

## Cuf WATER PURIFICATION ON-SITE PILOT VERIFICATION City of Margate / FL

**Proposal No. W25087 R2**

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**Submitted to:**

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## EXECUTIVE SUMMARY

This Pilot Proposal is for a **Cuf**® (Continuous Ultra Filtration) Verification to be conducted at the client's location in the City of Margate, Florida.

A Pilot verification test program will be conducted using Purifics' mobile **Cuf**® as described herein (the "Pilot Equipment"). The Objectives of the pilot test program are identified in section 1.2.

A pilot program will be performed. The program will be split into 2 stages:

1. **Cuf**® process optimization,
2. **Cuf**® operating period at optimized parameters (i.e., flux and slipstream requirements)

The Pilot Equipment possesses the same functionality of a full-scale system, therefor the pilot data results are directly applicable to the full-scale system design.

The pilot study report will include detailed test results and an optimized full-scale system recommendation designed to purify all water to the required guidelines.

Purifics will supply the Pilot Equipment. Client will provide power, lab analysis, project manager, security, and any regulatory permits and other prerequisites for receiving, installing, and operating the Pilot Equipment at the Site.

The client will have the opportunity to observe and learn about the **Cuf**® process directly from a Purifics Applications Engineer Representative while on site.

Additional qualifications, installation case history, and technology information can be found at [www.purifics.com](http://www.purifics.com).

Further inquiries are welcome and can be addressed by Purifics.

Price and Terms are included in this proposal.





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## 1 CLIENT PILOT OBJECTIVE

The pilot is to confirm performance, cost structure, zero liquid discharge (ZLD) and full-scale design engineering for the **Cuf®** process. The **Cuf®** pilot unit will be operated at a maximum design flux of nominally 250 GFD (to be verified in Phase 1 testing).

The key operating parameters is characterized in the table below.

<b>Duty Objectives</b>	
Operational Life	25 years
Operating Duty	99%
Source Water	Ground Water
Max Design Flux	250 GFD

### 1.1 System Objectives Chart

<input checked="" type="checkbox"/> NSF / ANSI /CAN 61-372	<input type="checkbox"/> Class I Div 2
<input type="checkbox"/> Gravity Feed	<input type="checkbox"/> ASME B31.1 & 31.3
<input checked="" type="checkbox"/> Pressurized Feed	<input checked="" type="checkbox"/> Level and Flow Control
<input type="checkbox"/> Pre-treatment to RO	<input type="checkbox"/> Primary & Residual Disinfection
<input checked="" type="checkbox"/> Zero Liquid Discharge	<input checked="" type="checkbox"/> Strainer
<input type="checkbox"/> Chloride Resistant	<input type="checkbox"/> Transfer & Blending
<input type="checkbox"/> Redundancy	<input checked="" type="checkbox"/> Drive & Control Pumps
<input checked="" type="checkbox"/> 480 V 3-ph Power	<input checked="" type="checkbox"/> Profinet
<input type="checkbox"/> DO Addition – Metals Removal	<input checked="" type="checkbox"/> Air Compressor
<input checked="" type="checkbox"/> Coagulant Feed – DOC Removal	<input checked="" type="checkbox"/> >99% Duty
<input checked="" type="checkbox"/> 25 Year Design Life	<input checked="" type="checkbox"/> 0-100% Flow & Power Turndown
<input checked="" type="checkbox"/> Eliminate Membrane Replacement	<input type="checkbox"/> No Filtrate Loss
<input checked="" type="checkbox"/> Full Remote Capability	<input checked="" type="checkbox"/> Automatic TMP Maintenance
<input checked="" type="checkbox"/> Camera	<input type="checkbox"/> Viton Gasket Material
<input checked="" type="checkbox"/> 1 Year Warranty	<input checked="" type="checkbox"/> EPDM Gasket Material
<input type="checkbox"/> Inline pH Control	<input checked="" type="checkbox"/> NEC UL508A
<input type="checkbox"/> Inline Oxidation	<input checked="" type="checkbox"/> High Reliability & Durability
<input checked="" type="checkbox"/> Build America Buy America Compliant	<input checked="" type="checkbox"/> OPEX/MGD
	<input checked="" type="checkbox"/> Gravity/Atm. Filtrate Discharge

### 1.2 Pilot Program Objectives

The objectives of the onsite **Cuf®** pilot are:

1. Demonstrate and verify sustained effective water purification without pre-treatment
2. Demonstrate ~99% duty and 1% slipstream
3. Demonstrate flux in the range of 250 GFD
4. Demonstrate water purification of well water below all drinking water MCLs.





5. Demonstrate ZLD operating cost and performance
6. Obtain the necessary test data for regulatory approval for full-scale design
7. Obtain full scale cost structure including OPEX and CAPEX

### 1.3 Onsite Test Program Goals

The goals of the onsite pilot study are to determine and confirm:

- The ability to remove the contaminants in question
- The economic costs of implementing and maintaining the selected system
- The full-scale design and layout
- Sustained performance
- Full scale energy requirements





## 2 IMPLEMENTATION

### 2.1 Mobilization

The Pilot Equipment will be prepared for transport to Client's site following the Effective Date. The delivery time and method will be coordinated with Client.

### 2.2 Pilot Test Protocol

Prior to Piloting, a Pilot Test Protocol will be provided by Purifics for regulatory approval for the pilot program.

### 2.3 Set-up at the Site

At the Site, Client is responsible for positioning the Pilot Equipment, connecting the wiring, and completing the influent, effluent and slipstream plumbing. Thereafter, Purifics will power on the system and provide a training program to Client.

Typical setup & training is one day.

### 2.4 Manual

The Operation & Maintenance Support Information Manual is provided in digital format only. It can be accessed from the equipment SCADA screen by pushing the button "Manual".

### 2.5 Laboratory Analysis

Lab turnaround time is an important factor in this process. Laboratory testing is the responsibility of Client. Client shall select and approve the lab.

### 2.6 Demobilization

The Pilot Equipment will be demobilized and returned to Purifics upon conclusion of the on-site test. Chemicals are to be removed from the enclosure and all exterior holes covered prior to shipping. Client is responsible to review and follow "Return Shipping Instructions" posted inside of the enclosure.

Client will be responsible for any work at the Site.





### 3 TEST PROGRAM

#### 3.1 Test Set Up

The Pilot system will be installed as per Interface Diagram below. It will operate as per the Test Protocol. It is critical that raw source water be fed to the **Cuf®** without pre-treatment of any kind.

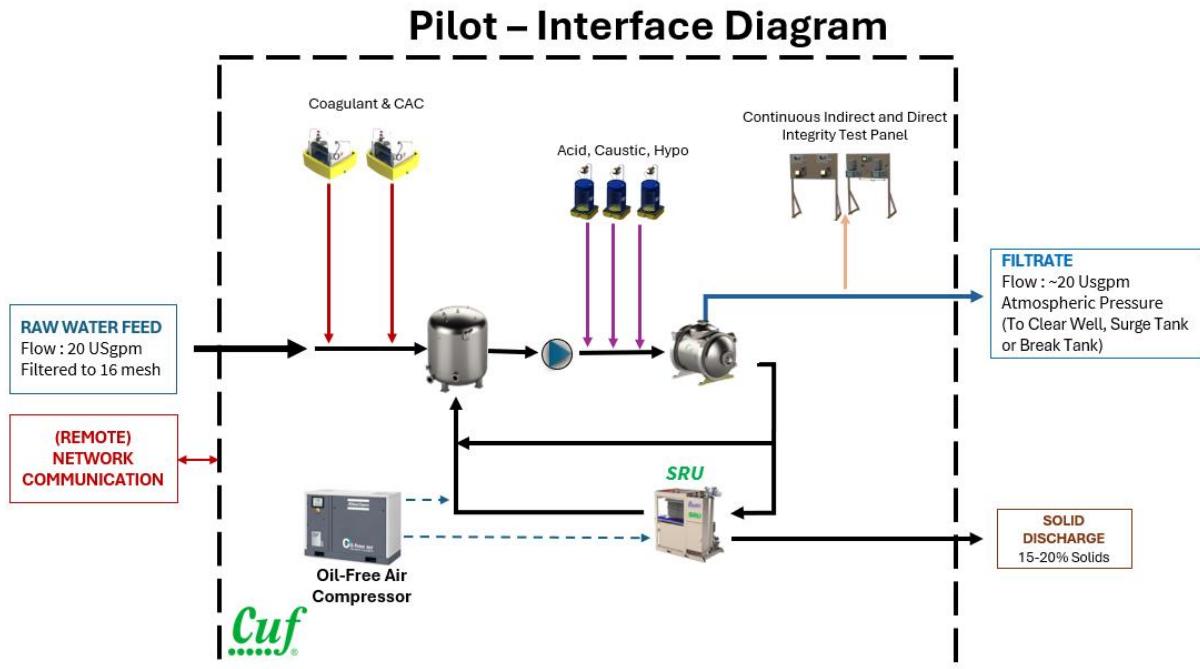


Figure: Process Flow Diagram

#### 3.2 Method

The Pilot Equipment is fully automated with remote operations capability. The Pilot Equipment's contaminant removal capability is identical in every way to a full-scale production platform. Consequently, full-scale system design is simply a matter of a linear scaling up in capacity based on the test data. The on-board SCADA measures and logs all parameters.

Pilot test programs consist of a series of test runs at various operating parameters to determine purification rates. During testing, influent and effluent samples will be drawn for analysis.

It should be recognized that some effluent samples will have contaminants of concern above the discharge requirements. This occurs because the purification level is systematically backed off until break through or a non-compliant discharge level is achieved. This is done in order to determine the optimal treatment condition and its corresponding rate.





### 3.3 Test Report

Upon completion of the testing, a report will be prepared addressing the following topics. Purifics shall utilize the collected test data and develop a recommendation for a full-scale **Cuf**® treatment train, and other system parameters.

- 1.0 Purpose
- 2.0 Test Description
- 3.0 Results & Discussion
- 4.0 Conclusion & Recommendations
- 5.0 Full-Scale **Cuf**® System Recommendation
  - Treatment Objectives
  - System Specifications
- 6.0 Cost Parameters
  - Capital Cost Summary
  - Maintenance Cost Summary
  - Operating Cost Summary
- 7.0 Appendix of Analytical Data

### 3.4 Optimization

The optimization period will consist of continuous flow treatment of the contaminated water at various operating conditions. The goal of the optimization testing is to minimize treatment costs and the size of an eventual full-scale **Cuf**®. Process conditions that can be varied to achieve optimization are system flow rate, system power, and other proprietary techniques.





## 4 DELIVERABLES

### 4.1 Purifics

- The Pilot Equipment
- Pilot Test Protocol
- One applications engineer/technologist to oversee and coordinate on-site set up at the Site and commissioning, operator training in the first week
- Training webinar available prior to execution.
- Pilot Program Final Report

### 4.2 Client

- A location suitable for installation of the Pilot Equipment and on-site testing
- 480 V Power Supply
- Direct Feed Water hook up, with minimum 5 psi Pressurized Feed, No interim Feed Water tank or chemical treatment
- Atmospheric Filtrate discharge (5psi max)
- Internet Access or Wireless Router is not functional in a remote location
- Lab analysis
- Qualified Operator (to be trained by Purifics during first week on-site)
- Project Manager (Point of Contact)
- Site security
- Regulatory approvals and permits if required
- Disposal of filtrate, concentrate rinses or other test water, liquids and material
- Raw unfiltered test data
- Off-loading & on-loading equipment
- Sign Off on Condition of Equipment at time of Start Up
- Decommission and Equipment and prepare for return shipment
- Proof of Insurance (Certificate of Insurance)
- Consumables if any (TMP rinse chemicals, Coagulant)





## 5 PILOT EQUIPMENT SPECIFICATIONS & SET UP

### 5.1 Pilot Equipment Loading and Off Loading



*Figure: Pilot Equipment Shipping*





## 5.2 Pilot System Equipment



Figure: CUF HMI (Left) & SRU (Right)



Figure: Cuf & DIT (Inside Sea Can)





### 5.3 Typical Fluid and Power Connections

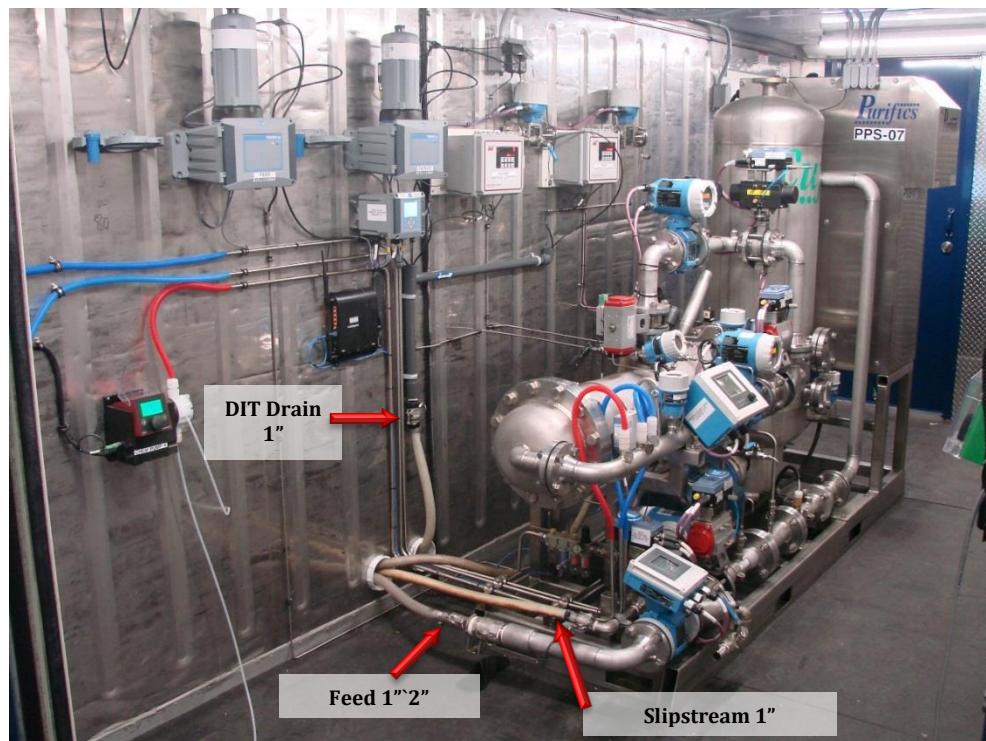


Figure: Cuf Feed, Drain and slipstream Connection

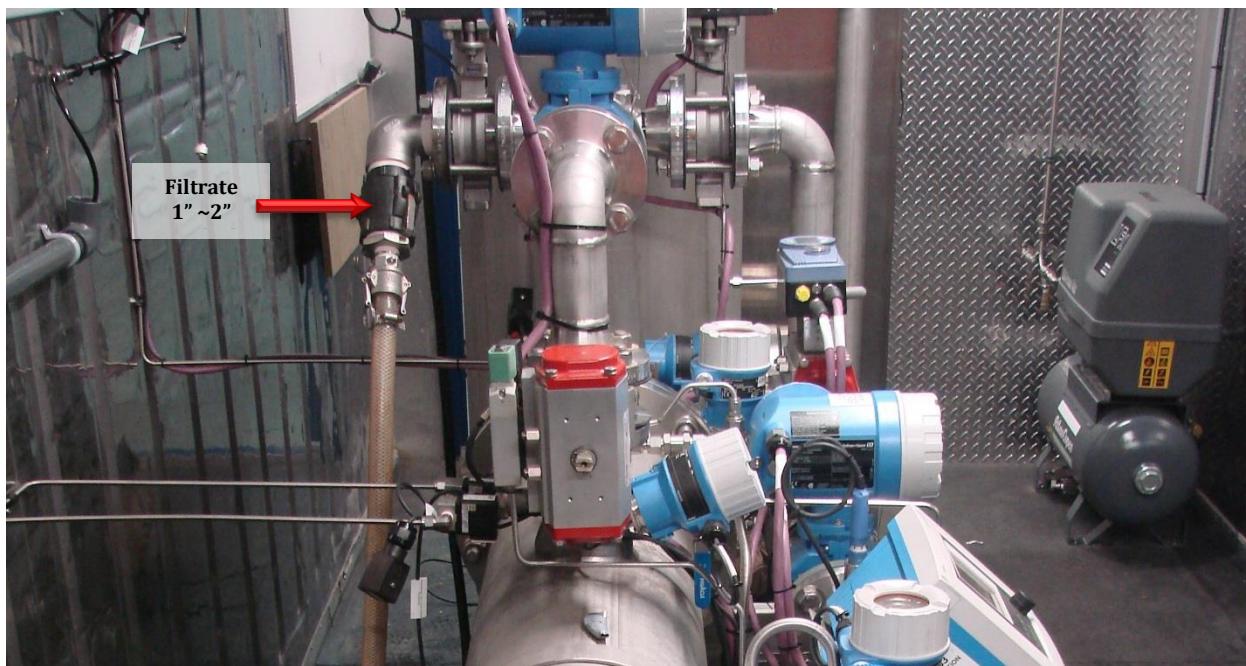


Figure: Cuf Filtrate Connection



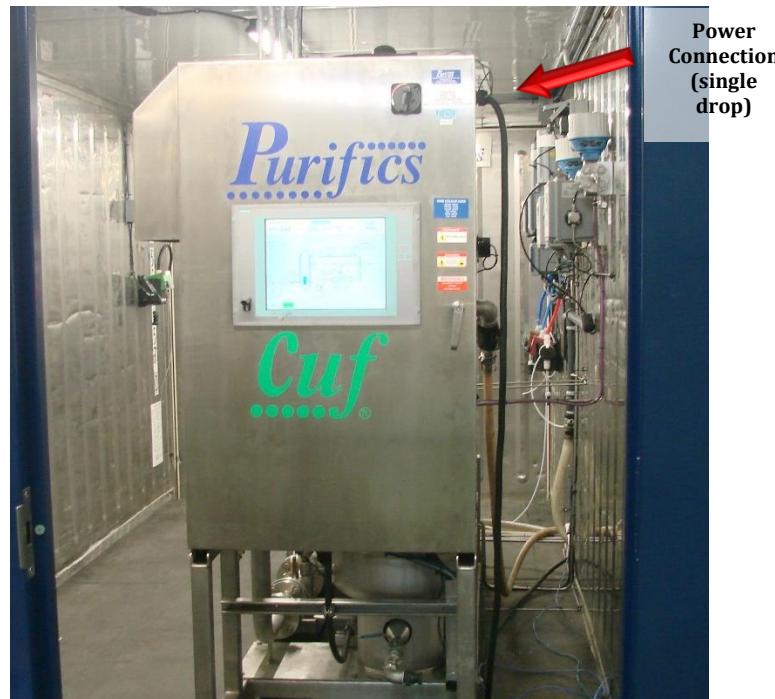


Figure: Cuf Power Connection



Figure: Feed Through

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#### 5.4 Typical Onsite Enclosure Using Portable Generator If Required



*Figure: Pilot Equipment on Site*

#### 5.5 Typical Pilot Operation During Winter 55° North Latitude.



*Figure: Pilot Equipment During Winter*





## 5.6 Pilot System Enclosure Features

The Pilot Equipment consists of an enclosure, 8 feet wide by 20 feet long.

The enclosure is fully insulated and has electric heat. Internally the walls are Stainless Steel lined, the ceiling is Aluminum and the floor rubber lined.

Access is through a standard lockable man door at one end and standard enclosure barn doors at the other end.

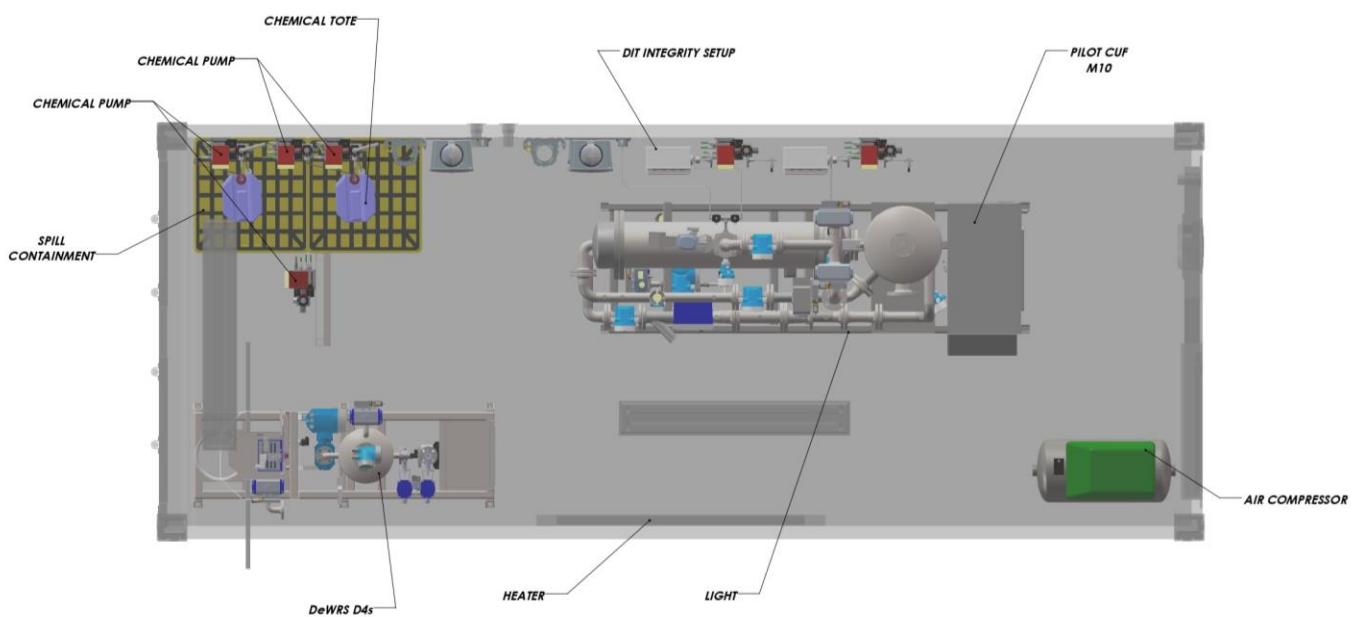
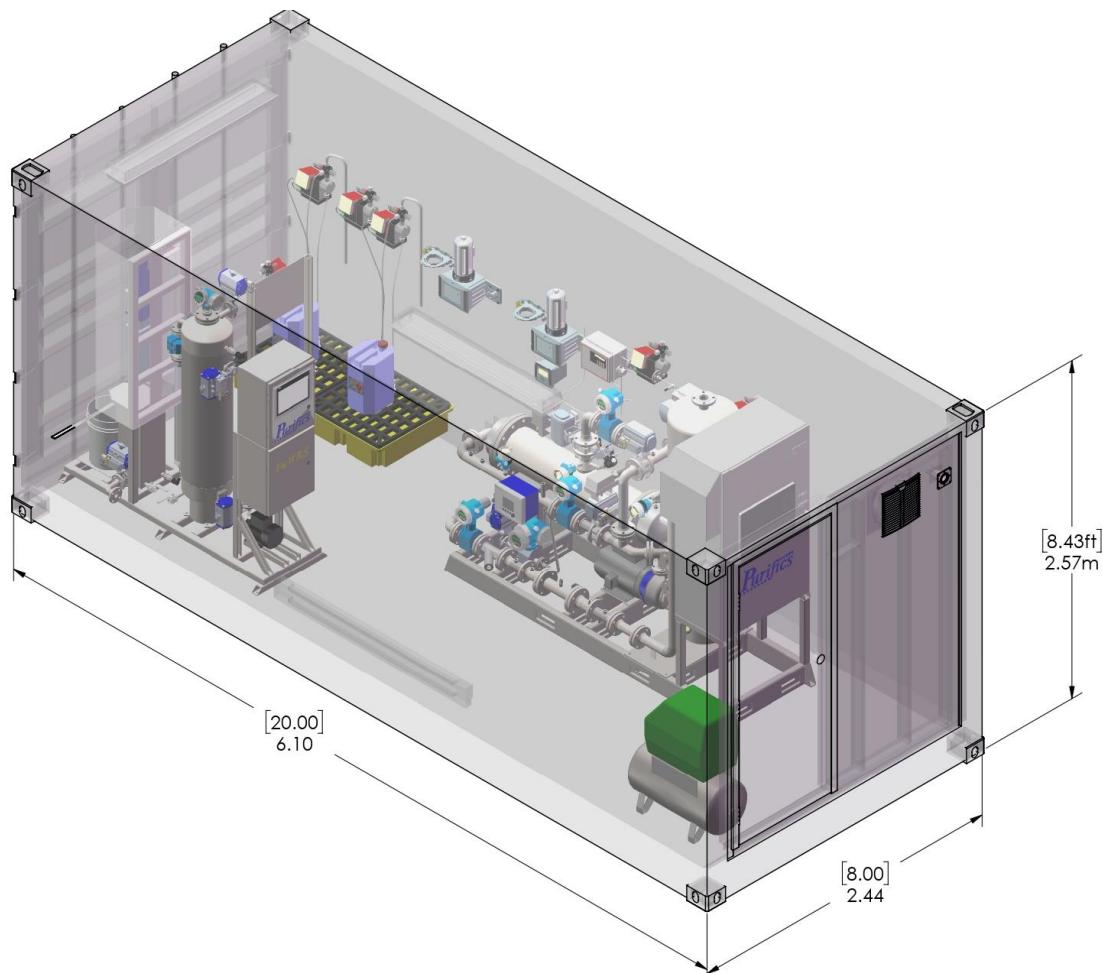
Internal lighting, fan ventilation, air compressor, first aid kit and fire extinguisher are incorporated in the enclosure.

The pilot system enclosure weighs approximately 10,500 lbs (4800kg).





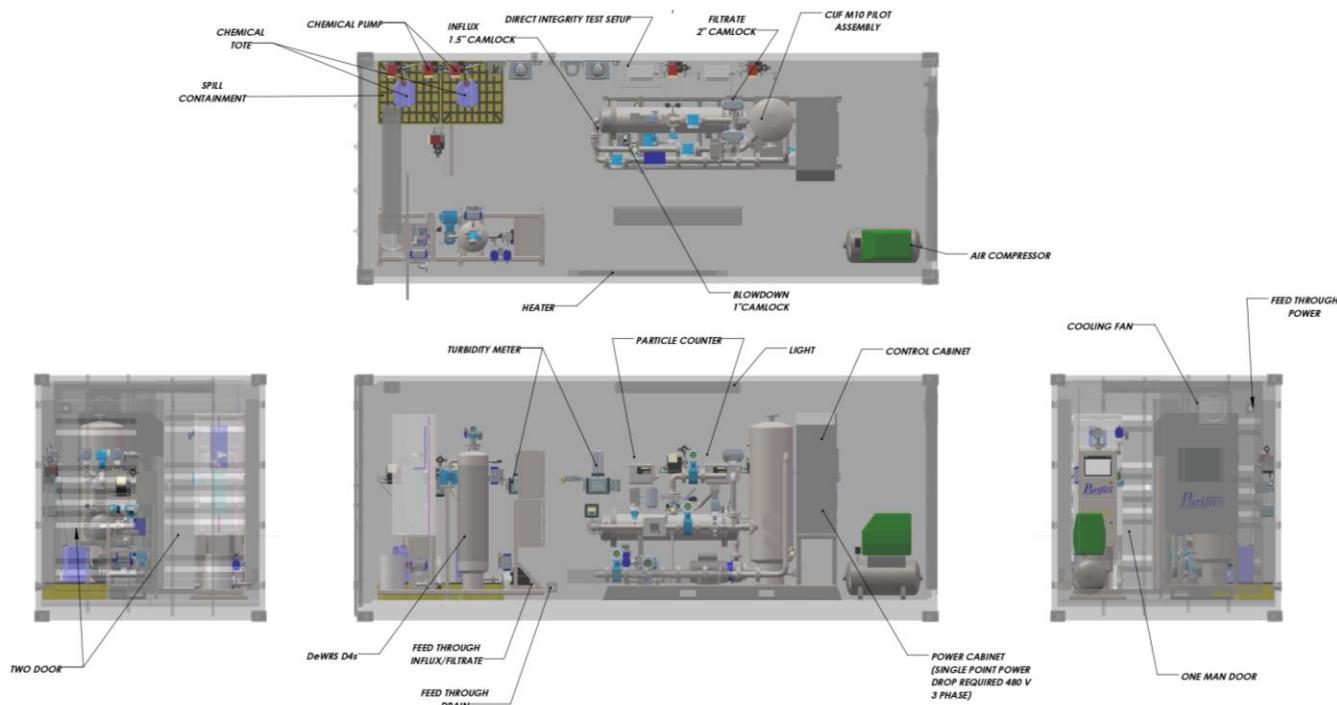
## 5.7 System Footprint



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## 5.8 Power Requirements

The Pilot Equipment is to be powered with a single drop of 480 VAC 3 phase Delta, 60 FLA. The client is required to provide one power cable, (Cabtire or Tech 90) to the electric cabinet disconnect at the point identified in the previous drawings. All other **Cuf**® equipment within the enclosure such as the air compressor, lighting, ventilation, and heating is powered from this cabinet.

## 5.9 Feed Water Requirements

The **Cuf**® accepts and controls water from a pressurized source (main) or gravity feed. If a pressurized source is not available a feed pump can be provided which may or may not be at additional cost.

## 5.10 Fluid Connections

The influent and effluent connections are typically camlocks to a flange and located at the side of the Pilot Equipment. Base flow rates are regulated by the system to 10 to 20 US gpm (55 to 80 litres per minute) for testing purposes.

- Feed: 1" ~2" camlock
- Filtrate: 1" ~2" camlock
- Slipstream: 1" camlock
- DIT drain: 1" camlock





## 5.11 Remote Operation

To facilitate remote control and monitoring the Pilot Equipment is equipped with a wireless internet link. This allows Purifics to monitor and support the client remotely.

## 5.12 Access

General day-to-day operations data is available to the client, consultants and operators. This is a fully open testing process with full access to data, logging and testing protocols, which are generated upon request. It is encouraged to refine the testing procedures to understand the process and capabilities of the equipment. All logged data will be provided in CSV and Excel data tables and will be routinely backed-up on a USB drive.

## 5.13 Operating Procedures

The Pilot Equipment can operate autonomously and is equipped with PLC controls and a panel-mounted HMI/SCADA system. Purifics staff will be on-site to facilitate start-up and training.

Detailed operating procedures are included in the pilot system. All operators must read the Operation & Maintenance Support Information Manual prior to being involvement within the enclosure.

The Operation & Maintenance Support Information Manual is provided in digital format only. It can be accessed from the equipment SCADA screen by pushing the button “Manual”.

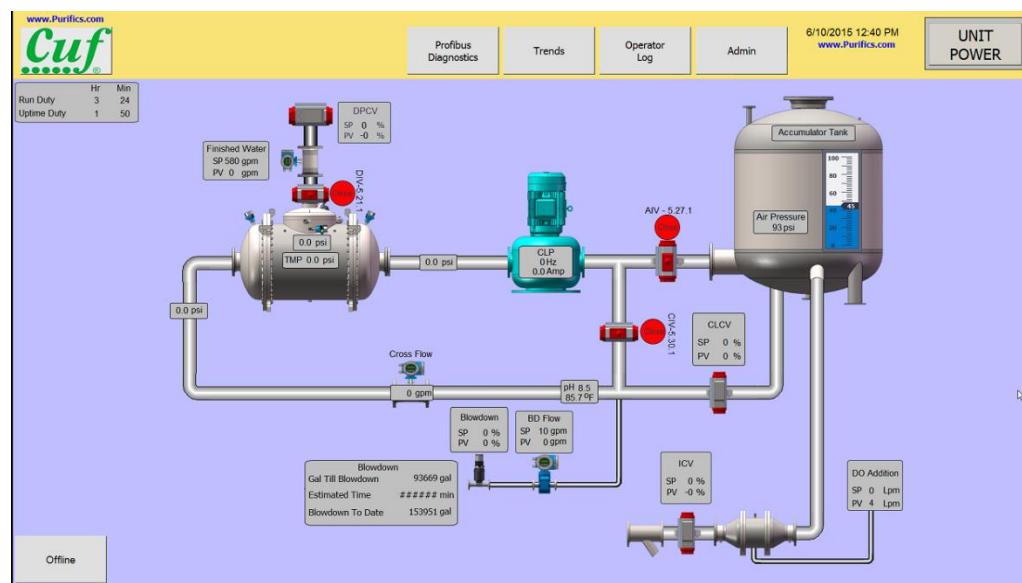


Figure: Typical Cuf® SCADA Screen



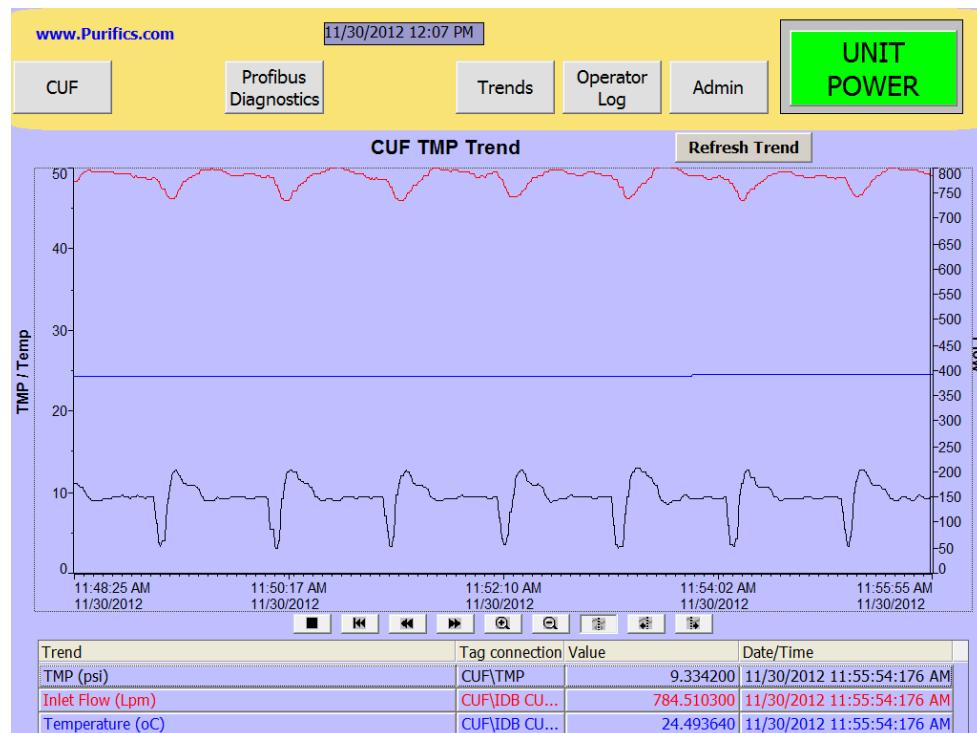


Figure: Typical Log Data Trend

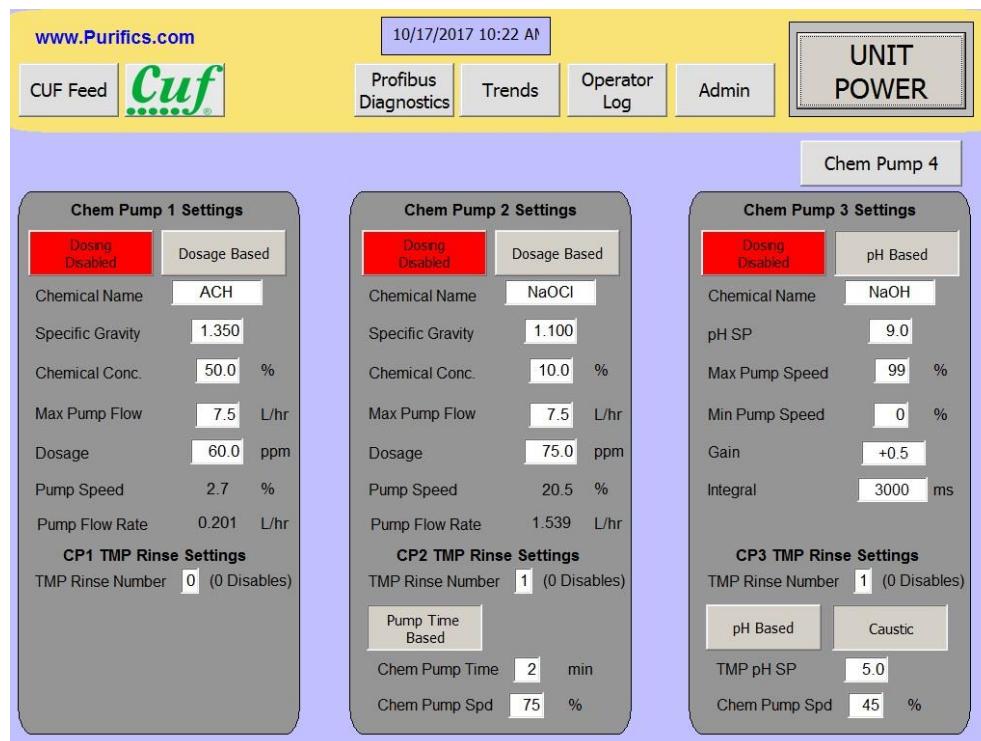


Figure: Typical Chemical Pumps Screen



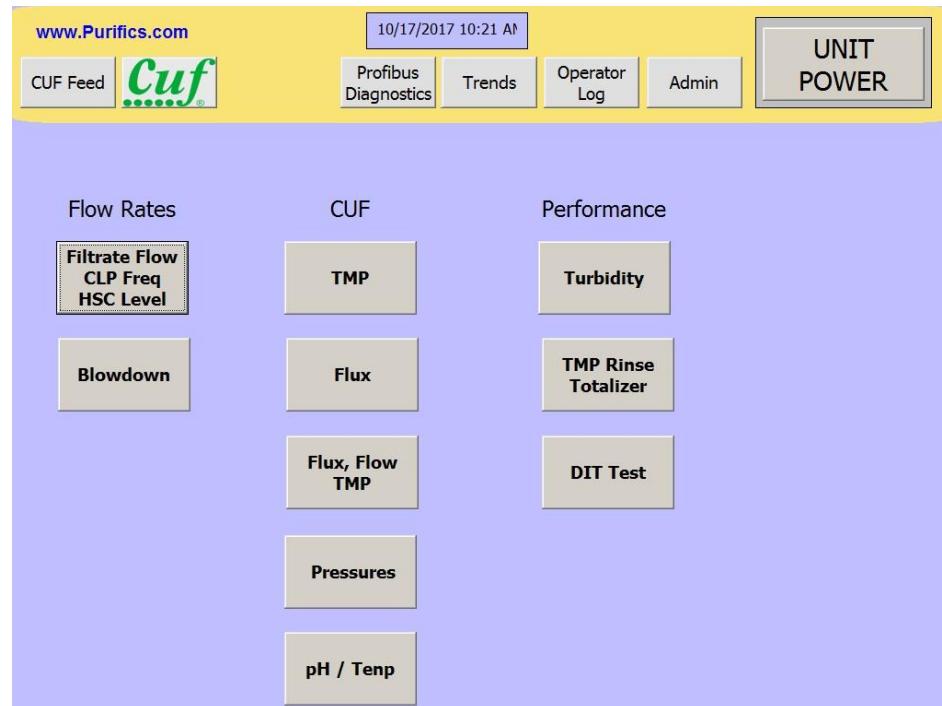


Figure: Typical Settings Screen

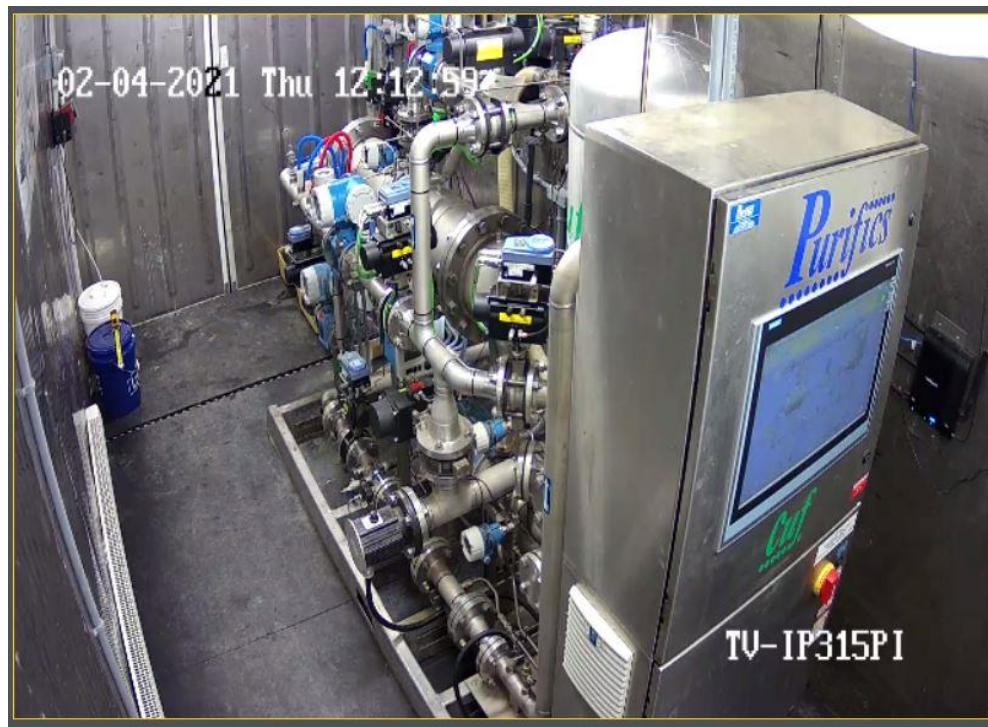


Figure: Typical webcam monitoring screen





## 5.14 Continuous Indirect Integrity Monitoring (CIIM) & Direct Integrity Test (DIT) System

If required, the pilot system can verify membrane integrity (LT2ESWTR) using a marker-based method. Turbidity meters (Hach) and particle counters (Nasec) take samples from feed & filtrate lines, and the controls are integrated to **Cuf**® PLC's. All Sensors are online, flow through devices.



Figure: Typical CIIM/DIT installation

## 5.15 Permitting & Regulatory Approval

Pilot Operation may or may not require permitting or regulatory approval. It is Client's responsibility to ensure that all regulatory requirements and approvals are met prior to pilot operation.

### Disclaimer

Purifics® is not the operator of the Pilot Equipment at Client's location and will not operate the Pilot Equipment; Purifics® will provide technical and application support when clearly directed under this Proposal.

Purifics® makes no representation concerning the need for a Certificate of Approval or other forms of license to operate the purification system. Client must determine for itself whether a Certificate of Approval or other form of license or permit is required in the applicable jurisdiction before operation of the Pilot Equipment commences.





## 6 PILOT TERM; PRICE & PAYMENT

### 6.1 Pilot Term

The duration of the pilot test program is 1-3 month starting on the date on which the Pilot Equipment is shipped to the site (the “**Initial Pilot Term**”) and such additional time as mutually agreed by Purifics and Client in a written extension of this pilot test program (the “**Extension Pilot Term**”), unless terminated earlier in accordance with the Pilot Terms and Conditions.

### 6.2 Price

The following is the fee structure owed by Client to Purifics in consideration of the lease of the Pilot Equipment and Services under this Proposal. Price is based on a cost-recovery basis.

Pilot Program Description	Amount
1) Pilot Program & Deliverables	\$25,000
• Setup/demobilization	
• Final Report	
• Application Technologist first week	
2) Delivery to and from site	\$10,000
<b>Total</b>	<b><u>\$35,000</u></b>





### 6.3 Charge Out Rates

Rates for any services beyond those expressly identified under the Initial Pilot Fees (e.g., additional field assistance, programming, etc.) are the following:

LEVEL	2026 Rate
	Per Day
Exec / PM Engineer*	\$2,089.63
Engineer*	\$1,713.76
Senior Technologist*	\$1,497.14
Technologist	\$1,216.82
Travel & Lodging	Cost + 20%
Mileage	\$0.80/KM
Meals	\$100.00 Per Diem

\* Two days minimum for any and all field assistance visits

### 6.4 Payment Terms

- All applicable taxes related to the lease, any services, and any other performance under the Agreement are extra.
- Payment of the Initial Pilot Fees are due thirty (30) days after the date on which the Pilot Equipment arrives at the Site.
- The Pilot Fees for the Extension Pilot Term are due thirty (30) days after invoice and will be invoiced monthly.
- All amounts herein are in US dollars currency.
- All amounts owed by Client to Purifics shall be paid by Client to Purifics through direct bank deposit at the bank and account identified by Purifics to Client, or as otherwise agreed by Purifics and Client.
- 1.5% per month charged on overdue accounts.

### 6.5 Valuation

The replacement value of the Pilot Equipment is the value declared on the Commercial Invoice, as submitted to US Customs. This is the value used for Insurance purposes. Depending on the pilot system used, this range is from \$275,000 USD.

### 6.6 Build America Buy America & USMCA

This proposal and equipment is BABA compliant and Tariff exempt under the USMCA.





## 7 ACCEPTANCE

Client accepts and agrees to entering into this agreement for the Water Purification On-Site Pilot Test Program under the terms set forth in this Proposal and the Pilot Lease Terms and Conditions:

Company: \_\_\_\_\_

Tel: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Purchase Order #: \_\_\_\_\_

Test Date: \_\_\_\_\_

Purifics agrees to enter into this agreement for the Water Purification On-Site Pilot Test Program under the terms set forth in this Proposal and the Pilot Lease Terms and Conditions:

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_



8 APPENDIX 1: **Cuf**®**Purifics**Why **Cuf**®

## Better Water at Lower Cost

### Proven Continuous Ultra Filtration Performance

**80%**  
Capital Reduction

**75%**  
Footprint Reduction

**80%**  
Chemicals Reduction

**50%**  
Energy Reduction

**50%**  
OpEx Reduction

<ul style="list-style-type: none"> <li>✓ All Weather Performance Capability</li> <li>✓ The Platform is the Plant</li> <li>✓ Zero Liquid Discharge</li> <li>✓ 250 GFD on Surface Water</li> <li>✓ Multi-Contaminant Removal Capacity</li> <li>✓ Lowest O&amp;M Cost Structure</li> <li>✓ Fully Automated</li> <li>✓ &gt;99% On-Line Duty</li> <li>✓ Continuous Self Cleaning</li> <li>✓ NSF/ANSI/CAN 61-372 Compliant</li> <li>✓ LT2ESWTR Compliant</li> <li>✓ Reduced Complexity</li> <li>✓ No End Life of Membrane</li> <li>✓ 50% Less Coagulant</li> <li>✓ In-Situ Concentrated Sweep Floc</li> <li>✓ Low-Cost Marker Based DIT</li> <li>✓ Twice the DOC Removal</li> <li>✓ Best Warranty</li> </ul>	<ul style="list-style-type: none"> <li>✓ Eliminates Backwash Process</li> <li>✓ Eliminates Backwash Tank</li> <li>✓ Eliminates Clarifier</li> <li>✓ Eliminates Flocculation &amp; Polymer</li> <li>✓ Eliminates Clean In Place (CIP)</li> <li>✓ Eliminates Membrane Replacement</li> <li>✓ Eliminates Filtrate Loss</li> <li>✓ Eliminates Pre-Treatment</li> <li>✓ Eliminates Chloramines</li> <li>✓ Eliminates Permanganate</li> <li>✓ Eliminates Temperature Constraints</li> <li>✓ Eliminates Jar Testing</li> <li>✓ Eliminates Bubble Decay Integrity Test</li> <li>✓ Eliminates DIT Volumetric Concentration</li> <li>✓ Eliminates Filter Press</li> <li>✓ Eliminates 0.3 Micron Prefilter</li> <li>✓ Eliminates Pressure Constraints</li> <li>✓ Eliminates pH Constraints</li> </ul>
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- ✓ Constant Flux Capability
- ✓ Allows Free Chlorine Use
- ✓ Reduces Cl<sub>2</sub> Demand
- ✓ 5.7 LRV Approval
- ✓ THM & HAA Compliance
- ✓ All Filtrate to Distribution
- ✓ Minimal Operator Requirement
- ✓ Continuous Flow
- ✓ 99.99% Feed Water Recovery
- ✓ Accepts Feed Pressure 0-150 psi
- ✓ Most Hydrophilic Membrane (SiC)
- ✓ Exceptional Cold-Water Performance
- ✓ Lower TMP & X Pressure
- ✓ Factory Acceptance & Review
- ✓ Factory Training Prior to Shipment
- ✓ Taste & Odor Removal
- ✓ In-Situ Coagulation
- ✓ In-Situ Oxidation
- ✓ In-Situ Reduction
- ✓ Virtually Indestructible
- ✓ Flexible Design Can Incorporate Carbon
- ✓ 5<sup>th</sup> Generation 100% SiC Ceramic Membrane
- ✓ Eliminates Cleaning Constraints
- ✓ Eliminates Prorated Warranty
- ✓ Eliminates Irreparable Fouling
- ✓ Eliminates Coagulant Breakthrough
- ✓ Eliminates Onsite Fabrication
- ✓ Eliminates Continuous Operator Adjustments
- ✓ Eliminates Composite Ceramic
- ✓ Eliminates Air Sparging
- ✓ Eliminates Intermittent or Batch Processing
- ✓ Eliminates Ion Exchange (SIX)
- ✓ Eliminates Flux De-Rating Due to Cold Water
- ✓ Eliminates Primary Disinfection
- ✓ Eliminates Dead-End
- ✓ Eliminates “Just a Filter”
- ✓ Eliminates Pinning
- ✓ Eliminates Charge Neutralization
- ✓ Eliminates Risk of Cross-Contamination
- ✓ Eliminates Complexity/Confusion
- ✓ Eliminates UV
- ✓ Eliminates Membrane Preservative
- ✓ 0 to 100% Turndown Capability

**Learn More:** <https://www.youtube.com/watch?v=bs1vtEjZjbw>





## Typical Contaminant Removal Performance

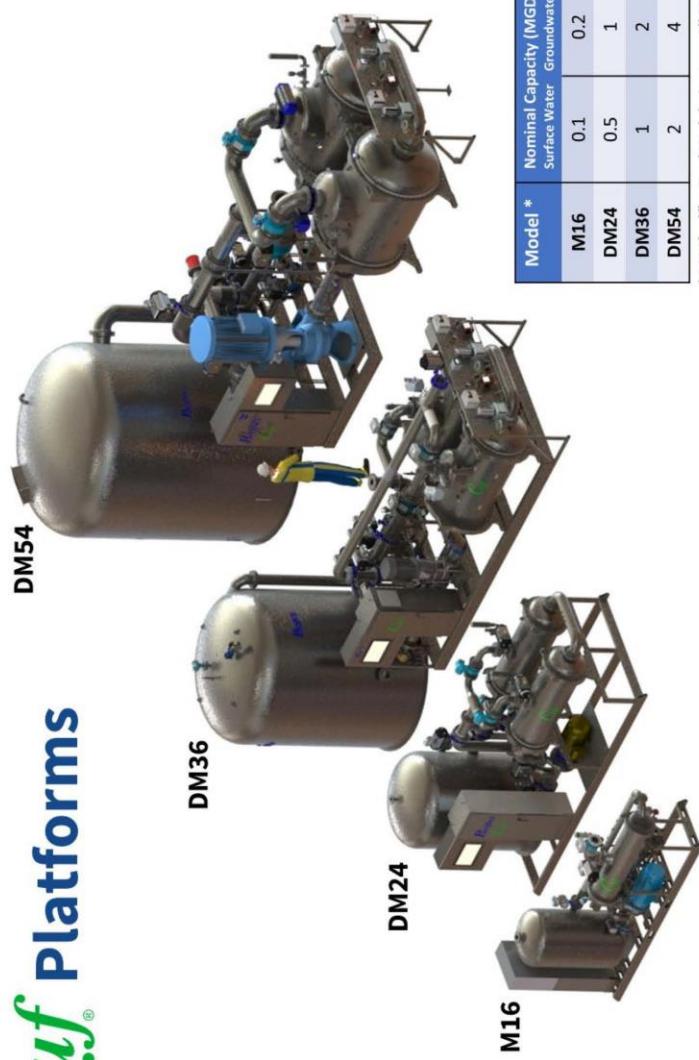
Contaminant (ppb)	Method
E. coli/Crypto	Marker DIT
Aluminum	pH>6.5
Antimony	Ox / DO
Arsenic	Ferric
Barium	Ox / DO
Beryllium	Ox / DO
Cadmium	Ox / DO
Chromium (6)	Red/Calmet
Cobalt	Ox / DO
Color (CU)	ACH/CSF
Complexed Copper	Red/Calmet
Copper	Ox / DO
DOC/TOC (ppm)	ACH/CSF
THM/HAA	ACH/CSF
Fluoride	Alum
H <sub>2</sub> S	Chlorine
Hardness	NaOH or Lime
Iron	Ox / DO
Lead	Ox / DO
Manganese	Ox / DO
Mercury	Ox / DO
Molybdenum	Ox / DO
Nickel	Ox / DO
PFAS (ppt)*	CAC
Phosphorus	Alum or ACH/CSF
Radium 226/228	HMO
Selenium	Red/Calmet
Silver	Ox / DO
Thallium	Ox / DO
Tin	Ox / DO
Uranium	Ox / DO
Vanadium	Ox / DO
Zinc	Ox / DO

\*Also removes EDCs, PPCPs, BTEX, & 1-4 Dioxane





# Cuf Platforms®



Model *	Nominal Capacity (MGD)	L x W x H
	Surface Water	Groundwater
M16	0.1	0.2 10' x 2.5' x 6'
DM24	0.5	1 15' x 6' x 8'
DM36	1	2 22' x 8' x 10'
DM54	2	4 28' x 12' x 12'

\* DM Signifies Dual Module System. All DM Platforms can be supplied as M platforms only and be expanded to DM at future date.





## 9 APPENDIX 2: **SRU<sup>®</sup>**



Why **SRU<sup>®</sup>**? <https://www.youtube.com/watch?v=3CiBB3s7lEs>



**Purifics****SRU** for ZLD  
Solid Recovery Unit**Residual Management**

**SRU** is a real time, fully automated, configurable, chemical free, extremely low energy, SiC Membrane Process to Recover Solids from water. The process allows full Solids Recovery and to achieve 100% Water Efficiency. Recovered Solids include coagulated organics (DOC), biomass, silt, algae, sludge, precipitated metals in any combination. Zero Liquid Discharge (ZLD) and 100% water efficiency is achieved. **SRU** solves the technical and purification challenge by removing Solids from the water into a solid phase. **SRU** can operate continuously or on demand and has a 25-year design life and can be a stand-alone process or integrated with other processes.

**Chemical Free, Consumable Free, Labor Free**

There is no polymer or chemicals of any kind, no consumables or no labor involved in the **SRU** process which eliminates all costs associated with traditional concentrate wastewater management and disposal methods.

**Holistic Residuals Management**

The solids produced by the **SRU** are at best, a viable product with commercial value or at worst a small solid waste handling disposal requirement which can be landfilled as per regulations. **SRU** is a Carbon Capture process with a very small footprint and very low electrical energy requirement.

**Capability**

The **SRU** solids / residuals are recovered at nominally 20% solids to pass a TCLP test for landfill disposal applied in high (multi MGD) and low flow applications.



**Applications**

Drinking Water Filtration Plants  
 Concentrating DAF Waste & Clarifier Bottoms  
 Product Recovery, Mining of Water for Metals & Nutrients  
 Filter Reject / Backwash Waste Dewatering

Municipal Sludge Concentration  
 Algae & Pathogen Removal  
 Replaces Filter Presses & Centrifuges

**Process**

**SRU** recovers solid contaminates or second phase constituents which are filtered or phase separated to customer requirements. The heart of **SRU** consists of proprietary ceramic membrane process technology using dynamic shock and process.

**Eliminates**

Conventional Solutions require chemicals (polymer), labor, consumables and high maintenance which are eliminated with the **SRU** process. The elimination of these obsolete process inputs further contributes to the unmatched reduction in the operating and capital cost structures of the **SRU** process vs alternatives.

**Operating Cost and Performance**

ZLD costs \$0.64 / day at a 1MGD **Cuf** drinking water plant in operation since 2015.

**Certification / Compliance**

LT2ESWTR > 4 Log LRV; NSF/ANSI/CAN 61-372; NEC – UL508A

**Solids, Different Water, Composition & Set Points**

Watch **SRU** Technology [HERE](#)

Watch **SRU** Operating: [HERE](#)

Watch **Cuf** with **SRU** [HERE](#)





### Closed Loop Residuals Reuse/Disposal

**SRU** Residuals can be sold/disposed of by any of the following methods with residuals production tuned to a range of 10 to 20% solids by mass which can pass the paint filter test.

1. Cement Plant (Fuel)

**SRU** residuals, when classified as a Sludge, are treated as a liquid waste when landfilled at a cost in the range of \$180/ton.

2. Landfill (Disposal)

**SRU** residuals, when classified as Solids, are landfilled at a cost in the range of \$65/ton.

3. Mining (Recovery)

4. Land Applied (Recovery)

**SRU** residuals can also be land applied.

Characterization of the residuals from a surface water plant confirmed that the residual solids can meet Codes of Practice for Soil Amendments Standards and could be used for land application. Recovery of the solids for land application makes the residuals a value-added product.

The residual solids help immobilize excess phosphorus in the soil which is beneficial for:

- agricultural amendment
- co-applied with manure/biosolids for nutrient management.

The detailed analysis and recommendation are available in the following report.

BIM (2018) Pilot Plant Study Ceramic Ultrafiltration.

<https://bowenisland.civicweb.net/document/152264>

### Residuals Characterization

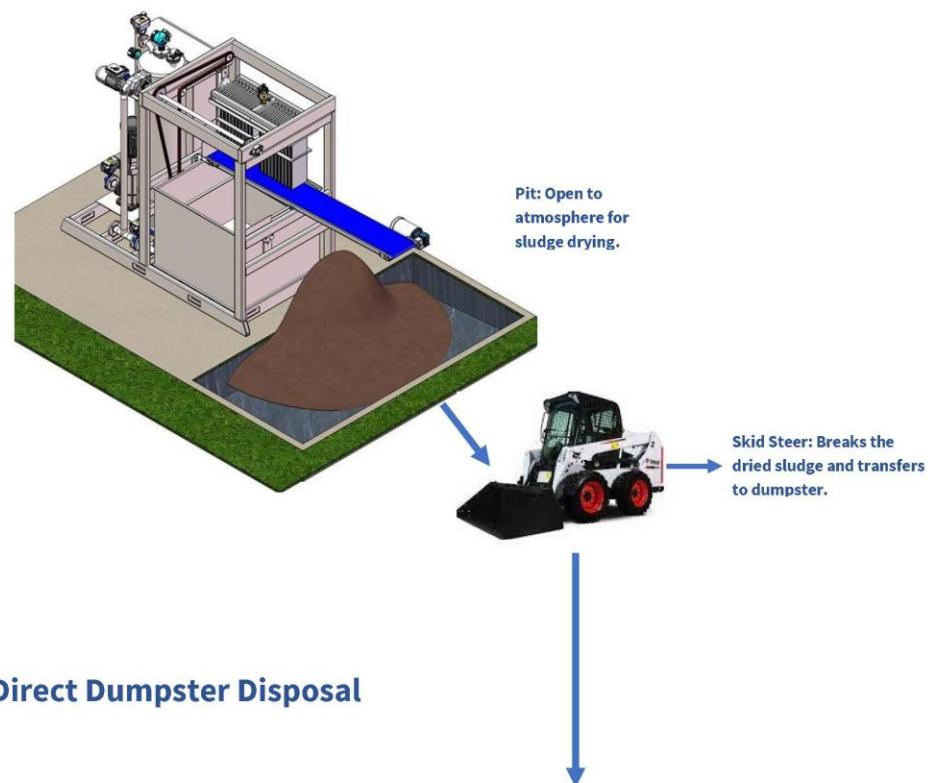
<b>Moisture, Average</b>	88.9 %
<b>Organic Content</b>	35.5 %
<b>Wet Bulk Density, (as-is)</b>	1.03 – 1.15 kg/L
<b>Dry Bulk Density</b>	0.10 – 0.15 kg/L
<b>Size Distribution</b>	Consistent
<b>Sample Classification</b>	Sandy Loam
<b>pH</b>	5.5 – 6.3



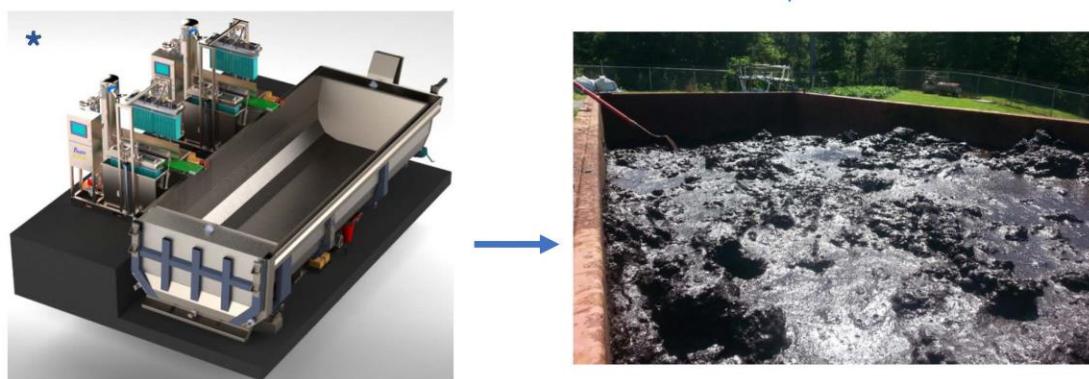


## Solids Management Options

### Option A – Pit Disposal



### Option B – Direct Dumpster Disposal



\*Plastic or Cardboard Lined Dumpster Advised



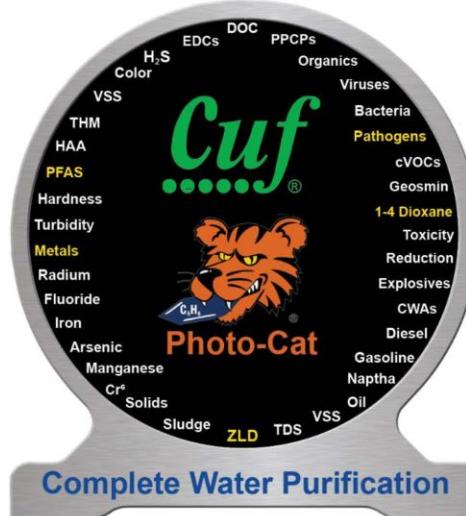


## 10 APPENDIX 3: PURIFICATION CAPABILITY



### Purification Capability

Purifics offers advanced, fully integrated technologies for complete water purification, backed by over 30 years of proven performance in both municipal and industrial applications. These unique technologies combine the best of Continuous Ultra-Filtration (**Cuf**) and Chemical Free AOP+ (**Photo-Cat**) with Complete Process Automation. Purifics systems purify water by removing: Chemicals, Metals, Turbidity, Bacteria, Viruses, Oil, Particulate, TOC, BOD, COD, DOC, Color, Taste, Odor, Hardness, EDCs, PPCPs, TSS, TTHM & HAA Precursors, PFOS/PFOA, H<sub>2</sub>S, green algae & Silica. See reverse for details.



#### Purification Technologies:

**Cuf** is a high-performance system that uses SiC ceramic membranes and concentrated sweep floc coagulation to remove multiple contaminants in a single compact platform. The system achieves Zero Liquid Discharge (ZLD) through its integrated Solids Recovery Unit (**SRU**), all without additional chemicals or labor. This eliminates the need for pre-treatment and membrane replacement while significantly reducing footprint, process complexity, and chemical consumption.

**Photo-Cat** is a chemical-free, photocatalytic Advanced Oxidation Process (AOP+) that delivers the highest oxidation potential in the industry. It effectively destroys chemical contaminants that conventional AOPs cannot, including persistent and emerging pollutants like 1,4-Dioxane and PFAS with no chemical additions. **Photo-Cat** offers a sustainable, low-operating-cost solution for the complete destruction of even the most difficult-to-treat compounds.

Purifics products are protected by US & Foreign Patents and patents pending. Purifics, Photo-Cat, **Cuf**, and AOP+ are registered trademarks.





## Contaminants Removed and/or Destroyed:

**Metals:** Ag, Al, As, Au, Ba, Be, Cd, Co, Cr<sup>6</sup>, Cu, Fe, Hg, Mn, Ni, P, Pb, Pt, Se, Sn, Tc<sup>99</sup>, Th, U, V, Zn

**Pathogens:** Cryptosporidium, E-coli, Giardia, Bacteriophage, Spores, Cyanobacteria, etc. >5 Log removal  
(Remove, or kill, or consume)

**Viruses:** Adenoviruses, MS2, etc. >7 Log removal  
(Remove, or kill, or consume)

**Oil/NAPL:** Heavy, Light, Oil/Sand, LNAPL, DNAPL, mechanical & chemical emulsions, diesel, gasoline  
Recovered as Neat product

**Particulate:** Absolute particulate removal by filtration, agglomeration, oxidation, reduction, etc.

**NORMs:** Radium 226, Radium 228, Gross Alpha, Gross Beta

**TDS:** Hardness (Ca & Mg)

<b>Chemicals:</b>	Alcohols	Amines	Chemical Warfare Agents	Nitro-Organics
	Aldehydes	Aromatics	Dioxins/Furans	PAHs
	Alkanes	BTEX	Energetics	PFOs & PFOA
	Alkenes	Carboxylic Acids	Ethers	Peroxides
	Alkynes	Chlorinated Alkanes	Explosives	Phenols
	Aliphatics	Chlorinated Aliphatics	Herbicides/Pesticides	TTHM & HAA Precursors
	Amides	Chlorinated Aromatics	Ketones	API – Active Pharmaceutical Ingredients

## Specific Contaminants of Concern

Purifics processes do not generate H<sub>2</sub>O<sub>2</sub> residual, Bromate, NDMA and will destroy these contaminants if present.

## Fluids Purification

In addition to water, Purifics technologies are capable of purifying fluids such as NAPLs & fuels, and aggressive chemicals such as solvents, acids and bases.

## Solution Specification

Purifics complete water purification systems operate at various ranges and are able to achieve advanced purification levels suited to the client's specific requirements and regulations. Purifics technology has been accredited with a variety of awards and certifications.

Protected by US & Foreign patents & patents pending. Purifics, Photo-Cat, *Cuf*, FDR, DeWRS and AOP+ are registered trademarks.





## 11 APPENDIX 4: COMPANY PROFILE



### Company Profile

#### Mission

**Complete Water Purification with Sustainable, Economic & Environmental Advantage**  
**Better Water at Lower Cost**



#### Proven Competitive Advantage



#### Company

Purifics; est. 1993, is a fluid purification technology-based business that provides Complete Water Purification Systems based on its FDR (Filter Destroy Recover) technology. These systems eliminate or reduce; chemicals, consumables, complexity, footprint, dependencies, and pre & post treatment. This provides dramatic reductions in lifecycle cost (CapEx and OpEx). The technology of our products was established by solving difficult water challenges for the Nuclear & Remediation industry and today solves Municipal & Industrial water purification challenges. Purifics' complete water purification systems are low carbon and sustainable green solutions with a proven track record of meeting water purification needs effectively with unmatched durability, efficiency, and reliability. The company holds 36+ Patents, Patents pending, Trademarks, Trade Secrets and has over 30 years of Application Experience in Industrial, Municipal and Reuse sectors.

#### Purification Capability

Why treat when you can **purify** water (fluids) by removing: Chemicals, Metals, Turbidity, Bacteria, Viruses, Oil, TSS, TOC, BOD, COD, DOC, Color, Taste, Odor, Hardness, TDS, EDCs, PPCPs, TTHM & HAA Precursors, PFAs, etc.





## How Purification Is Achieved, Technology & Services

**Cuf®** a high-performance continuous ultra-filtration system that uses SiC ceramic membranes and concentrated sweep floc coagulation to remove multiple contaminants in a single platform process. It reduces footprint, complexity and chemical use, while eliminating the need for pre-treatment & membrane replacement.

**SRU®** is a fully automated, chemical-free solids recovery system that enables true Zero Liquid Discharge (ZLD), offering a sustainable and efficient solution for water efficiency and waste elimination.

**Photo-Cat®** is a Chemical Free Photocatalytic AOP+ system that has the highest oxidation capability that destroys chemicals other AOPs cannot.

**Concentrated Sweep Floc** is a proprietary process that has 3 times the efficiency of DOC removal versus traditional Coagulation. This allows drinking water plants to revert to free chlorine and eliminates Jar Testing.

**Dynamic Shock** is a proprietary technology that eliminates backwash, pre-treatment, and allows sustained membrane flux.

**SiC Ceramic Membrane** is 5<sup>th</sup> generation membrane that operates at 5X the flux of conventional (composite ceramic/polymeric) membranes at the same operating parameters in the range of 250 – 500 GFD.

**Marker Based DIT** is a rapid ultra low-cost Challenge / DIT test. It is simple. It is an absolute test. It is not based on a number of theoretical assumptions as it is the case with bubble decay testing.

**Full Automation With Remote** The plant runs itself and only needs to be monitored, not controlled.

**PCAS** Precise Chemical/Carbon Addition System eliminates costs, hazard and performance issues.

## Turn-key Plant Equipment Solutions

Purifics develops, designs, and manufactures systems that completely solve your complex water challenges with technologies that promote sustainable risk-free technologies. Our solutions simplify operations, prevent waste, enable product recovery, and support long term environmental leadership. Purifics systems consistently exceed client standards, regulatory requirements, and certifications in a variety of municipal and industrial markets globally. Just add Bricks and Mortar and you have a complete turnkey solution.

## Bench & On-Site Verification Facilitated

Bench tests provide clients the opportunity to validate feasibility at no risk. On-site pilot Verification programs use our mobile water purification platforms (5 available) to validate the solution, eliminate risk, facilitate regulatory approval, quantify full-scale design/cost, and train staff.

## Customer Satisfaction is our Goal

In every project Purifics takes on, our goal is to solve the client's unique set of challenges. Our after-sales Worldwide Support (WWS) program is flexible and tailored to each customer's requirements. Purifics installed customer base exceeds 75 system installations globally.

