 11/2/2016
Receipt Date: 10/7/2016
Sample Date: 10/6/2016
Sample Time: 7:05:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1610137-03E

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date		Analyst
5310C/5310C (Aqueous) - 5310 DOC							*Test was conducted by: TestAmerica - Denver*			
pH on receipt:	< 2									
Dissolved Organic Carbon	2.0	mg/L		0.10		1	10/17/2016	10/17/16	10:47	YZ

Lab#: A1610137-03F

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date		Analyst
5310C (Aqueous) - TOC-persulfate							*Test was conducted by: TestAmerica - Denver*			
pH on receipt:	< 2									
Total Organic Carbon	2.00	mg/L		0.10		1	10/17/2016	10/17/16	9:13	YZ

Lab#: A1610137-03G

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5910B/5910B (Aqueous) - UV254-UVA							*Test was conducted by: ARS Aleut Analytical,LLC*		

ARS Aleut Analytical, LLC
4307 Arctic Boulevard
Anchorage, AK 99503
Phone: 907-258-2155
Fax: 907-258-6634

CRW Engineering
Attn: Trevor Trasky
Accounts Payable
3940 Arctic Blvd, Suite 300
Anchorage, AK 99503
907-562-3252/646-5626
Fax: 907-562-2273
Client Sample ID: Filtrate

Sampling Location: **Filtrate**
Client Project: Pilot Study
Sample Matrix: Drinking Water

PWS#: 120143

Comments: Results submitted to ADEC

Report Date: 11/2/2016
Receipt Date: 10/7/2016
Sample Date: 10/6/2016
Sample Time: 7:05:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1610137-03G

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
5910B/5910B (Aqueous) - UV254-UVA							*Test was conducted by: ARS Aleut Analytical,LLC*		
UV 254 Ultraviolet Absorption	0.0320	cm-1		0.0100		1	10/7/2016	10/7/16 12:00	JR

Lab#: A1610137-03H

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
552.2/5710B-FP (Aqueous) - HAA5 Form Potential							*Test was conducted by: Eurofins Eaton Analytical*		
See Subcontractor Report	0.0	NA		1.0					

LABORATORY REPORT

If you have any questions concerning this report, please do not hesitate to call us at (800) 332-4345 or (574) 233-4777.

S I I I IS

State	e tification	State	e tification
Alabama	40700	Montana	CERT0026
Alaska	IN00035	Nebraska	E87775
Arizona	AZ0432	Nevada	IN00035
Arkansas	IN00035	New Hampshire*	2124
California	2920	New Mexico	IN00035
Colorado	IN035	New Jersey*	IN598
Colorado Radiochemistry	IN035	New York*	11398
Connecticut	PH-0132	North Carolina	18700
Delaware	IN035	North Dakota	R-035
Florida*	E87775	Ohio	87775
Georgia	929	Oklahoma	D9508
Hawaii	IN035	Oregon (Primary AB)*	4074-001
Idaho	IN00035/E87775	Pennsylvania*	68-00466
Illinois*	200001	Puerto Rico	IN00035
Illinois Microbiology	200001	Rhode Island	LAO00343
Indiana Chemistry	C-71-01	South Carolina	95005
Indiana Microbiology	M-76-07	South Dakota	IN00035
Iowa	098	Tennessee	TN02973
Kansas*	E-10233	Texas*	T104704187-15-8
Kentucky	90056	Texas/TCEQ	TX207
Louisiana*	LA160002	Utah*	IN00035
Maine	IN00035	Vermont	VT-8775
Maryland	209	Virginia*	460275
Massachusetts	M-IN035	Washington	C837
Michigan	9926	West Virginia	9927 C
Minnesota*	018-999-338	Wisconsin	999766900
Mississippi	IN035	Wyoming	IN035
Missouri	880		

*NELAP/TNI Recognized Accreditation Bodies

eurofins | Eaton Analytical

110 South Hill Street
South Bend, IN 46617
Tel: (574) 233-4777
Fax: (574) 233-8207
1 800 332 4345

Laboratory Report

Client: Analytica Group

Attn: Erin West
475 Hall Street
Fairbanks, AK 99701

Report: 374731
Priority: Standard Written
Status: Final
PWS ID: Not Supplied
Alaska Lab ID # IN00035

Sample Information

EEA ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
3563314	A1610137-01G (4mg/L Dose)	5710 B	10/06/16 06:35	Client	10/11/16 08:30
3563315	A1610137-01G (4mg/L Dose)	552.2	10/25/16 15:20	EEA	10/11/16 08:30
3563316	A1610137-01G (1.5mg/L Dose)	5710 B	10/06/16 06:35	Client	10/11/16 08:30
3563317	A1610137-01G (1.5mg/L Dose)	552.2	10/25/16 15:20	EEA	10/11/16 08:30
3563318	A1610137-02H (4mg/L Dose)	5710 B	10/06/16 07:05	Client	10/11/16 08:30
3563319	A1610137-02H (4mg/L Dose)	552.2	10/25/16 15:20	EEA	10/11/16 08:30
3563320	A1610137-02H (1.5mg/L Dose)	5710 B	10/06/16 07:05	Client	10/11/16 08:30
3563321	A1610137-02H (1.5mg/L Dose)	552.2	10/25/16 15:20	EEA	10/11/16 08:30
3563322	A1610137-03H (4mg/L Dose)	5710 B	10/06/16 07:05	Client	10/11/16 08:30
3563323	A1610137-03H (4mg/L Dose)	552.2	10/25/16 15:20	EEA	10/11/16 08:30
3563324	A1610137-03H (1.5mg/L Dose)	5710 B	10/06/16 07:05	Client	10/11/16 08:30
3563325	A1610137-03H (1.5mg/L Dose)	552.2	10/25/16 15:20	EEA	10/11/16 08:30

Report Summary

Note: Sample containers were provided by the client.

Note: The samples submitted for Method 5710 B analysis were analyzed outside the eight day hold time.

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call Traci Chlebowski at (574) 233-4777.

Traci Chlebowski ASM — 11/01/2016

Authorized Signature | Title | Date

Client Name: Analytica Group
Report #: 374731

Client Name: Analytica Group Report #: 374731

Sampling Point: A1610137-01G (4mg/L Dose) PWS ID: Not Supplied

Formation Potential Incubation											
pH (pH units)		Method	Chlorine Demand	Chlorine Demand Time	Chlorine Dose	Residual Chlorine		Incubation Period	Temperature	Incubation Start Date	EEA ID #
(Initial)	(Adjusted)					(Total)	(Free)				
6.2	7.0	5710 B	10 mg/L	24 hours	4.0 mg/L	< 0.05 mg/L	< 0.05 mg/L	7.0 days	25 °C	10/18/16 15:20	3563314

*NR = The chlorine demand was not performed for this analytical sample, at the request of the client.

Disinfection Byproducts									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	EEA ID #
631-64-1	Dibromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/27/16 22:52	3563315
79-43-6	Dichloroacetic acid	552.2	---	1.0	**70**	ug/L	10/27/16 08:10	10/27/16 22:52	3563315
79-08-3	Monobromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/27/16 22:52	3563315
79-11-8	Monochloroacetic acid	552.2	---	2.0	< 2.0	ug/L	10/27/16 08:10	10/27/16 22:52	3563315
76-03-9	Trichloroacetic acid	552.2	---	1.0	**64**	ug/L	10/27/16 08:10	10/27/16 22:52	3563315
---	Total HAA5	552.2	60 *	1.0	**134**	ug/L	10/27/16 08:10	10/27/16 22:52	3563315

Sampling Point: A1610137-01G (1.5mg/L Dose) PWS ID: Not Supplied

Formation Potential Incubation											
pH (pH units)		Method	Chlorine Demand	Chlorine Demand Time	Chlorine Dose	Residual Chlorine		Incubation Period	Temperature	Incubation Start Date	EEA ID #
(Initial)	(Adjusted)					(Total)	(Free)				
6.2	7.0	5710 B	10 mg/L	24 hours	1.5 mg/L	< 0.05 mg/L	< 0.05 mg/L	7.0 days	25 °C	10/18/16 15:20	3563316

*NR = The chlorine demand was not performed for this analytical sample, at the request of the client.

Disinfection Byproducts									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	EEA ID #
631-64-1	Dibromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/27/16 23:29	3563317
79-43-6	Dichloroacetic acid	552.2	---	1.0	**19**	ug/L	10/27/16 08:10	10/27/16 23:29	3563317
79-08-3	Monobromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/27/16 23:29	3563317
79-11-8	Monochloroacetic acid	552.2	---	2.0	< 2.0	ug/L	10/27/16 08:10	10/27/16 23:29	3563317
76-03-9	Trichloroacetic acid	552.2	---	1.0	**8.9**	ug/L	10/27/16 08:10	10/27/16 23:29	3563317
---	Total HAA5	552.2	60 *	1.0	**27.9**	ug/L	10/27/16 08:10	10/27/16 23:29	3563317

Client Name: Analytica Group Report #: 374731

Sampling Point: A1610137-02H (4mg/L Dose) PWS ID: Not Supplied

Formation Potential Incubation											
pH (pH units)		Method	Chlorine Demand	Chlorine Demand Time	Chlorine Dose	Residual Chlorine		Incubation Period	Temperature	Incubation Start Date	EEA ID #
(Initial)	(Adjusted)					(Total)	(Free)				
6.6	7.0	5710 B	3.4 mg/L	24 hours	4.0 mg/L	0.34 mg/L	0.26 mg/L	7.0 days	25 °C	10/18/16 15:20	3563318

*NR = The chlorine demand was not performed for this analytical sample, at the request of the client.

Disinfection Byproducts									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	EEA ID #
631-64-1	Dibromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/28/16 00:05	3563319
79-43-6	Dichloroacetic acid	552.2	---	1.0	**55**	ug/L	10/27/16 08:10	10/28/16 00:05	3563319
79-08-3	Monobromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/28/16 00:05	3563319
79-11-8	Monochloroacetic acid	552.2	---	2.0	**3.3**	ug/L	10/27/16 08:10	10/28/16 00:05	3563319
76-03-9	Trichloroacetic acid	552.2	---	1.0	**51**	ug/L	10/27/16 08:10	10/28/16 00:05	3563319
---	Total HAA5	552.2	60 *	1.0	**109.3**	ug/L	10/27/16 08:10	10/28/16 00:05	3563319

Sampling Point: A1610137-02H (1.5mg/L Dose) PWS ID: Not Supplied

Formation Potential Incubation											
pH (pH units)		Method	Chlorine Demand	Chlorine Demand Time	Chlorine Dose	Residual Chlorine		Incubation Period	Temperature	Incubation Start Date	EEA ID #
(Initial)	(Adjusted)					(Total)	(Free)				
6.6	7.0	5710 B	3.4 mg/L	24 hours	1.5 mg/L	< 0.05 mg/L	< 0.05 mg/L	7.0 days	25 °C	10/18/16 15:20	3563320

*NR = The chlorine demand was not performed for this analytical sample, at the request of the client.

Disinfection Byproducts									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	EEA ID #
631-64-1	Dibromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/28/16 00:42	3563321
79-43-6	Dichloroacetic acid	552.2	---	1.0	**16**	ug/L	10/27/16 08:10	10/28/16 00:42	3563321
79-08-3	Monobromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/28/16 00:42	3563321
79-11-8	Monochloroacetic acid	552.2	---	2.0	< 2.0	ug/L	10/27/16 08:10	10/28/16 00:42	3563321
76-03-9	Trichloroacetic acid	552.2	---	1.0	**15**	ug/L	10/27/16 08:10	10/28/16 00:42	3563321
---	Total HAA5	552.2	60 *	1.0	**31**	ug/L	10/27/16 08:10	10/28/16 00:42	3563321

Client Name: Analytica Group Report #: 374731

Sampling Point: A1610137-03H (4mg/L Dose) PWS ID: Not Supplied

Formation Potential Incubation											
pH (pH units)		Method	Chlorine Demand	Chlorine Demand Time	Chlorine Dose	Residual Chlorine		Incubation Period	Temperature	Incubation Start Date	EEA ID #
(Initial)	(Adjusted)					(Total)	(Free)				
6.6	6.9	5710 B	2.3 mg/L	24 hours	4.0 mg/L	0.85 mg/L	0.72 mg/L	7.0 days	25 °C	10/18/16 15:20	3563322

*NR = The chlorine demand was not performed for this analytical sample, at the request of the client.

Disinfection Byproducts									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	EEA ID #
631-64-1	Dibromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/28/16 01:19	3563323
79-43-6	Dichloroacetic acid	552.2	---	1.0	**45**	ug/L	10/27/16 08:10	10/28/16 01:19	3563323
79-08-3	Monobromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/28/16 01:19	3563323
79-11-8	Monochloroacetic acid	552.2	---	2.0	**2.8**	ug/L	10/27/16 08:10	10/28/16 01:19	3563323
76-03-9	Trichloroacetic acid	552.2	---	1.0	**44**	ug/L	10/27/16 08:10	10/28/16 01:19	3563323
---	Total HAA5	552.2	60 *	1.0	**91.8**	ug/L	10/27/16 08:10	10/28/16 01:19	3563323

Sampling Point: A1610137-03H (1.5mg/L Dose) PWS ID: Not Supplied

Formation Potential Incubation											
pH (pH units)		Method	Chlorine Demand	Chlorine Demand Time	Chlorine Dose	Residual Chlorine		Incubation Period	Temperature	Incubation Start Date	EEA ID #
(Initial)	(Adjusted)					(Total)	(Free)				
6.6	6.9	5710 B	2.3 mg/L	24 hours	1.5 mg/L	< 0.05 mg/L	0.10 mg/L	7.0 days	25 °C	10/18/16 15:20	3563324

*NR = The chlorine demand was not performed for this analytical sample, at the request of the client.

Disinfection Byproducts									
Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	EEA ID #
631-64-1	Dibromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/28/16 01:55	3563325
79-43-6	Dichloroacetic acid	552.2	---	1.0	**1.6**	ug/L	10/27/16 08:10	10/28/16 01:55	3563325
79-08-3	Monobromoacetic acid	552.2	---	1.0	< 1.0	ug/L	10/27/16 08:10	10/28/16 01:55	3563325
79-11-8	Monochloroacetic acid	552.2	---	2.0	< 2.0	ug/L	10/27/16 08:10	10/28/16 01:55	3563325
76-03-9	Trichloroacetic acid	552.2	---	1.0	**15**	ug/L	10/27/16 08:10	10/28/16 01:55	3563325
---	Total HAA5	552.2	60 *	1.0	**16.6**	ug/L	10/27/16 08:10	10/28/16 01:55	3563325

† EEA has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Lab Definitions

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis. CCL, CCM, and CCH are the CCC standards at low, mid, and high concentration levels, respectively.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control. FBL, FBM, and FBH are the LFB samples at low, mid, and high concentration levels, respectively.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample al6iquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix. SDL, SDM, and SDH / LFSMDL, LFSMDM, and LFSMDH are the MSD or LFSMD at low, mid, and high concentration levels, respectively.

Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results. MSL, MSM, and MSH / LFSML, LFSMM, and LFSMH are the MS or LFSM at low, mid, and high concentration levels, respectively.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

ANALYTICA CHAIN OF CUSTODY FOR EXTERNAL LAB ANALYSIS

COC Number: 183046-3

ARS Aleut Analytical, LLC
4307 Arctic Boulevard
Anchorage, AK 99503
Report to: Mary Curry
phone: 907-258-2155

307207

PO Number: 5825

Requested Turnaround: 10/21/16

~~374577~~ SS 10-12-16

AK Drinking water compliance

374731

Testing Laboratory:

Eurofins Eaton Analytical (EEA)
110 South Hill Street
South Bend, IN 46617
phone: 574-472-5567

Client Identifier:

Analytica ID	Test Method	Method Description	Sample Date	Matrix	Comments
A1610137-01G	552.2	552.2 (Aqueous) - Haloacetic Acids (I)	10/6/2016 6:35	Drinking Wate	Please see below

FP 4mg/L 3563 314
HAA ↓ 315
FP 1.5mg/L ↓ 316
HAA ↓ 317

Client Identifier:

Analytica ID	Test Method	Method Description	Sample Date	Matrix	Comments
A1610137-02H	552.2	552.2 (Aqueous) - Haloacetic Acids (I)	10/6/2016 7:05	Drinking Wate	Please see below

FP 4mg/L 3563 318
HAA ↓ 319
FP 1.5mg/L ↓ 320
HAA ↓ 321

Client Identifier:

Analytica ID	Test Method	Method Description	Sample Date	Matrix	Comments
A1610137-03H	552.2	552.2 (Aqueous) - Haloacetic Acids (I)	10/6/2016 7:05	Drinking Wate	Please see below

FP 4mg/L 3563322 FP 1.5mg/L 3563324
HAA ↓ 3563323 HAA ↓ 3563325

Analytica Relinquished by:	Date/Time:	Received by:	Date/Time:
	10 10 16 12:10 PM		10-11-16 0830
Relinquished by:	Date/Time:	Received by:	Date/Time:

0.2°C Blue

* DBPFP KH.

client would like to use two different chlorine doses at these locations. One at 4 mg/l chlorine and one at 1.5 mg/l chlorine. If you have any questions, please contact a PM or the lab.

IS 10/10/16

Client Provided Sample Container

eurofins | Eaton Analytical

Eurofins Eaton Analytical
Run Log

Run ID: **222114** Method: **552.2**

Type	Sample Id	Sample Site	Matrix	Instrument ID	Analysis Date	Calibration File
CCL	3572907		RW	PW3	10/27/2016 21:02	552_2-102716PW3
LMB	3572904		RW	PW3	10/27/2016 22:15	552_2-102716PW3
FS	3563315	A1610137-01G (4mg/L Dose)	FP	PW3	10/27/2016 22:52	552_2-102716PW3
FS	3563317	A1610137-01G (1.5mg/L Dose)	FP	PW3	10/27/2016 23:29	552_2-102716PW3
FS	3563319	A1610137-02H (4mg/L Dose)	FP	PW3	10/28/2016 00:05	552_2-102716PW3
FS	3563321	A1610137-02H (1.5mg/L Dose)	FP	PW3	10/28/2016 00:42	552_2-102716PW3
FS	3563323	A1610137-03H (4mg/L Dose)	FP	PW3	10/28/2016 01:19	552_2-102716PW3
FS	3563325	A1610137-03H (1.5mg/L Dose)	FP	PW3	10/28/2016 01:55	552_2-102716PW3
CCC	3572905		RW	PW3	10/28/2016 06:12	552_2-102716PW3

QC Summary Report

Sample Type	Analyte	Method	MRL	Client ID	Result Flag	Amount	Target	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Dil Factor	Extracted	Analyzed	EEA ID #
LCL	SS-2-Bromopropionic acid	552.2	N/A	---		4.9703	5.0	ug/L	99	70 - 130	---	---	1.0	10/27/2016 08:10	10/27/2016 21:02	3572907
LCL	Dibromoacetic acid	552.2	1.0	---		0.9455	1.0	ug/L	95	50 - 150	---	---	1.0	10/27/2016 08:10	10/27/2016 21:02	3572907
LCL	Dichloroacetic acid	552.2	1.0	---		1.2382	1.0	ug/L	124	50 - 150	---	---	1.0	10/27/2016 08:10	10/27/2016 21:02	3572907
LCL	Monobromoacetic acid	552.2	1.0	---		1.0709	1.0	ug/L	107	50 - 150	---	---	1.0	10/27/2016 08:10	10/27/2016 21:02	3572907
LCL	Monochloroacetic acid	552.2	2.0	---		1.4203	2.0	ug/L	71	50 - 150	---	---	1.0	10/27/2016 08:10	10/27/2016 21:02	3572907
LCL	Trichloroacetic acid	552.2	1.0	---		1.1981	1.0	ug/L	120	50 - 150	---	---	1.0	10/27/2016 08:10	10/27/2016 21:02	3572907
LCL	IS-1,2,3-Trichloropropane	552.2	N/A	---		144501	145371	ug/L	99	70 - 130	---	---	1.0	10/27/2016 08:10	10/27/2016 21:02	3572907
LMB	SS-2-Bromopropionic acid	552.2	N/A	---		4.9911	5.0	ug/L	100	70 - 130	---	---	1.0	10/27/2016 08:10	10/27/2016 22:15	3572904
LMB	Dibromoacetic acid	552.2	1.0	---	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 22:15	3572904
LMB	Dichloroacetic acid	552.2	1.0	---	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 22:15	3572904
LMB	Monobromoacetic acid	552.2	1.0	---	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 22:15	3572904
LMB	Monochloroacetic acid	552.2	2.0	---	<	2.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 22:15	3572904
LMB	Trichloroacetic acid	552.2	1.0	---	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 22:15	3572904
LMB	IS-1,2,3-Trichloropropane	552.2	N/A	---		146714	145371	ug/L	101	70 - 130	---	---	1.0	10/27/2016 08:10	10/27/2016 22:15	3572904
FS	SS-2-Bromopropionic acid	552.2	N/A	A1610137-01G (4mg/L Dose)		4.5796	5.0	ug/L	92	70 - 130	---	---	1.0	10/27/2016 08:10	10/27/2016 22:52	3563315
FS	Dibromoacetic acid	552.2	1.0	A1610137-01G (4mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 22:52	3563315
FS	Dichloroacetic acid	552.2	1.0	A1610137-01G (4mg/L Dose)		70		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 22:52	3563315
FS	Monobromoacetic acid	552.2	1.0	A1610137-01G (4mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 22:52	3563315
FS	Monochloroacetic acid	552.2	2.0	A1610137-01G (4mg/L Dose)	<	2.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 22:52	3563315
FS	Trichloroacetic acid	552.2	1.0	A1610137-01G (4mg/L Dose)		64		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 22:52	3563315
FS	IS-1,2,3-Trichloropropane	552.2	N/A	A1610137-01G (4mg/L Dose)		150299	145371	ug/L	103	70 - 130	---	---	1.0	10/27/2016 08:10	10/27/2016 22:52	3563315
FS	Total HAA5	552.2	1.0	A1610137-01G (4mg/L Dose)		134		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 22:52	3563315
FS	SS-2-Bromopropionic acid	552.2	N/A	A1610137-01G (1.5mg/L Dose)		4.7582	5.0	ug/L	95	70 - 130	---	---	1.0	10/27/2016 08:10	10/27/2016 23:29	3563317
FS	Dibromoacetic acid	552.2	1.0	A1610137-01G (1.5mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 23:29	3563317
FS	Dichloroacetic acid	552.2	1.0	A1610137-01G (1.5mg/L Dose)		19		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 23:29	3563317
FS	Monobromoacetic acid	552.2	1.0	A1610137-01G (1.5mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 23:29	3563317
FS	Monochloroacetic acid	552.2	2.0	A1610137-01G (1.5mg/L Dose)	<	2.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 23:29	3563317
FS	Trichloroacetic acid	552.2	1.0	A1610137-01G (1.5mg/L Dose)		8.9		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 23:29	3563317
FS	IS-1,2,3-Trichloropropane	552.2	N/A	A1610137-01G (1.5mg/L Dose)		143409	145371	ug/L	99	70 - 130	---	---	1.0	10/27/2016 08:10	10/27/2016 23:29	3563317
FS	Total HAA5	552.2	1.0	A1610137-01G (1.5mg/L Dose)		27.9		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/27/2016 23:29	3563317
FS	SS-2-Bromopropionic acid	552.2	N/A	A1610137-02H (4mg/L Dose)		4.3879	5.0	ug/L	88	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 00:05	3563319
FS	Dibromoacetic acid	552.2	1.0	A1610137-02H (4mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:05	3563319
FS	Dichloroacetic acid	552.2	1.0	A1610137-02H (4mg/L Dose)		55		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:05	3563319
FS	Monobromoacetic acid	552.2	1.0	A1610137-02H (4mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:05	3563319
FS	Monochloroacetic acid	552.2	2.0	A1610137-02H (4mg/L Dose)		3.3		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:05	3563319
FS	Trichloroacetic acid	552.2	1.0	A1610137-02H (4mg/L Dose)		51		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:05	3563319
FS	IS-1,2,3-Trichloropropane	552.2	N/A	A1610137-02H (4mg/L Dose)		141572	145371	ug/L	97	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 00:05	3563319
FS	Total HAA5	552.2	1.0	A1610137-02H (4mg/L Dose)		109.3		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:05	3563319
FS	SS-2-Bromopropionic acid	552.2	N/A	A1610137-02H (1.5mg/L Dose)		5.0692	5.0	ug/L	101	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 00:42	3563321
FS	Dibromoacetic acid	552.2	1.0	A1610137-02H (1.5mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:42	3563321

QC Summary Report (cont.)

Sample Type	Analyte	Method	MRL	Client ID	Result Flag	Amount	Target	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Dil Factor	Extracted	Analyzed	EEA ID #
FS	Dichloroacetic acid	552.2	1.0	A1610137-02H (1.5mg/L Dose)		16		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:42	3563321
FS	Monobromoacetic acid	552.2	1.0	A1610137-02H (1.5mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:42	3563321
FS	Monochloroacetic acid	552.2	2.0	A1610137-02H (1.5mg/L Dose)	<	2.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:42	3563321
FS	Trichloroacetic acid	552.2	1.0	A1610137-02H (1.5mg/L Dose)		15		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:42	3563321
FS	IS-1,2,3-Trichloropropane	552.2	N/A	A1610137-02H (1.5mg/L Dose)		143218	145371	ug/L	99	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 00:42	3563321
FS	Total HAA5	552.2	1.0	A1610137-02H (1.5mg/L Dose)		31		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 00:42	3563321
FS	SS-2-Bromopropionic acid	552.2	N/A	A1610137-03H (4mg/L Dose)		4.3005	5.0	ug/L	86	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 01:19	3563323
FS	Dibromoacetic acid	552.2	1.0	A1610137-03H (4mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:19	3563323
FS	Dichloroacetic acid	552.2	1.0	A1610137-03H (4mg/L Dose)		45		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:19	3563323
FS	Monobromoacetic acid	552.2	1.0	A1610137-03H (4mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:19	3563323
FS	Monochloroacetic acid	552.2	2.0	A1610137-03H (4mg/L Dose)		2.8		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:19	3563323
FS	Trichloroacetic acid	552.2	1.0	A1610137-03H (4mg/L Dose)		44		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:19	3563323
FS	IS-1,2,3-Trichloropropane	552.2	N/A	A1610137-03H (4mg/L Dose)		146323	145371	ug/L	101	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 01:19	3563323
FS	Total HAA5	552.2	1.0	A1610137-03H (4mg/L Dose)		91.8		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:19	3563323
FS	SS-2-Bromopropionic acid	552.2	N/A	A1610137-03H (1.5mg/L Dose)		4.1481	5.0	ug/L	83	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 01:55	3563325
FS	Dibromoacetic acid	552.2	1.0	A1610137-03H (1.5mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:55	3563325
FS	Dichloroacetic acid	552.2	1.0	A1610137-03H (1.5mg/L Dose)		1.6		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:55	3563325
FS	Monobromoacetic acid	552.2	1.0	A1610137-03H (1.5mg/L Dose)	<	1.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:55	3563325
FS	Monochloroacetic acid	552.2	2.0	A1610137-03H (1.5mg/L Dose)	<	2.0		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:55	3563325
FS	Trichloroacetic acid	552.2	1.0	A1610137-03H (1.5mg/L Dose)		15		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:55	3563325
FS	IS-1,2,3-Trichloropropane	552.2	N/A	A1610137-03H (1.5mg/L Dose)		129830	145371	ug/L	89	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 01:55	3563325
FS	Total HAA5	552.2	1.0	A1610137-03H (1.5mg/L Dose)		16.6		ug/L	---	---	---	---	1.0	10/27/2016 08:10	10/28/2016 01:55	3563325
CCC	SS-2-Bromopropionic acid	552.2	N/A	---		5.1285	5.0	ug/L	103	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 06:12	3572905
CCC	Dibromoacetic acid	552.2	1.0	---		18.8014	20.0	ug/L	94	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 06:12	3572905
CCC	Dichloroacetic acid	552.2	1.0	---		19.4309	20.0	ug/L	97	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 06:12	3572905
CCC	Monobromoacetic acid	552.2	1.0	---		18.5154	20.0	ug/L	93	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 06:12	3572905
CCC	Monochloroacetic acid	552.2	2.0	---		42.9545	40.0	ug/L	107	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 06:12	3572905
CCC	Trichloroacetic acid	552.2	1.0	---		24.0089	20.0	ug/L	120	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 06:12	3572905
CCC	IS-1,2,3-Trichloropropane	552.2	N/A	---		134474	145371	ug/L	93	70 - 130	---	---	1.0	10/27/2016 08:10	10/28/2016 06:12	3572905

Sample Type Key

Type (Abbr.)	Sample Type	Type (Abbr.)	Sample Type
CCC	Continuing Calibration Check		
CCL	Continuing Calibration Low		
FS	Field Sample		
LMB	Laboratory Method Blank		

END OF REPORT

AAA Chain of Custody

Custody form MUST be signed

Please provide as much information as possible

ARS Aleut Analytical
formerly Analytica Group

Anchorage Laboratory
4307 Arctic Blvd
Anchorage, AK 99503
907.258.2155
907.258.6634 fax

Mat-Su Service Center
701 East Parks Highway #203
Wasilla, AK 99654
907.373.5440

Fairbanks Laboratory
475 Hall Street
Fairbanks, AK 99701
907.456.3116
907.456.3125 fax

ARS Corporate Office
2609 North River Road
Port Allen, LA 70767
225.381.2991
225.381.2996 fax

Sampling Event ID:

Client/Company Name & Address: City of Wrangell, Box 531, Wrangell, AK 99929

Contact Person: Wayne McClelland

Phone No:

Fax No:

E-mail:

Public Water System (PWS) ID: 120143

Project Name: ~~120143~~ Pilot Plant

Turnaround Time (TAT) for Results

☐ Standard ☑ **Expedited** (prior authorization required for < 10 days)

please specify due date below; additional charges may apply

Requested Date for Results: as soon as practical

Results to STATE: ☐ Yes ☑ No ☐ Routine ☑ Non-Routine

Section To Be Completed by AAA

Quote Number:

LGN: A1610137

Account #: Check Credit

Invoice Contact Name & Address & Phone:

PO/Contract No.:

Special Instructions/Requirements:
special purpose
Langelier Index - pH = 24 Hour HoldTime

Kit Preparation/Shipping Charge: $12.00

Requested Analysis/Method

	Client Sample Identification (Name, Designation, Location, etc.)	Date Sampled	Time Sampled	Matrix (Aqueous, DW-Drinking Water, WW-Waste Water, Soil/Solid, Other)	No. of Containers	Langelier Index Preservative Lot#	200.7 ICP Preservative Lot#	HAA5 DBP Preservative Lot#	DOC Preservative Lot#	Preservative Lot#	Preservative Lot#	Field Preserved	Field Filtered	Use for MS/MSD	Comments
1	Raw Water	10-6	06:35	DW	1	X									
2	Daf Basin		07:05	DW	1	X									
3	Filtrate		07:05	DW	1	X									
4	~~Raw~~ Raw Water		06:35	DW	1		X								
5	Daf Basin		07:05	DW	1		X								
6	Filtrate		~~06:35~~ 7:05	DW	1		X								
7	Raw water		06:35	DW				X							
8	Daf Basin		07:05	DW				X							
9	Filtrate		07:05	DW				X							
10	Raw water		06:35	DW					X						

Relinquished by:	Date	Time	Received by:	Date	Time
Wayne McClelland	10-6	~~12:6~~ 9:45	DHL	10-7-16	8:10am
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Name of Sampler: (printed)					

Section To Be Completed by AAA

Condition of Custody Seal: (Intact) Broken Absent

Receiving location: ANCH

Temperature on arrival: 2.C °C ___ °C

Thermometer ID # 71213 Measurement method: (Temp Blank) Other

Shipping method/Tracking number: Courier

Version 4.0 April 2016

page ___ of ___

AAA Chain of Custody

Custody form MUST be signed

Please provide as much information as possible

ARS Aleut Analytical
formerly Analytica Group

Anchorage Laboratory
4307 Arctic Blvd
Anchorage, AK 99503
907.258.2155
907.258.6634 fax

Mat-Su Service Center
701 East Parks Highway #203
Wasilla, AK 99654
907.373.5440

Fairbanks Laboratory
475 Hall Street
Fairbanks, AK 99701
907.456.3116
907.456.3125 fax

ARS Corporate Office
2609 North River Road
Port Allen, LA 70767
225.381.2991
225.381.2996 fax

Sampling Event ID:

Appendix C
City and Borough of Wrangell
CRW Engineering Group, LLC
Dec 2018
107 of 112

Client/Company Name & Address:
Wrangell (City of)
Box 531
Wrangell, AK 99929

Contact Person: Wayne McMillan
Phone No: 907 660 7093
Fax No: 907 874 4207
E-mail: wrg.wtr@aptalaska.net

Public Water System (PWS) ID: 120413

Project Name: 120413 Pilot Plant

Turnaround Time (TAT) for Results

☐ Standard ☑ **Expedited** (prior authorization required for < 10 days)
please specify due date below; additional charges may apply

Requested Date for Results: 6S Business Practice

Results to STATE: ☐ Yes ☑ No ☐ Routine ☑ Non-Routine

Special Instructions/Requirements:
Special Purpose

Section To Be Completed by AAA

Quote Number:
LGN: A1610137 A1610140 w lowrite
Account #: Check Credit

Invoice Contact Name & Address & Phone:

PO/Contract No.:

Kit Preparation/Shipping Charge:

Requested Analysis/Method

	Client Sample Identification (Name, Designation, Location, etc.)	Date Sampled	Time Sampled	Matrix (Aqueous, DW-Drinking Water, WW-Waste Water, Soil/Solid, Other)	No. of Containers	DOC Preservative Lot#	UV 254 Preservative Lot#	TOC Preservative Lot#	Fe, Mn, HNO3 Preservative Lot#	Preservative Lot#	Preservative Lot#	Field Preserved	Field Filtered	Use for MS/MSD	Comments
1	Daf Basm	10-6	07:05	DW	1	X									
2	Filtrate		07:05	DW	1	X									
3	Raw water		06:35	DW	1		X								
4	Daf Basm		06:35	DW	1		X								
5	Filtrate		07:05	DW	1		X								
6	Raw ~~Daf Basm~~		06:35	DW	1			X							
7	Daf Basm		07:05	DW	1			X							
8	Filtrate		07:05	DW				X							
9	Raw water		06:35	DW					X						
10	Daf Basm		07:05	DW					X						

Relinquished by:	Date	Time	Received by:	Date	Time
Wayne McMillan	10-6	09:45	D&P Phlf	10-7-16	8:10 AM
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Name of Sampler: (printed)

Section To Be Completed by AAA

Condition of Custody Seal: (Intact) Broken Absent

Receiving location: ANC

Temperature on arrival: 2.6 °C ____ °C

Thermometer ID # 72213 Measurement method: (Temp Blank) Other

Shipping method/Tracking number: Alert

Version 4.0 April 2016

Analytica Chain of Custody Form

ANALYTICA GROUP ®

12189 Pennsylvania St.
Thornton, CO 80241
(303) 469-8868
(303) 469-5254 fax

4307 Arctic Boulevard
Anchorage, AK 99503
(907) 258-2155
(907) 258-6634 fax

475 Hall St.
Fairbanks, AK 99701
(907) 456 - 3116
(907) 456-3125 Fax

5438 Shaune Drive
Juneau, AK 99801
(907) 780-6668
(907) 780-6670 fax

Page _____ of _____

Chain of Custody No: 79440

Client Name & Address:
City of Wrangell
Box 531
Wrangell, AK 99929

Report to: Wayne McClelland
Phone No: 907 660 2083
Fax No: 907 874 4207
E-mail: wrgwtfo@ptaksta.net

Special Instructions/Comments:
Special purpose

Public Water System (PWS) ID#: 120143

Project Name:
Pilot Plant

Turnaround Time for Results (TAT)
___ Standard
_✓_ Expedited (< 10 days, prior authorization required)
(please specify due date below; add'l charges may apply)

Requested Due Date for Results: AS soon as practical

Section To be Completed by Analytica
Quote ID:
LGN: A1610137
Account #:
Cash
Credit Card

Invoice to Name & Address:

P.O. or Contract No:

Kit Prep/Shipping Charge: $

Requested Analysis/Method

Client Sample Identification / Location	Date Sampled	Time Sampled	Matrix (S-DW-WW-Other)	No. of Containers	Fe, Mn, Hard Lot# Pres	True Color Lot# Pres	Alkalinity Lot# Pres	Langlier Ind Lot# Pres	LT - Metals-CO Lot# Pres	Lot# Pres	Lot# Pres	Field Preserved	Field Filtered	MS/MSD ?
Filtrate	10-6	07:05	DW	1	X									
Raw Water		06:35	DW	1		X								
Daf Basin		07:05	DW	1		X								
Filtrate		07:05	DW	1		X								
Raw Water		06:35	DW	1			X							
Daf Basin		07:05	DW	1			X							
Filtrate		07:05	DW	1			X							
Filtrate		07:05	DW	#				X						
Filtrate		07:05	DW	#					X					

Relinquished by:	Date	Time	Received by:	Date	Time
Wayne McClelland	10-6	09:45	[signature]	10/07/16	8:10 am
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Name of Sampler: (printed)

Section To Be Completed by Analytica

	THO	ANC	JNU	FBKS
Condition of Custody Seal?:		1825		
Initialed By:		DP		
Temp/Loc:		2.6°C		
Thermo ID#:		72213		
Shipped Via:		Courier		

Version 2.0

REQUEST FOR ANALYTICAL SERVICES
Abbreviated Terms and Conditions
(A complete copy of Analytica's General Provision of Sale available upon request)

1. **Payment.** Prepayment is required unless a credit line has been approved in advance. Client agrees to provide Analytica a completed business application, within ten (10) business days of request, but no later than five (5) days prior to work being received, along with any other requested information, in order to establish an approved credit line. For Clients with approved credit, Analytica will submit invoices upon completion of the scheduled work. Invoices(s) are due and payable upon receipt. Balances remaining unpaid 30 days after invoice date shall accrue interest at 1.5% per month (18% per annum). Analytica shall receive payments for the Services in accordance with the amount(s) listed in the prevailing general rate, or Quotation provided when applicable. Client shall be required to pay Analytica's invoice, regardless of reimbursement from their Client, and the final billing will be based upon the actual work performed, pursuant to the samples and documents submitted at the time of receipt. If Analytica engages legal counsel to enforce its rights of payment or any other rights under the parties' Agreement, Client will be liable for all costs incurred by Analytica, including reasonable attorney fees.

2. **Schedule and Delays.** Client shall notify Analytica by telephone, and confirm in writing within one (1) business day, upon any event or condition impairing Client's ability to meet the parties' agreed time schedule. Such notifications shall include any proposed revisions to the schedule. Delays caused by matters outside of Client's control shall be excusable, but Analytica's work shall be compensable under paragraph 1. If any contract outside this Agreement imposes the risk of penalties or liquidated damages or other damages on the Client for delays, and to the extent such penalties or damages are imposed on the Client for reasons other than delays within Analytica's control, Client waives all rights to seek reimbursement from Analytica. No other claim for reimbursement from Analytica will be permitted unless Analytica has been expressly advised (in writing) of the potential penalties or damages at the time the parties agree upon a schedule, and all such claims are subject to the limits of paragraph 5 herein.

3. **Warranties.** Analytica agrees to perform the Services in substantial conformity with applicable regulations and/or other written specifications supplied by the Client assuming those written specifications were supplied prior to samples being received. Services performed by Analytica will be conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession in the same locality under similar conditions. The capacity of the laboratory is allocated to work received, not to work quoted. Work quoted is not a guarantee to perform services and, therefore, advance notification of sample arrival is highly recommended. Analytica agrees all Services, including but not limited to, all deliverable(s) supplied in connection with the performance of the Services, found to be defective (defined as unusable) will be reperformed, replaced, or repaired, to the Client's satisfaction and at Analytica's expense. ***No other warranties, either express or implied, including warranties of fitness, shall apply to any service performed by Analytica or any report, opinion, document or other item produced by Analytica.*** Analytica will not be liable for consequential damages, resampling costs, or similar Client expenses unless these costs are caused as a direct result of Analytica's negligence. Analytica's total liability to Client for any and all injuries, claims, losses, expenses or damages whatsoever arising out of or in any way related to the Services from any cause or causes, including but not limited to Analytica's negligence, errors, omissions, strict liability, breach of contract or breach of warranty shall not exceed the total dollar amount or value of the specific Services performed. Third party acts of negligence, errors or omissions, or a Client submitting samples with less than ½ holding time remaining, will release Analytica from liability for any reimbursement.

4. **Changes and Additional Compensation.** No changes to this agreement and no changes to the scope of any work will be allowed unless an authorized representative or officer of Analytica specifically agrees to the changes in writing. Client agrees to provide written notice of any requested changes in the scope of work and to reasonably compensate Analytica for any work completed prior to the change request. This written notice shall be provided by a representative of the Client that has the authority to approve both changes to the scope of work and the associated charges that may be incurred. Names of such representatives should be made available at the time the order is formalized. Changes, such as substantial differences in sample quantities, may impact costs and turnaround time commitments previously made by Analytica, and may result in additional fees. Client's failure to provide written notice as required in this paragraph shall be a waiver of Client's right to dispute any work performed.

5. **Sample Kits.** Sample kits and/or bottles will be supplied free of charge as long as samples are received by Analytica for billable analyses, paid for in advance as a supply or Client is enrolled in a program that includes sample kits. Analytica will provide sample kits, such as sample containers, labels, Chain of Custody forms, custody seals, etc., shipped to one location via regular ground transportation methods upon request. Client agrees to allow 2-3 working days (from the date of Client's request) for Analytica to ship sample kits. Rush delivery charges, including but not limited to, expedited freight charges or administrative fees may be charged by Analytica for any requests requiring expedited processing. A bottle deposit of $2.00 per bottle may be charged when sample kit shipment is made and subsequently refunded when a bottle is returned containing a sample. *Sample kits, including bottles, not used by Clients are not returnable and charges will not be refunded.*

6. **Holding Times/Expedited Turnaround Times.** Analytica will initiate sample preparation and/or analysis within the regulated holding time provided samples are received with not less than 1/2 the prescribed holding time remaining. If samples are received outside these parameters, Analytica will make a reasonable effort to meet the holding time. Additionally, expedited turnaround surcharges will be applied to cover additional cost and capacity utilization. Client agrees to indemnify and hold harmless Analytica from any and all claims, including but not limited to, expenses, fines, fees, penalties, resampling costs, etc., resulting from missing a regulated holding time if Client has provided samples outside the stated parameters. Client also agrees to provide a minimum 24 hours advance notification to Analytica of sample arrival requiring expedited processing.

7. **Normal Hours of Operation and Sample Receipt.** Analytica maintains normal business hours of 8a.m. to 5p.m., Monday through Friday. In observance of recognized holidays, Analytica is closed for business on the following days: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, the day after Thanksgiving and Christmas Day and as required by any governmental agency having jurisdiction. Unless contractually arranged, Client agrees to contact Analytica in advance to schedule any sample acceptance and/or analysis during times outside of normal business hours. Expedited turnaround surcharges may be applied. Samples received after 2 p.m. on normal business days may not be formally accepted until the next business day (12pm for AK locations). Normal business days are used for turnaround time calculations. Weekends, holidays, and after-hours may require expedited turnaround charges. Samples specifically requested or required by the Client to be analyzed or received outside of Analytica's normal business hours may be subject to an additional fee of $330.00 plus any applicable surcharges. Client agrees to indemnify and hold harmless Analytica from any and all claims, including but not limited to, expenses, fines, fees, penalties, resampling costs, etc., resulting from missing a regulated holding time if Client has provided samples outside the stated parameters.

8. **Non-Standard and Analytical Complications.** In order to process non-standard or complicated work, special procedures may be required. These procedures may include special handling, non-standard methods, dilutions, etc., and may be subject to additional charges. Analytica will notify Client of any analytical complexities requiring special procedures, multiple re-runs, special handling, etc. due to complicated or extremely contaminated samples or matrices. Additional charges will be discussed at the time of notification. Non-authorization of special procedures by the Client may result in the work not being processed in the prescribed time or not processed at all. Multi-phased samples will be processed and charged as separate samples.

9. **Equipment/Rinsate, Bottle Blanks or Trip Blanks.** Analytical methods requiring various field blank samples such as Equipment/Rinsate Blanks or Bottle Blanks will not be supplied by Analytica unless Client specifically requests otherwise. Consistent with most Quality Programs, Trip Blank samples will be routinely supplied by Analytica unless Client specifically requests otherwise. Trip Blank samples will be received (contained in a cooler), analyzed and billed as an additional sample, unless prior agreements have been made in writing.

10. **Sample Disposal.** Ownership of residual Client samples is retained by the Client and is not transferred to Analytica when samples are received or when sample custody transfers to Analytica. Residual Client samples may be returned to the Client within thirty (30) days after completion of the Services, unless agreed to otherwise in writing. Upon completion of this 30 day term, or upon Client request or by written agreement, Analytica retains the right to dispose of residual Client samples and shall act in a prudent manner in selecting and arranging for the transportation, handling, storage or disposal of hazardous substances or suspected hazardous substances. Analytica will only use insured contractors considered lawful professionals in the disposal of hazardous substances or suspected hazardous substances. Disposal of residual Client samples by Analytica may incur a charge of $10 per sample.

11. **Minimum Orders.** Analytica retains the right to impose a minimum order charge of One-Hundred Dollars ($100.00) on all deliveries, including but not limited to analytical reports, electronic deliveries, supplies, etc.

12. **Turnaround Times (TAT).** Analytica's standard turnaround time varies depending upon the type of analytical service provided. Please consult with your Client Services Representative for details of what is considered standard turnaround time for the Services requested. Expedited TAT surcharges are applied for all work requested and processed sooner than standard turnaround time.

13. **Duplicate/Matrix Spike/Matrix Spike Duplicates.** All Client specified Duplicate (Dup), Matrix Spike (MS) and Matrix Spike Duplicate (MSD) samples will be billed at the general rate or quoted method unit rate, when applicable. Duplicates, Matrix Spike and Matrix Spike Duplicates must be clearly labeled as such on the Chain of Custody form.

COC/02.28.2005

ARS Aleut Analytical
formerly Analytica Group

AAA Chain of Custody

Custody form MUST be signed
Please provide as much information as possible

Anchorage Laboratory
4307 Arctic Blvd
Anchorage, AK 99503
907.258.2155
907.258.6634 fax

Mat-Su Service Center
701 East Parks Highway #203
Wasilla, AK 99654
907.373.5440

Fairbanks Laboratory
475 Hall Street
Fairbanks, AK 99701
907.456.3116
907.456.3125 fax

ARS Corporate Office
2609 North River Road
Port Allen, LA 70767
225.381.2991
225.381.2996 fax

Sampling Event ID:

Client/Company Name & Address:
City of Wrangell
Box 531
Wrangell, AK 99929

Contact Person: Wayne McClelland
Phone No:
Fax No:
E-mail:

Public Water System (PWS) ID: 120143
Project Name: ~~120143~~ Pilot Plant

Turnaround Time (TAT) for Results
☐ Standard ☑ **Expedited** (prior authorization required for < 10 days)
please specify due date below; additional charges may apply
Requested Date for Results: as soon as practical
Results to STATE: ☐ Yes ☑ No ☐ Routine ☑ Non-Routine

Section To Be Completed by AAA
Quote Number: LGN:
Account #: Check Credit
Invoice Contact Name & Address & Phone:

Special Instructions/Requirements:
special purpose
Langelier Index - pH = 24 Hour HoldTime

PO/Contract No.:

Kit Preparation/Shipping Charge: $12.00

Requested Analysis/Method

#	Client Sample Identification (Name, Designation, Location, etc.)	Date Sampled	Time Sampled	Matrix (Aqueous, DW=Drinking Water, WW=Waste Water, Soil/Solid, Other)	No. of Containers	Langelier Index Preservative Lot#	200.7 Ica Preservative Lot#	HAA5 DBP Preservative Lot#	DOC Preservative Lot#	Preservative Lot#	Preservative Lot#	Field Preserved	Field Filtered	Use for MS/MSD	Comments
1	Raw Water	10-6	06:35	DW	1	X									
2	Daf Basin		07:05	DW	1	X									
3	Filtrate		07:05	DW	1	X									
4	Raw Raw Water		06:35	DW	1		X								
5	Daf Basin		07:05	DW	1		X								
6	Filtrate		~~07:05~~ 7:05	DW	1		X								
7	Raw water		~~06:35~~ 06:35	DW				X							
8	Daf Basin		07:05	DW				X							
9	Filtrate		07:05	DW				X							
10	Raw water		06:35	DW					X						

Relinquished by:	Date	Time	Received by:	Date	Time
Wayne McClelland	10-6	~~16:45~~ 9:45	DHPL	10-7-16	5:10am
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Name of Sampler: (printed)					

Section To Be Completed by AAA
Condition of Custody Seal: (Intact) Broken Absent
Receiving location: Anch
Temperature on arrival: 2.5 °C
Thermometer ID # 7L213 Measurement method: ~~Temp Blank~~ Other
Shipping method/Tracking number: Courier

Version 4.0 April 2016

AAA Chain of Custody

Custody form MUST be signed
Please provide as much information as possible

ARS Aleut Analytical
formerly Analytica Group

Anchorage Laboratory
4307 Arctic Blvd
Anchorage, AK 99503
907.258.2155
907.258.8634 fax

Mat-Su Service Center
701 East Parks Highway #203
Wasilla, AK 99654
907.373.5440

Fairbanks Laboratory
475 Hall Street
Fairbanks, AK 99701
907.456.3116
907.456.3125 fax

ARS Corporate Office
2609 North River Road
Port Allen, LA 70767
225.381.2991
225.381.2996 fax

Sampling Event ID:

Client/Company Name & Address:
Wrangell (City of)
Box 531
Wrangell, AK 99929

Contact Person: Wayne MacMillan
Phone No: 907 860 7093
Fax No: 907 874 4207
E-mail: wrg.wtp@aptalaska.net

Public Water System (PWS) ID: 120113
Project Name: 20113 Pilot Plant

Turnaround Time (TAT) for Results
☐ Standard ☒ **Expedited** (prior authorization required for < 10 days)
please specify due date below; additional charges may apply
Requested Date for Results: as soon as practical
Results to STATE: ☐ Yes ☒ No ☐ Routine ☒ Non-Routine

Special Instructions/Requirements:
Special Purpose

Section To Be Completed by AAA
Quote Number: LGN:
Account #: Check Credit
Invoice Contact Name & Address & Phone:
PO/Contract No.:

Kit Preparation/Shipping Charge:

Requested Analysis/Method

	Client Sample Identification (Name, Designation, Location, etc.)	Date Sampled	Time Sampled	Matrix (Aqueous, DW-Drinking Water, WW-Waste Water, Solid/Solid, Other)	No. of Containers	DOC Preservative Lot#	UV 254 Preservative Lot#	TOC Preservative Lot#	Fe, Mn, Diss Preservative Lot#	[illegible] Preservative Lot#	Alkalinity Preservative Lot#	Field Preserved	Field Filtered	Use for MS/MSD	Comments
1	Def Basin	10-6	07:05	DW	1	X									
2	Filtrate		07:05	DW	1	X									
3	Raw water		06:35	DW	1		X								
4	Def Basin		06:35	DW	1		X								
5	Filtrate		07:05	DW	1		X								
6	~~Raw Def Basin~~		06:35	DW	1			X							
7	Def Basin		07:05	DW	1			X							
8	Filtrate		07:05	DW				X							
9	Raw water		06:35	DW					X						
10	Def Basin		07:05	DW					X						

Relinquished by:	Date	Time	Received by:	Date	Time
Wayne MacMillan	10-6	09:45	Dick Pihl	10-7-16	8:10 AM
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Name of Sampler: (printed)

Section To Be Completed by AAA
Condition of Custody Seal: (Intact) Broken Absent
Receiving location: ANC
Temperature on arrival: 2.6 °C
Thermometer ID # 72213 Measurement method: (Temp Blank) Other
Shipping method/Tracking number: Alert

Version 4.0 April 2016

page ____ of ____

Analytica Chain of Custody Form

ANALYTICA GROUP

12189 Pennsylvania St.
Thornton, CO 80241
(303) 469-8868
(303) 469-5254 fax

4307 Arctic Boulevard
Anchorage, AK 99503
(907) 258-2155
(907) 258-6634 fax

475 Hall St.
Fairbanks, AK 99701
(907) 456 - 3116
(907) 456-3125 Fax

5438 Shaune Drive
Juneau, AK 99801
(907) 780-6668
(907) 780-6670 fax

Page _____ of _____

Chain of Custody No: 79440

Client Name & Address:
City of Wrangell
Box 531
Wrangell, AK 99929

Public Water System (PWS) ID#: 120163

Project Name: Pilot Plant

Report to: Wayne McMillan

Phone No: 907 660 2083

Fax No: 907 874 4207

E-mail: wrgwtr@aptalaska.net

Special Instructions/Comments:
Special purpose

Turnaround Time for Results (TAT)
___ Standard ✓ Expedited (< 10 days, prior authorization required)
(please specify due date below; add'l charges may apply)

Requested Due Date for Results: AS soon as practical

Section To be Completed by Analytica
Quote ID: LGN:
Account #: Cash Credit Card

Invoice to Name & Address:

P.O. or Contract No:

Requested Analysis/Method

Kit Prep/Shipping Charge: $

Client Sample Identification / Location	Date Sampled	Time Sampled	Matrix (S-DW-WW-Other)	No. of Containers	Fe, Mn, Hard (Lab Filt)	True Color (Lab Filt)	Alkalinity (Lab Filt)	Langlier Ind (Lab Filt)	CT-Mets/S-CO (Lab Filt)	(Lab Filt)	(Lab Filt)	Field Preserved	Field Filtered	MS/MSD ?
E. Treat	10-6	07:05	DW	1	X									
Raw Water		06:35	DW	1		X								
DAF Basin		07:05	DW	1		X								
E. Treat		07:05	DW	1		X								
Raw Water		06:35	DW	1			X							
DAF Basin		07:05	DW	1			X							
E. Treat		07:05	DW	1			X							
E. Treat		07:05	DW	1				X						
E. Treat		07:05	DW	1					X					

duplicate

Relinquished by:	Date	Time	Received by:	Date	Time
Wayne McMillan	10-6	09:45	[signature]	10/07/16	8:10 AM
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Name of Sampler: (printed)

Section To Be Completed by Analytica

Condition of Custody Seal?:	THO	ANC: yes	JNU	FBKS
Initialed By:		DP		
Temp/Loc:		2.6°C		
Thermo ID#:		72213		
Shipped Via:		Courier		

Version 2.0

Appendix D – Particle Count Analysis

ARS Aleut Analytical, LLC
3710 Woodland Dr. Suite 900 Suite 900
Anchorage, AK 99517
907-258-2155
Fax: 907-258-6634

6/9/2017

City of Wrangell
P.O. Box 531
Wrangell, AK 99929
Attn: Wayne McHolland

Work Order #: A1705153
Date: 6/9/2017
Work ID: Wrangell
Date Received: 5/10/2017

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
A1705153-01	Contact Chamber Effluent		

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Jerry Baker
Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

ARS Aleut Analytical, LLC
Work Order: A1705153

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Standard Methods for the Examination of Water and Wastewater, 22nd Edition, 2012.

SAMPLE RECEIPT:

One (1) sample was received 5/10/2017 5:00 PM at ARS Aleut Analytical - Anchorage. The sample was received in good condition and in order per chain of custody.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN:

A summary of our review is shown below.

All analytical results contained in this report have been reviewed under AAA's internal quality assurance and quality control program. Any deviations in quality control parameters for specific analyses are noted in the following text.

The following is a subcontracted test and has been represented to us as having met criteria:

Test Method: Microscopic Particulate Analysis - MPA - Aqueous

ARS Aleut Analytical, LLC
3710 Woodland Dr. Suite 900 Suite 900
Anchorage, AK 99517
Phone: 907-258-2155
Fax: 907-258-6634

City of Wrangell
Attn: Wayne McHolland
P.O. Box 531
Wrangell, AK 99929
907-874-4212
Fax: 907 874-3952 or 874-4207

Client Sample ID: Contact Chamber Effluent

Client Project: Wrangell
Sample Matrix: Aqueous

Report Date: 6/9/2017
Receipt Date: 5/10/2017
Sample Date: 5/10/2017
Sample Time: 8:30:00AM
Collected By: WM

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D =Sample Dilution Required
** = RL higher than MCL; target not detected
TNC = Too Numerous to Count - result rejected
CF = Confluent Growth - result rejected
TCNG = Turbid Culture No Growth - rejected

Lab#: A1705153-01A

Analysis Method Parameter	Result	Units	Flags	MRL	MCL	Dil Factor	Prep Date	Analysis Date	Analyst
MPA-EPA910992029 (Aqueous) - MPA									*Test was conducted by: Microlabs NW*
See Subcontractor Report	**0.0**		NA	1.0					

Microlab Northwest LLC
0 0th PL N . Redmond WA 0
Phone . .
Web www.Microlabnw.com
Mail Russ.c microlabnw.com

Report 212-17
Date June 8, 2017

LABORATORY REPORT

Ann West
ARS International
3710 Woodland Dr., Suite 900
Anchorage, AK 99503

P N (907) 371-9548 **FA** **MA L** Datareport@amrad.com
SU C Particle Identification
SP C M N Water Sample
R F R NC EPA 910 Microscopic Analysis of Particles

N R DUC N

One one-liter bottle of water was received for analysis. It was designated at A1705153-01A, Chamber Effluent, Location ANC 11. The bottle was agitated and 50 milliliters was filtered through a cellulose ester membrane filter. This is a procedure used for stormwater runoff rather than EPA 910. The EPA 910 requires a large filter sample of the particles collected from 500 to 1000 gallons of water. Particles are then washed from this filter with up to 4 liters of clean distilled water and concentrated with a small aliquot used for the final analysis.

The procedure used here characterizes the dominant particle types but misses the particle types that may be present at low percentages or that are rare in the water volume. The size of the particles was based on the average Feret's diameter.

R SUL S

The dominant particle type in this sample, 93%, was casts from siderophillic bacteria. This included primarily Leptothrix and Gillionella. These would be categorized at "Other" and gave an orange color to the filter. The next most common particle type was Ciliates at 5%. Diatoms were about 1% and included Navicular, Pinnularia, Cyclotella, and Cocconeis. Non-diatomaceous algae was at about 1%.

SIZE	<10	10-25	25-100	100-200	>200
# Per 100 mls	33,612,954	415,172	31,632	0	0

These results do not qualify as EPA 910992029 results. As explained above, that would require the submission of a string filter of 500 to 1000 gallons of water from which the particles would be collected and identified. The diatoms present suggest relatively unpolluted water though the amount of siderophillic bacteria indicates that the water source contains ample iron in solution.

Microlab Northwest LLC
0 0th PL N . Redmond WA 0
Phone . .
Web www.Microlabnw.com
Mail Russ.c microlabnw.com

Report 212-17
Date June 8, 2017

C NCLUS N

The diatoms present are typical of "clean" water but the volume of water supplied is not sufficient to assess the presence of detrimental life forms. The EPA 910992029 requires a filtration system on site collecting the particles from 500 to 1000 gallons of water. The filter then needs to be processed within 30 hours to remove the particles, concentrate them, and mount them for analysis. Our laboratory is not prepared to perform this analysis.

Thank you for this opportunity to be of service. If I can provide any further assistance please contact me.

Signed: Russ Crutcher
E. R. Crutcher, Consultant

Scanned

AAA Chain of Custody

Custody form MUST be signed
Please provide as much information as possible

ARS Aleut Analytical
formerly Analytica Group

Anchorage Laboratory	Mat-Su Service Center	Fairbanks Laboratory	ARS Corporate Office
3710 Woodland Dr. Suite 900	701 East Parks Highway #203	475 Hall Street	2609 North River Road
Anchorage, AK 99517	Wasilla, AK 99654	Fairbanks, AK 99701	Port Allen, LA 70767
907.258.2155	907.373.5440	907.456.3116	225.381.2991
907.258.6634 fax		907.456.3125 fax	225.381.2996 fax

Sampling Event ID:

Client/Company Name & Address: City of Wrangell

Public Water System (PWS) ID: 120143

Project Name:

Section To Be Completed by AAA

Quote Number:

LGN: A1705153

Account #: | Check | Credit

Turnaround Time (TAT) for Results

☐ Standard ☐ **Expedited** (prior authorization required for < 10 days)
please specify due date below; additional charges may apply

Requested Date for Results:

Results to STATE: ☐ Yes ☐ No ☐ Routine ☐ Non-Routine

Contact Person: Wayne McHolland
Phone No: 305 1151
Fax No:
E-mail: wrgwtf@apkalaska.net

Invoice Contact Name & Address & Phone:

Special Instructions/Requirements: MPA.
Special Sample

PO/Contract No.:

Kit Preparation/Shipping Charge:

Requested Analysis/Method

	Client Sample Identification (Name, Designation, Location, etc.)	Date Sampled	Time Sampled	Matrix (Aqueous, DW-Drinking Water, WW-Waste Water, Soil/Solid, Other)	No. of Containers	MPA Preservative Lot#	Preservative Lot#	Preservative Lot#	Preservative Lot#	Preservative Lot#	Preservative Lot#	Field Preserved	Field Filtered	Use for MS/MSD	Comments
1	Contact Chamber Effluent	5.10	08:30	A	1	X									
2															
3															
4															
5															
6															
7															
8															
9															
10															

Relinquished by:	Date	Time	Received by:	Date	Time
			Derick Phillips	5-10-17	17:00
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Name of Sampler: (printed)					

Section To Be Completed by AAA

Condition of Custody Seal: Intact Broken Absent

Receiving location: Anchorage

Temperature on arrival: 3.2 °C DQ# AAA 5-11-17 °C

Thermometer ID # C1109 Measurement method: Temp Blank Other DQ# 5-11

Shipping method/Tracking number: Courier

Version 6.0 April 2017

page ____ of ____

City and Borough of Wrangell
Appendix D
6 of 6
CRW Engineering Group, LLC
Dec 2018

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

Reply to
Attn Of: OWW-130

MAY 2 2 2006

Mr. Robert B. Caldwell
Public Works Superintendent
City of Wrangell
Box 531
Wrangell, Alaska 99929

Re: Renewal of National Pollutant Discharge Elimination System (NPDES) Permit For the City of Wrangell WWTP; NPDES Permit No. AK-002146-6

Dear Mr. Caldwell:

The Environmental Protection Agency (EPA) received the above referenced NPDES application materials on May 1, 2006. We have determined your application to be timely and complete. According to federal regulation 40 CFR 122.6(a), when a timely and complete application is received by EPA, and, through no fault of the permittee, EPA does not reissue a new permit prior to the expiration date of the existing permit, then the permit remains fully effective and enforceable. Accordingly, the NPDES permit for the Wrangell Wastewater Treatment Plant will be administratively extended if the permit is not re-issued by January 8, 2007.

Please note that EPA may request additional information during the development of the draft permit to clarify, modify, or supplement previously submitted material. If you have any questions, please contact Lisa Olson at (206) 553-0176.

Sincerely,

Michael J. Lidgard, Manager
NPDES Permits Unit

Permit No.: AK-002146-6

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

AUTHORIZATION TO DISCHARGE
UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, 33 U.S.C. §1251 et seq., as amended by the Water Quality Act of 1987, P.L. 100-4, the "Act", the

The City of Wrangell
Wastewater Treatment Plant

is authorized to discharge from a facility located at **Wrangell, Alaska** (latitude: 56° 27' 10"; longitude: 132° 22' 40")

to receiving waters named **Zimovia Strait**,

in accordance with the discharge point, specific limitations, monitoring requirements, management practices and other conditions set forth herein.

This permit shall become effective January 7, 2002.

This permit and the authorization to discharge shall expire at midnight, January 8, 2007.

Signed this 4th day of. December 2001.

Randall F. Smith, Director
Office of Water, Region 10
U.S. Environmental Protection Agency

TABLE OF CONTENTS

I. SPECIFIC LIMITATIONS AND REQUIREMENTS

A. Effluent Limitations

1. During the effective period of this permit, the permittee is authorized to discharge from outfall 001, subject to the restrictions set forth herein. This permit does not authorize the discharge of any waste streams, including spills and other unintentional or non-routine discharges of pollutants, that are not part of the normal operation of the facility as disclosed in the permit application, or any pollutants that are not ordinarily present in such waste streams.

2. There shall be no discharge of floating solids, visible foam, or oily wastes which produce a sheen on the surface of the receiving water.

3. The pH shall not be less than 6.5 standard units nor greater than 8.5 standard units.

4. Dissolved Oxygen shall not be less than 2.0 mg/L nor greater than 17.0 mg/L.

5. The following effluent limits shall apply at all times:

Table 1. EFFLUENT LIMITATIONS

Effluent Parameter	Unit of Measurement	Monthly Average	Maximum Daily
Flow	million gallons/day	0.6	3.6
Five day Biochemical Oxygen Demand (BOD_5)	mg/L	120*	200
	lbs/day	601	1001
Total Suspended Solids (TSS)	mg/L	140*	200
	lbs/day	701	1001
Fecal Coliform Bacteria	colonies/100 mL	1.0×10^5	1.5×10^5
Total Residual Chlorine**	mg/L	---	0.1

* The average monthly percent removal shall be greater than or equal to 30%
** This limit will only apply if chlorination is used for disinfection.

B. Monitoring Requirements

1. Annual Reporting

In addition to the monthly Discharge Monitoring Report (DMR) required under Part II.C. of this permit, an annual written report, covering the previous calendar year, shall be submitted to Environmental Protection Agency (EPA) by **January 15** of each year. The annual report shall contain summaries of the receiving water quality monitoring data, and

any sediment analyses or bioaccumulation results if required in the previous year. In addition to summarizing the data, the permittee shall also evaluate and interpret data in relation to the magnitude and ecological significance of observed changes in the parameters measured. Potential changes in water quality, sediment chemistry, and biological parameters over time and with distance from the outfall, shall be addressed. All reports will address compliance with water quality standards by using appropriate descriptive and statistical methods to test for and to describe any impacts of the effluent on water quality.

2. Influent and Effluent Monitoring Requirements

During the effective period of this permit, the following monitoring requirements shall apply:

Table 2. INFLUENT/EFFLUENT MONITORING REQUIREMENTS

Effluent Parameter[1]	Sample Location	Sample Frequency	Sample Type
Flow, mgd	effluent	continuous	recorder
Five day Biochemical Oxygen Demand (BOD_5), mg/L	influent & effluent[2]	1/week[3]	24-hour composite
Total Suspended Solids (TSS), mg/L	influent & effluent[2]	1/week[4]	24-hour composite
pH, s.u.[5]	effluent	1/week	grab
Fecal Coliform Bacteria, colonies/100ml	effluent	1/month	grab
Total Ammonia as N, mg/L	effluent	1/quarter	24-hour composite
Temperature, °C	effluent	1/week	grab
Dissolved Oxygen (DO), mg/L	effluent	1/week	grab
Total Residual Chlorine[6]	effluent	1/month	grab

Notes:

1 If the discharge concentration falls below the method detection limit (MDL), the permittee shall report the effluent concentration as "less than {numerical MDL}" on the DMR. Actual analytical results shall be reported on the DMR when the results are greater than the MDL. For averaging, samples below the MDL shall be assumed equal to zero. The permittee shall report the number of non-detects for the month in the "comments section" of the DMR.

2 Influent and effluent sampling is required. Samples shall be collected during the same 24-hour period. The percent removal for BOD_5 and TSS shall be reported on each monthly DMR.

3 Sampling for BOD reverts to monthly after the new treatment plant achieves 12 consecutive months at full compliance with BOD effluent limitations and percent removals.

4 Sampling for TSS reverts to monthly after the new treatment plant achieves 12 consecutive months at full compliance with TSS effluent limitations and percent removals.

5 The permittee shall report the number of pH excursions during the month with the DMR for that month.

6 Monitoring is required only if chlorination is used for disinfection.

Influent and effluent monitoring results shall be reported monthly as specified in Part II.C. (Reporting of Monitoring Results). Quarterly reporting of ammonia shall be included in the DMRs for April, July, October and January (none due in January 2002).

3. Receiving Water Quality Monitoring Requirements

The permittee shall implement the receiving water quality monitoring program as described below. The primary objectives of this program are: a) to assess compliance with the water quality standards and the criteria in Section 301(h) of the Act; b) to assess whether changes in permit conditions are warranted; and c) to provide data for evaluating the reissuance of this permit.

Sampling stations shall be established using an electronic navigational aid to ensure that the same sampling stations are occupied during subsequent sampling events. In addition, efforts shall be made to prevent the sampling vessel from drifting off the sampling site.

Table 3 Ambient Monitoring Requirements

Parameter.	Station Location[1]	Depth	Monitoring Frequency
Turbidity, nephelometric turbidity units (NTU)	1000 feet NW of ZID 1000 feet SE of ZID <5m NW of ZID boundary <5m SE of ZID boundary	surface, mid-depth, and bottom	Annually in August or September
Secchi Disk Depth	1000 feet NW of ZID 1000 feet SE of ZID <5m NW of ZID boundary <5m SE of ZID boundary	surface waters only	Annually in August or September
Dissolved oxygen, mg/L	1000 feet NW of ZID 1000 feet SE of ZID <5m NW of ZID boundary <5m SE of ZID boundary	surface, mid-depth, and bottom	Annually in August or September
pH, s.u.	1000 feet NW of ZID 1000 feet SE of ZID <5m NW of ZID boundary <5m SE of ZID boundary	surface, mid-depth, and bottom	Annually in August or September
Salinity, ppt	1000 feet NW of ZID 1000 feet SE of ZID <5m NW of ZID boundary <5m SE of ZID boundary	every 3 m (w/one station at outfall depth)	Annually in August or September
Temperature, °C	1000 feet NW of ZID 1000 feet SE of ZID <5m NW of ZID boundary <5m SE of ZID boundary	every 3 m (w/one station at outfall depth)	Annually in August or September

Parameter	Station Location[1]	Depth	Monitoring Frequency
Total Ammonia as N, mg/L	1000 feet NW of ZID 1000 feet SE of ZID <5m NW of ZID boundary <5m SE of ZID boundary	surface waters only (above 1.0 m)	Annually in August or September
Fecal coliform, #/100ml	NW of outfall at MZ boundary SE of outfall at MZ boundary <5m NW of ZID boundary <5m SE of ZID boundary	surface waters only (above 15-30 cm)	April, June , August, November[2]
Fecal coliform, #/100ml	At low tide or when a minus tide coincides with peak daily flow: Station 1: 1.5 m from shore along length of outfall Stations 2 & 3: 91 m to either side of station 1. Stations 4 & 5: where 1600m MZ touches the shoreline Area A: 1.5 m from shore (See map in Appendix A)	surface waters only (above 15-30 cm)	Monthly May through August for the life of the permit

Notes:
1 Reference stations should be located at sites where water depth is equivalent to the outfall depth.
2 Monitoring may be decreased after two years to once per year (in August or September) if the results indicate that discharge has not caused Water Quality Standards (WQS) to be exceeded outside the mixing zone.

Sampling shall be done according to the above schedule and submitted in the Annual Report.

4. Biological Monitoring for Benthic Infauna and Sediment Analyses

Sediment analyses for total volatile solids (TVS) and a benthic survey shall be conducted at least once during the life of this permit. The sampling shall be coordinated, to the extent practicable, with the sampling times for the water quality monitoring program and may be conducted during maintenance dives. Samples shall be collected from the following five stations:

- the southeastern and northwestern boundary of the ZID,
- inside the ZID near the middle of the diffuser,
- and two reference stations at least 1000 feet northwest and southeast of the outfall.

One benthic sample and two TVS samples shall be collected at each station.

If sediment samples are collected from gravel or cobble substrates, analyses for TVS shall be done on the finer size fractions (silt and clay fractions, combined).

Benthic samples shall be stored. Analyses may be required if the EPA determines that substantial changes have occurred in TVS content of the sediments around the outfall. The stored samples for benthic community analysis shall be inspected every two to three months and any alcohol which has evaporated from the jars shall be replaced.

Data analyses for TVS shall be presented in the annual written report as mean values and standard deviations by stations.

5. Monitoring Program Plan including Quality Assurance Requirements

   a. Within **120 days of the effective date of this permit**, the permittee shall complete and implement a Monitoring Program Plan that includes a Quality Assurance/Quality Control (QA/QC) program.

      This plan shall address the details of:

      - all monitoring procedures (e.g., methods to insure adequate preservation of composite samples, methods of station location and relocation, identification of sampling equipment),
      - monitoring objectives,
      - specific QA/QC procedures including the method detection limits and precision requirements that will insure that program objectives are met,
      - how data will be used to evaluate the monitoring objectives,
      - name(s), address(es), and telephone number(s) of the laboratories, used by or proposed to be used by the permittee, and
      - other activities designed to achieve data quality goals for the monitoring programs.

   b. The document, *Guidance for Preparation of Quality Assurance Project Plans*, EPA, Region 10, Quality and Data Management Program, QA/G-5, may be used as a reference guide in preparing the QA/QC program. This document is available at www.epa.gov/r10earth/offices/oea/qaindex.htm.

   c. The permittee shall amend the Monitoring Program Plan whenever there is a modification in the sample collection, sample analysis, or other conditions or requirements of the plan.

   d. Copies of the Monitoring Program Plan shall be kept on site and shall be made available to EPA and ADEC upon request.

C. Non-industrial Source Control Program

Section 301(h) regulations require that the permittee implement a public education program designed to minimize the entrance of nonindustrial toxic

pollutants and pesticides into its POTW. Elements of the public education program shall include:

- development and dispersement of information containing non-hazardous alternatives to hazardous household products and pesticides;

- proper and free disposal of hazardous wastes in local newspapers including disposal guidelines specifying what toxic pollutants can and cannot be discharged to the sewer system; and

- Signs shall be placed on the shoreline near the fecal coliform mixing zone and the outfall line. The signs shall state that primary treated domestic wastewater is being discharged, that mixing zones exist, and certain activities, such as the harvesting of shellfish for raw consumption and bathing, should not take place within the mixing zone. The sign shall also have the name and owner of the facility, approximate location and size of the mixing zone and give a facility contact phone number for additional information a sign placed on the shoreline, near the mixing zone and outfall line that states that primary treated domestic wastewater is being discharged, that mixing zones do exist and that certain activities should not take place within the mixing zones. The signs shall also include the approximate location and size of the mixing zones and give a facility. An outfall sign must also be placed at the beach designated as a shellfish collection area. The sign shall state that the consumption of raw shellfish is not advised along with the advice of steaming shellfish for 4 - 9 minutes, discarding shellfish that do not open after steaming.

  An annual report on the nonindustrial source control program shall be submitted by **January 15th** of the following year. This report shall summarize the actions taken, and their effectiveness, to control nonindustrial sources of toxic pollutants and pesticides.

D. Operation and Maintenance Plan

1. Within **180 days after the effective date** of this permit, the permittee shall review/develop and implement its operation and maintenance (O&M) plan and ensure that it includes appropriate best management practices (BMPs); the plan must be reviewed annually thereafter. BMPs include measures that prevent or minimize the potential for the release of pollutants to the Zimovia Strait. The O&M Plan shall be retained on site and made available to EPA and ADEC upon request.

2. The permittee shall develop a description of pollution prevention measures and controls appropriate for the facility. The appropriateness and priorities of controls in the O&M Plan shall reflect identified potential sources of pollutants at the facility. The description of BMPs shall address, to the extent practicable, the following minimum components:

- Spill prevention and control;
- Optimization of chemical usage;
- Preventive maintenance program;
- Minimization of pollutant inputs from industrial users;
- Research, develop and implement a public information and education program to control the introduction of household hazardous materials to the sewer system; and
- Water conservation.

E. Design Criteria Requirement

The design flow criteria for the permitted facility is 0.6 mgd. Each month, the permittee shall compute an annual average value for flow entering or exiting the facility based on the previous twelve months data. If the average annual value exceeds 85% of the design criteria value, the permittee shall notify EPA and develop a facility plan and schedule within **one year from the date of first reaching the annual average flow of 0.51 mgd**. The plan must include the permittee's strategy for continuing to maintain compliance with effluent limits and will be made available to the Director, ADEC or an authorized representative upon request.

II. MONITORING, RECORDING, AND REPORTING REQUIREMENTS

A. Representative Sampling. Samples taken in compliance with the monitoring requirements established under Part I shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge. In order to ensure that the effluent limits set forth in this permit are not violated at times other than when routine samples are taken, the permittee shall collect additional samples whenever any discharge occurs that may reasonably be expected to cause or contribute to a violation that is unlikely to be detected by a routine sample. The permittee shall analyze the additional samples for those parameters limited in Part I.A. of this permit that are likely to be affected by the discharge.

The permittee shall collect such additional samples as soon as the spill, discharge, or bypassed effluent reaches the outfall. The samples shall be analyzed in accordance with paragraph II.B ("Monitoring Procedures"). The permittee shall report all additional monitoring in accordance with paragraph II.D ("Additional Monitoring by the Permittee").

B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under 40 CFR 136, unless other test procedures have been specified in this permit or alternate methods have been approved by the EPA Water Office Director.

C. Reporting of Monitoring Results. Monitoring results shall be summarized each month on the DMR form. The reports shall be submitted monthly and are to

be postmarked by the 15th day of the following month. Legible copies of these, and all other reports, shall be signed and certified in accordance with the requirements of Part IV.I. Signatory Requirements, and submitted to the Director, Office of Water and the State agency at the following addresses:

original to: United States Environmental Protection Agency
Region 10
NPDES Compliance Unit
1200 Sixth Avenue, OW-133
Seattle, Washington 98101
(206) 553-1280 fax

copy to: Alaska Department of Environmental Conservation
Division of Air and Water Quality
410 Willoughby Avenue, Suite 303
Juneau, Alaska 99709
(907) 465-5300
fax: 465-5274
May be submitted via scanned (.pdf, .bmp or .tif) document to:
wq_permit@envircon.state.ak.us

D. Additional Monitoring by the Permittee. If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the permittee must include the results of this monitoring in the calculation and reporting of the data submitted in the DMR.

Upon request by the Director, the permittee must submit results of any other sampling, regardless of the test method used.

E. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements,
2. The individual(s) who performed the sampling or measurements,
3. The date(s) analyses were performed,
4. The individual(s) who performed the analyses,
5. The analytical techniques or methods used, and
6. The results of such analyses.

F. Retention of Records. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the

application for this permit, for a period of at least **three years** from the date of the sample, measurement, report, or application. This period may be extended by request of the Director at any time. Data collected on-site, copies of DMRs, and a copy of this NPDES permit must be maintained on-site during the duration of activity at the permitted location.

G. Twenty-four Hour Notice of Noncompliance Reporting

1. The permittee must report the following occurrences of noncompliance by telephone within 24 hours from the time the permittee becomes aware of the circumstances:

   a. any noncompliance that may endanger health or the environment;

   b. any unanticipated bypass that exceeds any effluent limitation in the permit (See Permit Part III.G., "Bypass of Treatment Facilities");

   c. any upset that exceeds any effluent limitation in the permit (See Permit Part III.H., "Upset Conditions");

   d. any violation of a maximum daily discharge limitation for any of the pollutants in Table 2 of Permit Part I.A. requiring 24-hour reporting; or

   e. any sanitary sewer overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limitation in the permit.

2. The permittee must also provide a written submission within five days of the time that the permittee becomes aware of any event required to be reported under Permit Part II.G.1., above. The written submission must contain:

   a. a description of the noncompliance (including location) and its cause;

   b. the period of noncompliance, including exact dates and times;

   c. the estimated time noncompliance is expected to continue if it has not been corrected;

   d. steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance; and

   e. if the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated flow.

3. The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the NPDES Compliance Hotline in Seattle, Washington, by telephone, (206) 553-1846.

4. Reports must be submitted to the addresses in Permit Part II.C. ("Reporting of Monitoring Results").

H. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.C. are submitted. The reports shall contain the information listed in Part II.E.

I. Inspection and Entry. The permittee shall allow the Director or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit,

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit,

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, and

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

III. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for: enforcement action; permit termination, revocation and re-issuance, or modification; or denial of a permit renewal application. The permittee shall give advance notice to the Director and ADEC of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions

1. Civil and Administrative Penalties. Any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act shall be subject to a civil or administrative penalty, not to exceed

the maximum amounts authorized by Sections 309(d) and 309(g) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note).

2. Criminal Penalties

   a. Negligent Violations. Any person who negligently violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act shall, upon conviction, be punished by a fine and/or imprisonment as specified in Section 309(c)(1) of the Act.

   b. Knowing Violations. Any person who knowingly violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act shall, upon conviction, be punished by a fine and/or imprisonment as specified in Section 309(c)(2) of the Act.

   c. Knowing Endangerment. Any person who knowingly violates a permit condition implementing Sections 301, 302, 303, 306, 307, 308, 318, or 405 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine and/or imprisonment as specified in Section 309(c)(3) of the Act .

   d. False Statements. Any person who knowingly makes any false material statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under this Act or who knowingly falsifies, tampers with, or renders inaccurate any monitoring device or method required to be maintained under this Act, shall, upon conviction, be punished by a fine and/or imprisonment as specified in Section 309(c)(4) of the Act.

C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize, or prevent, any discharge, or sludge use or disposal, in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed, or used, by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or

auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

F. Removed Substances. Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of waste waters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

G. Bypass of Treatment Facilities

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2 and 3 of this section.

2. Notice

a. Anticipated Bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible, at least **10 days** before the date of the bypass.

b. Unanticipated Bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.G. Twenty-four Hour Notice of Noncompliance Reporting.

3. Prohibition of Bypass

a. Bypass is prohibited and the Director may take enforcement action against a permittee for a bypass, unless:

(1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(3) The permittee submitted notices as required under paragraph 2 of this section.

b. The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determined that it will meet the three conditions listed above in paragraph 3.a. of this section.

H. Upset Conditions

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph 2 of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

2. Necessary upset demonstration conditions. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

a. An upset occurred and that the permittee can identify the cause(s) of the upset,

b. The permitted facility was at the time being properly operated,

c. The permittee submitted notice of the upset as required under Part II.G. Twenty-four Hour Notice of Noncompliance Reporting, and

d. The permittee complied with any remedial measures required under Part III.D. Duty to Mitigate.

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

IV. GENERAL REQUIREMENTS

A. Notice of New Introduction of Pollutants

1. The permittee shall provide adequate notice to the Director, Office of Water, and ADEC of:

a. Any new introduction of pollutants into the treatment works from an indirect discharger which would be subject to Sections 301 or 306 of the Act if it were directly discharging those pollutants, and

b. Any substantial change in the volume or character of pollutants being introduced into the treatment works by a source introducing pollutants into the treatment works at the time of issuance of the permit.

2. For the purposes of this section, adequate notice shall include information on:

   a. The quality and quantity of effluent to be introduced into such treatment works, and

   b. Any anticipated impact of the change on the quantity or quality of effluent to be discharged from such publicly owned treatment works.

B. Control of Undesirable Pollutants. Under no circumstances shall the permittee allow introduction of the following wastes into the waste treatment system:

   1. Wastes which will create a fire or explosion hazard in the treatment works;

   2. Wastes which will cause corrosive structural damage to the treatment works, but in no case, wastes with a pH lower than 5.0, unless the treatment works is designed to accommodate such wastes;

   3. Solid or viscous substances in amounts which cause obstructions to the flow in sewers, or interference with the proper operation of the treatment works;

   4. Waste waters at a flow rate and/or pollutant discharge rate which is excessive over relatively short time periods so that there is a treatment process upset and subsequent loss of treatment efficiency; and

   5. Any pollutant, including oxygen demanding pollutants (e.g., BOD, etc.) released in a discharge of such volume or strength as to cause interference in the treatment works.

C. Planned Changes. The permittee shall give notice to the Director and ADEC as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when the alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are not subject to effluent limitations in the permit. Notice is also required when the alteration or addition results in a significant change in the permittee's sludge use or disposal practices, including notification of additional use or disposal sites not reported during the permit application process.

D. Anticipated Noncompliance The permittee shall give advance notice to the Director and ADEC of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

E. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, termination, or a notification of

planned changes or anticipated noncompliance, does not stay any permit condition.

F. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application should be submitted at least **180 days before the expiration date** of this permit. The application shall include an updated industrial user survey and priority pollutant scan.

G. Duty to Provide Information. The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

H. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Director or ADEC, it shall promptly submit such facts or information.

I. Signatory Requirement. All applications, reports or information submitted to the Director and ADEC shall be signed and certified.

1. All permit applications shall be signed as follows:

   a. For a corporation: by a responsible corporate officer.

   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.

   c. For a municipality, state, federal, or other public agency: by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Director or ADEC shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to the Director and ADEC, and

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the organization.

3. Changes to authorization. If an authorization under Part IV.I.2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part IV.I.2. must be submitted to the Regional Administrator and ADEC prior to or together with any reports, information, or applications to be signed by an authorized representative.

J. Certification. Any person signing a document under this section shall make the following certification:

> *"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."*

K. Availability or Reports. Except for data determined to be confidential under 40 CFR 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Director. As required by the Act, permit applications, permits, and effluent data shall not be considered confidential.

L. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private infringement of federal, state, or local laws or regulations.

M. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

N. Transfers. This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Director at least **30 days** in advance of the proposed transfer date,

2. The notice includes a written agreement between the existing and new permittee's containing a specific date for transfer of permit responsibility, coverage, and liability between them, and

3. The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit.

If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

O. State Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

P. Reopener Provision. This permit is subject to modification, revocation and reissuance, or termination at the request of any interested person (including the permittee) or upon EPA initiative. However, permits may only be modified, revoked or reissued, or terminated for the reasons specified in 40 CFR Parts 122.62, 122.63 or 122.64, and 40 CFR Part 124.5. This includes new information which was not available at the time of permit issuance and would have justified the application of different permit conditions at the time of issuance and includes, but is not limited to, future monitoring results. All requests for permit modification must be addressed to the EPA in writing and shall contain facts or reasons supporting the request.

V. DEFINITIONS

"*Average monthly discharge limitation*" means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

"*Average weekly discharge limitation*" means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week.

"*Biosolids*" means any sludge or material derived from sludge that can be beneficially used. Beneficial use includes, but is not limited to, land application to agricultural land, forest land, a reclamation site or sale or give away to the public for home lawn and garden use.

"*Daily discharge*" means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

A "*Grab*" sample is a single sample or measurement taken at a specific time or over as short a period of time as is feasible.

"*Maximum daily discharge limitation*" means the highest allowable "daily discharge".

"*Method detection limit (MDL)*" is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero as determined by a specific laboratory method (40 CFR 136).

"*Mixing Zone*" is the volume contained within a 1,600 meter radial distance from the outfall.

"*Pathogen*" means an organism that is capable of producing an infection or disease in a susceptible host.

"*Pollutant*," for the purposes of this permit, is an organic substance, an inorganic substance, a combination of organic and inorganic substances, or pathogenic organisms that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food-chain, could, on the basis of information available to the Administrator of the EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction), or physical deformations in either organisms or offspring of the organisms.

"*Sewage sludge*" means solid, semi-solid, or liquid residue generated during the treatment of domestic sewage and/or a combination of domestic sewage and industrial waste of a liquid nature in a Treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the incineration of sewage sludge or grit and screenings generated during preliminary treatment of domestic sewage in a Treatment Works. These must be disposed of in accordance with 40 CFR 258.

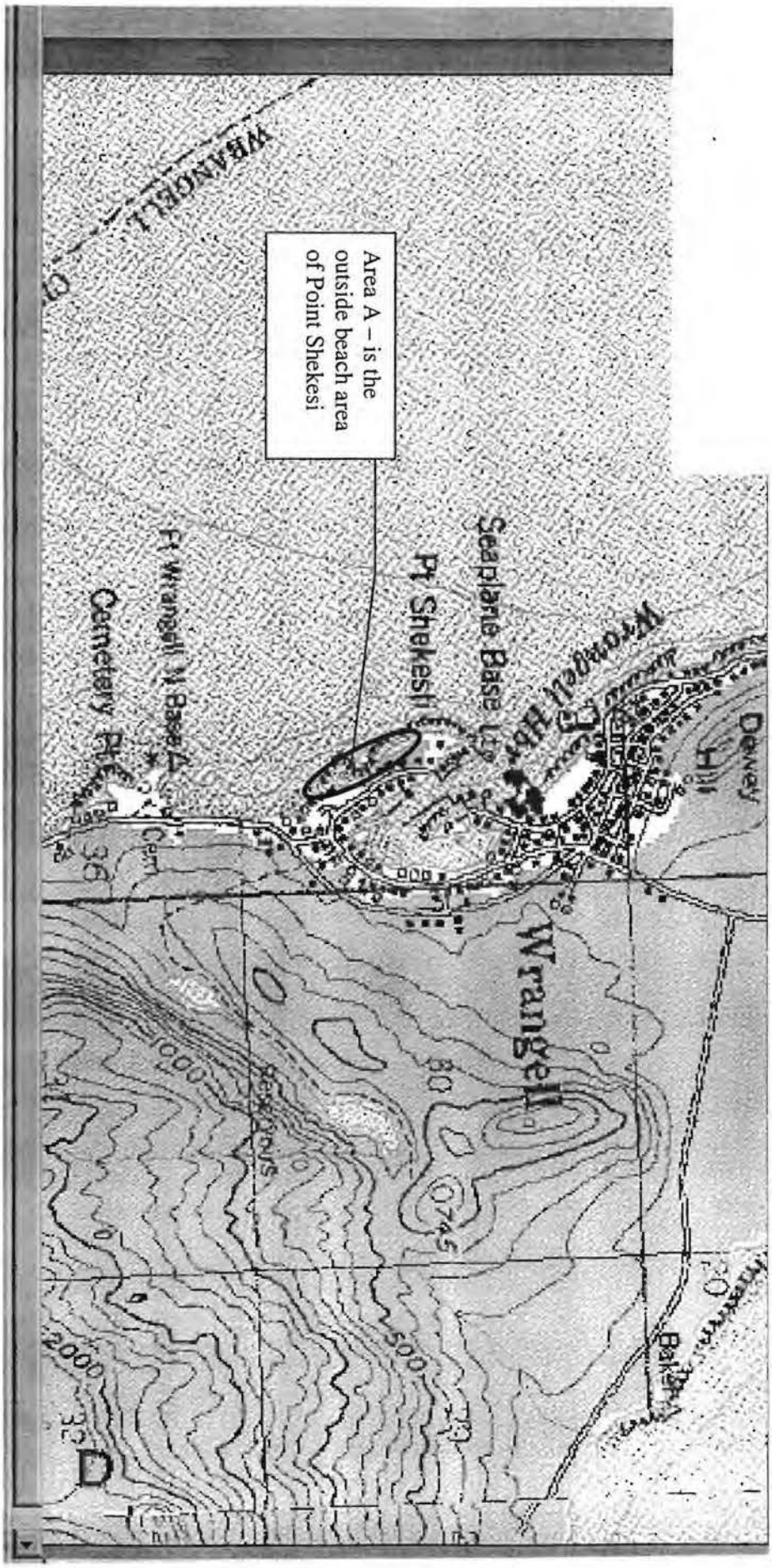
A "*24-hour composite*" sample shall mean a flow-proportioned mixture of not less than eight discrete aliquots. Each aliquot shall be a grab sample of not less than 100 mL and shall be collected and stored in accordance with procedures prescribed in the most recent edition of *Standard Methods for the Examination of Water and Wastewater*.

"*Toxic pollutants*" are those substances listed in 40 CFR 401.15.

"*Upset*" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

The "*ZID*" is the Zone of Initial Dilution. The ZID is defined by the volume of water centered over the outfall diffuser with a radius of 100 feet.

APPENDIX A


Area A – is the outside beach area of Point Shekesi
WRANGELL
Seaplane Base
Pt Shekesi
Wrangell Harbor
Dewey Hill
Ft Wrangell N Base
Cemetery
Wrangell
Bakery
D