

April 30, 2020

Plumas Eureka Community Service District
 Attn: Mr. John Rowden, Project Manager
 200 Lundy Lane
 Blairsden, CA 96103

RE: Letter Proposal for Pilot Testing, Plumas Pines Public Golf Course Wells 1B and 2

Dear Mr. Rowden:

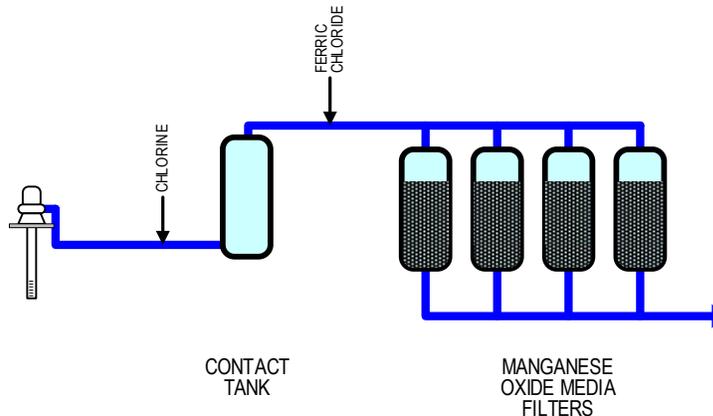
It is our understanding that the Plumas Eureka Community Service District (PECS D) operates two wells at the Plumas Pines Public Golf Course, both of which exceed the regulated limits for iron and manganese and one, Well 2, exceeds the limit for arsenic. The selected production and water quality parameters for the wells are summarized in the text table below.

	<u>USEPA MCL</u>	<u>Well 1B</u>	<u>Well 2</u>
Production (gpm)	NA	300	450
pH (Std Units)	6.5-8.5	7.99	7.81
Arsenic (ug/L)	10	5.6	16
Iron (ug/L)	300	830	740
Manganese (ug/L)	50	110	100
Ammonia (ug/L)		1,000	1,600

Both wells were pilot tested for the removal of arsenic, iron, and manganese. The results were, according to the District, "marginal". Therefore, the District asked ATEC Systems to prepare a proposal to determine if the three contaminants of interest could be removed, or at least reduced, to below the USEPA Maximum Contaminant Level (MCL) for arsenic and the Secondary MCL (SMCL) for iron and manganese.

ATEC System's Approach

ATEC system uses an integrated filter system that removes iron, manganese, and arsenic in one process. The removal process schematic is shown below. Chlorine is used to oxidize the arsenic in the water and maintain the adsorptive capacity of



the media. Ferric chloride is added to coagulate the oxidized arsenic. This system is like the system previously pilot tested with some modifications that, based on our

experience, may improve performance. Although not shown in the schematic, it may be necessary to reduce the pH to enhance arsenic removal but, if possible, we would try to avoid this option as it implicitly suggests that the pH would have to be increased to comply with the lead and copper rule. During the previous pilot test, iron removal was not incomplete; this is problematic as the basic principle of the process being tested was to oxidize the arsenic from As(III) to As(V) to allow it to combine with iron. If iron removal is limited, it follows that arsenic removal will also be limited.

Pilot Test

The ATEC Pilot testing will be conducted using 42-inches of ATEC Systems Associates' Pyrolusite filter media with varying doses of chlorine, ferric chloride and loading rates.

The scope of work for the pilot test portion of this project is:

- 1) Set up the pilot plant:
 - a) Provide necessary fittings and connections to connect the well pump outlets to the pilot plant, provided such connections are threaded and no larger than 2". The system normally runs with a ¾" standard garden hose connection. The pilot test requires a flow of 6 to 10 gpm.
 - b) For the pilot test, the well must be operated like the water to be treated in new full-sized system. If it is not, all guarantees of efficacy of treatment, explicit or implied are void.
- 2) At the well site, we will run the plant for a continuous period of 10 hours, up to one week.
- 3) Measure the following parameters on the source and product water as indicated below during pilot plant operation:
 - i) Manganese, hourly;
 - ii) Iron, hourly;
 - iii) Arsenic, collect lab samples bihourly;
 - iv) pH, hourly;
 - v) Temperature, hourly;
 - vi) Free and total residual chlorine in the product water, hourly;
 - vii) Hydrogen Sulfide, as needed;
 - viii) Ammonia, as needed;
 - ix) Other parameters as mutually agreed prior to commencing the assignment.
 - b) Collect samples for laboratory analysis and verification of arsenic. Containers will be provided by the client. The cost of this lab testing and any other required by the client, is by the client.
 - c) Measure the following parameters:
 - i) Flow rate;
 - ii) Influent and effluent pressure;
 - iii) Chlorine dosage
 - iv) Ferric Chloride dosage
- 4) Remove the pilot plant.

Pilot Test Report

A **Pilot Test Report** for the wells will be prepared detailing the results of the pilot testing and an analysis of the variables used in the pilot test. The report will include an evaluation of the technical feasibility of using the treatment process on the source water, development of a basis of design and cost estimates for a full-scale facility. The Pilot Test Report will be in a format suitable for review by District staff, The Pilot Test Report will include:

- 1) Source water background and water; quality information
- 2) Pilot testing and analytical methodologies
- 3) Pilot testing results, discussion, and conclusions
- 4) A basis of design for treatment including
 - a. Treatment vessel sizing
 - b. Media requirements
 - c. Chemical feed requirements
 - d. Process monitoring and analytical equipment recommendations
- 5) A schedule for design, permitting approval, construction, and start-up
- 6) A cost estimate for completion of the project

Description of Pilot Plant

The physical characteristics of ATEC Systems Associates' pilot plant are described in the Tables 1 and 2. Photographs of the pilot plant presented in Figure 1. Site requirements and necessary client provided data are shown in Table 3.

A section of pipe to provide about one minute of retention will be provided ahead of the pilot plant to simulate the retention that is estimated will be necessary to help in arsenic removal in the full-sized system.

STAFFING

The pilot testing will be conducted by a member of ATEC Systems' staff who has completed at least 25 pilot tests of similar projects. The pilot testing work will be conducted under the supervision of Bill Ketchum, the president of ATEC Systems Associates, Inc. who has been involved in the development of ATEC Systems' programs for removing metals from drinking water since their inception. The pilot test report will be prepared by, or under the supervision, of Lee H. Odell, P. E., Principal Engineer at Murraysmith, Inc.

TIME AND COST

The cost of the pilot testing with Pyrolusite media by ATEC Systems Associates is \$20,000 including travel expenses.

All validation samples for iron and manganese concentrations in raw and treated water will be sent to certified lab for validation of field results. All arsenic samples will be sent to the same lab for analysis. All lab testing will be at Owner's expense.

We will collect samples and maintain chain-of-custody documents for lab testing, if desired

Our normal terms of payment are Net 15 Days from date of invoice. Progress billings will be submitted as work progresses.

PROPOSED SCHEDULE

The pilot test will be scheduled for the earliest, mutually agreeable time. Completion of the pilot test portion of the work will require approximately one week. The analysis of the data and preparation of the pilot test report will require approximately two weeks after receipt of the final lab test results.

ACCEPTANCE

Signing in the space provided below will indicate acceptance of this letter proposal. In the alternative, this proposal and scope of work may be incorporated in a purchase order or other document indicating acceptance. Please return one executed copy of this letter proposal or other documentation of acceptance to ATEC Systems Associates, Inc. at the address in this letter.

We appreciate your interest and look forward to the opportunity to collaborate with you and your organization on this project.

Yours truly,
ATEC Systems Associates, Inc.



William E. Ketchum
President

ACCEPTANCE:

BY: _____ TITLE _____ DATE _____

Table 1

**Physical Characteristics of Pilot Filter Set and Media
 ATEC Iron and Manganese Removal System**

Pilot Filters¹

Sidewall Height (inches)			48 to 60
Height (inches)			62 to 74
Diameter (inches)			6
Filter Surface Area (each) (ft. ²)			0.1964
Total Filter Surface Area (ft ²)			0.7854
Underdrain			Stainless Steel Wedgewire, 0.01" slots
Media Support			³ / ₄ " minus crushed granite, 4"
Source Water Connections			³ / ₄ " Standard Hose
Recommended Pressure	Minimum/Maximum	Working	20/90 psi

Filter Media²

Depth in Filters (inches)		36 to 48
Volume in Filters (ft ³)		2.36 to 3.15
Approximate Weight in Filters (lbs.)		285
Weight (lbs./ft ³)		120.5
Physical Size (mm)		0.32 –to-0.85

Maximum Removal Capacity

Iron Removal (mg/L)		10
Manganese Removal (mg/L)		10
Hydrogen Sulfide Removal (mg/L)		5
Non-Adsorptive Removal (microns)		>20

Chemical Dosing Equipment³

Stenner Peristaltic Solution Metering Pumps (up to 17.0 gpd @ 100 psi)
 LMI Solution Metering Pumps (various capacities)

Other Equipment

Chlorine Analyzer, Hach CL 17 or ProMinent D2C
 Flow Meters, Sea Metrics, Inc., FT-420
 Data Logger, Endress + Hauser, Mini-Logger
 Automatic Samplers, ISCO, Inc.

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- ¹ The pilot filter plant consists of four, 6" filter columns connected by common manifolds for influent, effluent and backwash water. Each filter is controlled by a three-way ball valve. The system is set up to closely mimic a full-scale filter system in terms of media depth, application rates in terms of both area (gpm/ft² of filter area) and volume (gpm/ft³ of media), and backwash characteristics to the extent possible. Source water is metered using a totalizing flow meter. Pressure is measured on the influent and effluent manifold to determine head loss. Chemical injection points are located as close to the filter as possible to simulate actual operation. In cases where extended contact time is desired before the source water enters the filters, a pipe section of pre-determined volume is placed between the chemical injection points and the filters to provide accurate contact time measurement. Sidewall height is variable to a maximum of 60" without modification, allowing a maximum media bed depth of 48".
- ² AS-721M and AS-741M Filter Media, 0.85 to 2.36mm and 0.42mm to 0.85mm, respectively, are both granular manganese dioxide media, derived from naturally occurring pyrolusite, and are certified to ANSI/NSF Standard 61.
- ³ Solution metering pumps are available for the injection of up to three chemicals, if needed. Normally, the only chemical injected is chlorine. And in the case of arsenic, ferric chloride. There are, however, provisions for exceptional circumstances, such as pH adjustment for corrosion control or the treatment of water at fish hatcheries that do not permit chlorine.

Table 2
Analytical Equipment

The following analytical equipment is normally stocked on our pilot trailers.

Spectrophotometer, Model DR/2800, Hach Co., Loveland, CO
Digital Titrator, Hach Co., Loveland, CO
pH Meter, Model 266, Orion Co., Boston, MA
Stir Plate, Hach Co., Loveland, CO
0.45-Micron Filter, Nalgene

Glassware—beakers, flasks, columns, sample cells, 10 and 25 ml

Although not normally carried in each trailer, a turbidity meter is available.

Reagents for the following field tests:

Spectrophotometer

Free Chlorine, DPD, Method 8021 and 10059 (300 tests)
Total Chlorine, DPD, Method 8167 or 10060 (300 tests)

Iron, FerroZine Method, Method 8147 (500 tests)
Iron, Total, FerroVer Method, Method 8008 (300 tests)

Manganese, Low Range, PAN Method, Method 8149 (500 tests)

Nitrogen, Ammonia, Salicylate Method, Method 8155 (100 tests)

Sulfide, Methylene Blue Method, Method 8131 (100 tests)

Silica, Molybdate Method, Method 8282 (100 tests)

Digital Titrator

Alkalinity, Phenolphthalein and Total Method, Method 8203 (100 tests)
Hardness, Phenolphthalein and Total Method, Method 8203 (100 tests)
Total Chlorine, Iodometric Method, Method 8209 (100 tests)

Field tests not listed above may be available. Please note that we send all tests for arsenic and other contaminants that require digestion or distillation to a commercial laboratory.

Figure 1
ATEC Iron and Manganese Removal Pilot Plant



The exterior of ATEC Systems' pilot trailer is shown above. The source and product water connections are shown entering and exiting the trailer. Inside dimensions are 14' x 6' x 6½'.



The front one-half of the trailer is shown above. The instrument foreground on the wall is an in-line chlorine analyzer. The smaller boxes on the wall above the light are electronic flow meters used to monitor cumulative as well as instantaneous flow for each treatment train in the pilot plant.



Picture above shows the interior of the pilot plant trailer from the rear. The sample outlets and the analytical equipment are on the desk in the front of the trailer.



The picture on the left shows one set of filters. Source water enters through the hose inlet in the wall, passes through a flow meter, past a chlorine injection point, through an in-line static mixer, into the inlet manifold, down through the filter media. Product water is discharged through the wall. The pail holding the sodium hypochlorite solution can be seen to the right of the filter vessels and the in-line chlorine analyzer is on the wall above the NaOCl container. The sample ports and analytical equipment is forward of the chlorine analyzer. A second container of Ferric Chloride solution and feed pump is provided for pilot testing for arsenic removal.

Table 3
SUMMARY OF SITE AND INITIAL DATA REQUIREMENTS

1. Power, 115 VAC for injection equipment and lighting
2. Source water, minimum 10 gpm @ 30 psig
3. Disposal of water and backwash effluent¹

Data Needed from Utility

1. Comprehensive Water System Plan (relevant sections)
2. Inorganic test results (most recent)

¹ Any necessary permits are the responsibility of the client