



C0000016

BLACK & VEATCH Waste Science, Inc.

101 North Wacker Drive, Suite 1100, Chicago, Illinois 60606, (312) 346-3775, Fax: (312) 346-4781

USEPA/ARCS V
Pristine #17-5P56

BVWS Project 70260
BVWS File C.3
October 3, 1995

Mr. Thomas Alcamo
U.S. Environmental Protection Agency
77 West Jackson Boulevard (HSRM-6J)
Chicago, Illinois 60604

Subject: Supporting Information for the
Added Pristine Treatment Plant
Costs, Pristine Inc. Site,
Reading, Ohio

Dear Mr. Alcamo:

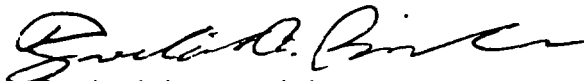
The attached tables and appendices provide the basis for the added Pristine Treatment Plant costs discussed in our September 6, 1995 letter.

Table 1 shows the itemized capital costs and Table 2 shows the detail for the undiscounted operation and maintenance costs. Appendix C contains a rough preliminary schematic flow diagram showing the generic process changes.

Please contact me if you have any questions.

Sincerely,

BLACK & VEATCH Waste Science, Inc.



Frederick A. Brinker

Enclosures

cc: W.C. Bruce
L.G. Magill
R.M. McAvoy
C.D. Norman, USEPA (HSMC-5J)
B.I. Manzke, USEPA (MCC-10J)

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EPA Region 5 Records Ctr.



223948

**Supporting Information
for the
Added Pristine Treatment Plant Costs**

**Pristine Inc. Site
Reading Ohio**

Table 1 Estimated Additional Capital Cost Summary Pristine Inc. Treatment Plant		
Item	Cost	Source
Modified Solids Removal System @ 165 gpm (SS)	\$70,000	B&V History*
Additional Carbon Adsorption Tank @ 165 gpm	30,000	B&V History*
4-Chemical Feed Systems @ 165 gpm @ \$5,600	22,400	B&V History*
2-Pumps @ 165 gpm @ \$3,000	6,000	B&V History*
Auxiliary Equipment (PHIC, ORPC, Valves, etc.)	51,250	B&V History
Ion Exchange System with post bagfilter and controls @ 165 gpm	279,904	Quotation (Appendix B)
Activated alumina adsorbent system with controls @ 165 gpm	99,450	Quotation (Appendix B)
Purchased Equipment Cost	559,004	
Additional Control Costs @ 12.5% of purchased equipment	69,876	B&V History
Total Equipment Cost	628,880	
Equipment piping and electrical installation @ 30% of total equipment cost	188,664	B&V and CRA History
Installed Equipment Cost	817,544	
Tax @ 7% of Total Equipment Costs	44,022	CRA History
Freight @ 8% of Total Equipment Costs	50,310	CRA History
General Contractor Costs @ 20% of Total Equipment Cost	125,776	CRA History
Bonds and Insurance @ 1.7% of Installed Equipment Cost	13,898	CRA History
Startup @ 7.88% of Installed Equipment Costs	64,422	CRA History
Onsite Supervision @ 3.9% of Installed Equipment Cost	31,884	CRA History
Total Capital Cost	\$1,147,856	

* See Appendix A.

Table 2 Estimated Additional Operating and Maintenance (O&M) Cost Summary Pristine Inc. Treatment Plant		
O&M Description	Additional Annual O&M Cost	Source
Carbon adsorption	\$ 39,286	Table 3
Solids Removal	420,000	Table 4
Analysis	122,738	Table 5
Solids Disposal	144,256	Table 6
Subtotal:	\$726,280	

Every 3 years, activated alumina must be replaced (B&V Data):

$$@ \left(\frac{\$225}{ft^3} \right) (130 ft^3) = \$29,250$$

Every 6 years, ion exchange resin must be replaced (B&V Data):

$$@ \left(\frac{\$425}{ft^3} \right) (200 ft^3) = \$85,000$$

Every 3 years, O&M cost =

$$\$29,500 + 726,280 = \$755,530$$

Every 6 years, O&M cost =

$$\$755,530 + 85,000 = \$840,530$$

Total Additional O&M cost @ 30 years @ 0% =

$$(21) (726,280) + (5) (755,530) + 4 (840,530) = \$22,391,650$$

Table 3 Additional Carbon Adsorption Costs for Phenol Removal Pristine Inc. Treatment Plant
--

Basis: Pristine Trust did not plan on removing phenol.

Phenol In =

$$(443 \text{ } \mu\text{g/L}) \left(\frac{150 \text{ gal.}}{\text{min.}} \right) \left(\frac{1}{119,825,709.6 \left(\frac{\mu\text{g}}{\text{L}} \right) \left(\frac{\text{gal.}}{\text{lbm}} \right)} \right) \left(\frac{60 \text{ min.}}{\text{hr.}} \right) \left(\frac{24 \text{ hrs.}}{\text{day}} \right) \left(\frac{365 \text{ days}}{\text{yr.}} \right) = 291.47 \text{ lbm/yr.}$$

Phenol Out =

$$(0.7 \text{ } \mu\text{g/L}) \left(\frac{\left(\frac{150 \text{ gal.}}{\text{min.}} \right) (60) (24) (365)}{119,825,809.6} \left(\frac{\text{L}}{\mu\text{g}} \right) \left(\frac{\text{lbm}}{\text{gal.}} \right) \left(\frac{\text{min.}}{\text{yr.}} \right) \right) = 0.46 \text{ lbm/yr.}$$

Phenol Removed =

$$291.01 \text{ lbm/yr.}$$

Carbon Usage at 0.443 mg/L =
(EPA-600/8-80-023)

$$\frac{14 \text{ lbm}}{1,000 \text{ lbm of carbon}}$$

Additional Carbon Usage =

$$(290.01) \left(\frac{1,000}{14} \right) = 20,786 \text{ lbms}$$

Table 3 (Continued) Additional Carbon Adsorption Costs for Phenol Removal Pristine Inc. Treatment Plant
--

Additional Carbon Cost

$$\text{at } \left(\frac{\$1.00}{\text{lbm}} \right) (B+V \text{ Data}) = \$20,786$$

Additional O&M Cost of Added Carbon Adsorber @ 165 gpm for maintenance, materials, and process analysis costs (B&V Data) =

$$(1,000 + 2,500 + 15,000) = \$18,500$$

Total Additional O&M Costs:

$$\text{Total} = \$39,286$$

Table 4 Annual O&M Costs for Additional Solids Removal, Ion Exchange, Activated Alumina and Carbon Adsorption (Resin, Alumina, and Carbon Costs are not included) Pristine Inc. Treatment Plant				
Electrical Equipment (480 volt power)	Flow Rate			Run Time
	5-50 gpm	100 gpm	300 gpm	
Air Compressor, hp	10	10	15	30%
Discharge Pump, hp	3	7.5	15	100%
Chemical Pumps (7 @ 0.25 hp each), hp	1.75	1.75	1.75	50%
Mixers and Rake (5 @ 1 hp each), hp	5	5	5	100%
Vent Fan, hp	0.75	1	1.5	100%
Miscellaneous, hp	1	2	6	100%
Total, hp	13.5	19.5	33	Continuous
Yearly Cost	\$5,700	\$8,100	\$13,800	
Other Costs				
Operator	\$42,000	\$42,000	\$42,000	3 days/week at 8 hours/day
Maintenance Person	16,000	16,000	16,000	Once per week at 8 hours
Repair Materials	10,000	12,000	15,000	Pump seals, Instr. Repair, Chemical pump maintenance, sand, etc.
Other Utility Services	2,000	2,000	2,000	Telephone, water, gas
Sodium Hydroxide	45,000	90,000	270,000	\$0.15 per lb.
Chemical Reactant	40,000	80,000	240,000	\$0.79 per lb.

Table 4 (Continued) Annual O&M Costs for Additional Solids Removal, Ion Exchange, Activated Alumina and Carbon Adsorption (Resin, Alumina, and Carbon Costs are not included) Pristine Inc. Treatment Plant				
Electrical Equipment (480 volt power)	Flow Rate			Run Time
	5-50 gpm	100 gpm	300 gpm	
Additional Polymer	\$3,000	\$6,000	\$18,000	\$1.65 per lb.
Sulfuric Acid	3,000	6,000	18,000	\$0.13 per lb.
In-Process Analytical	40,000	45,000	60,000	
Subtotal	\$201,000	\$299,000	\$681,000	
Total	\$206,700	\$307,100	\$694,800	

Annual Cost for 165 gpm = \$420,000/year (See Appendix A).

Table 5 Estimated Additional Monitoring Costs Pristine Inc. Treatment Plant			
Analysis Item	Pristine Trust's Assumed Monitoring Plan	Final Required Monitoring Plan	Cost (B&V Data)
22 organics	3 analysis/month		\$920/month
48 organics		11 analysis/month	\$5,159/month
7 metals	1 analysis/month		\$325/month
13 metals		2 analysis/week	\$850/week
As and Cr ⁺⁶		2 analysis/week	\$120/week
CN and N(NH ₃)		2 analysis/week	\$120/week
Cl ₂		26 analysis/year (summer only)	\$3,250/year
Other (COD, TSS, TDS, Fluoride)	1 analysis/month		\$240/month
Other (BOD, COD, TSS, TDS, Oil and Grease, Fluoride)		1 analysis/week	\$360/week
Toxic	2 analysis/quarter	2 analysis/quarter	--

Cost Increase =

$$12 (5,159-920) + 52 (850+120+120+360) - 12 (325+240) + 3,250 = \$122,738$$

Table 6 Additional Annual O&M Costs for Increased Solids Disposal Due to Increased Solids Removal Pristine Inc. Treatment Plant
--

Total Solids in @ 150 gpm:

From Material Balance =

3,183.58 *lbm/day*

Current Planned Solids Removal @ 150 gpm:

From Material Balance =

924.29 *lbm/day*

Solids Concentrations @ 150 gpm:

$$\text{Influent} = \frac{(3,183.58 \text{ lbm/day}) (119,825,809.6) (\text{gal./lbm}) (\mu\text{g/L})}{(150) (60) (24) \text{ gal./day}} = 1,766,088 \mu\text{g/L}$$

New Effluent Assuming 500 $\mu\text{g/L}$ Remains after Additional Solids Removal =

500 $\mu\text{g/L}$

New Solids Removed @ 150 gpm:

$$\frac{(1,766,088 - 500) \mu\text{g/L} (150) (60) (24) \text{ gal./day}}{(119,825,809.6) (\text{gal./lbm}) (\mu\text{g/L})} = 3,182.68 \text{ lbm/day}$$

Increased Solids Removal @ 150 gpm =

$$(3,182.68 - 924.29) = 2,258.4 \text{ lbm/day} = 412.16 \text{ tons/year}$$

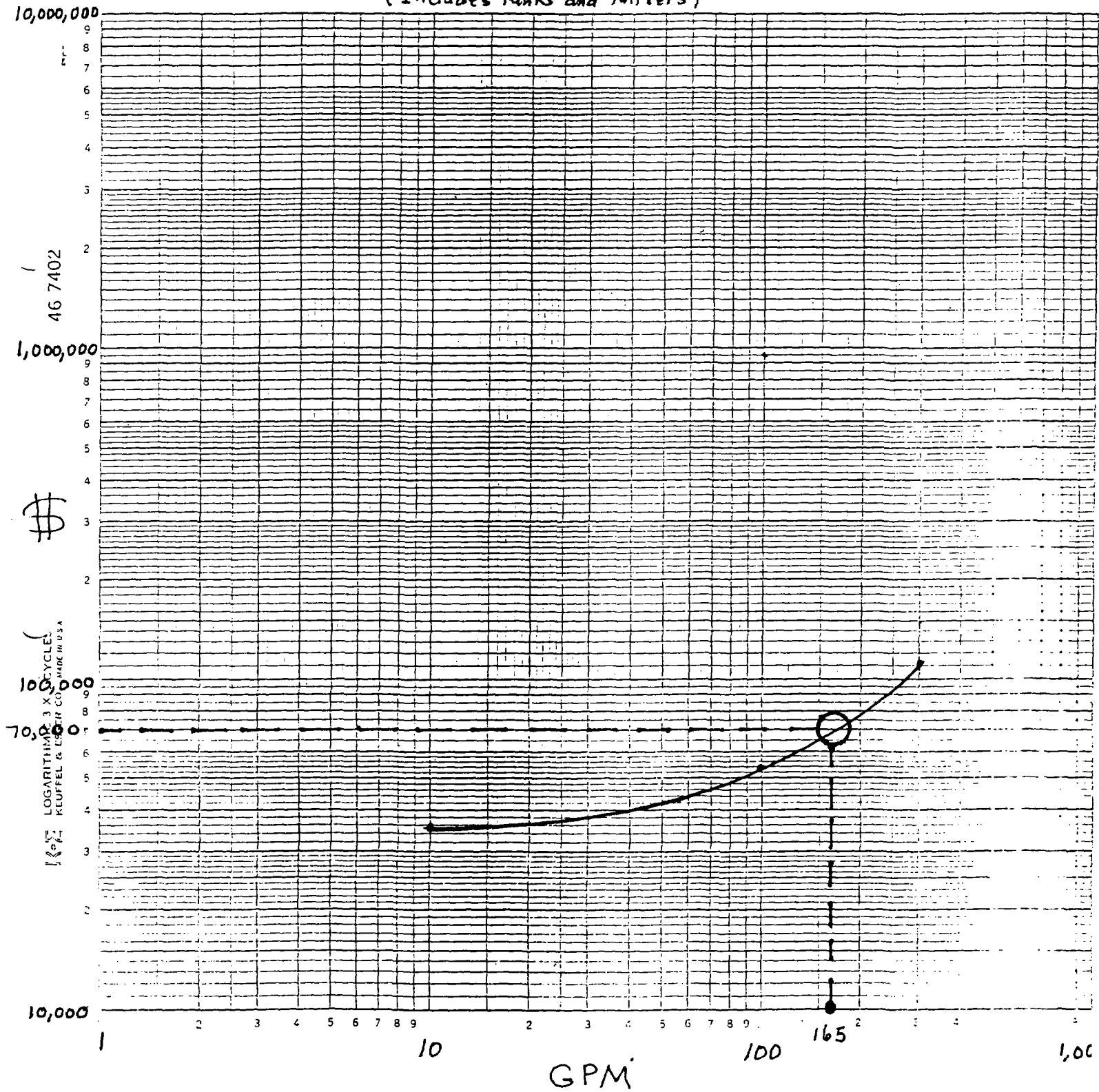
Increased Solids Removal Costs at 150 gpm (B&V Data) =

$$\left(\frac{412.16 \text{ tons}}{\text{yr.}} \right) \frac{\$350}{\text{ton}} = \frac{\$144,256}{\text{yr.}}$$

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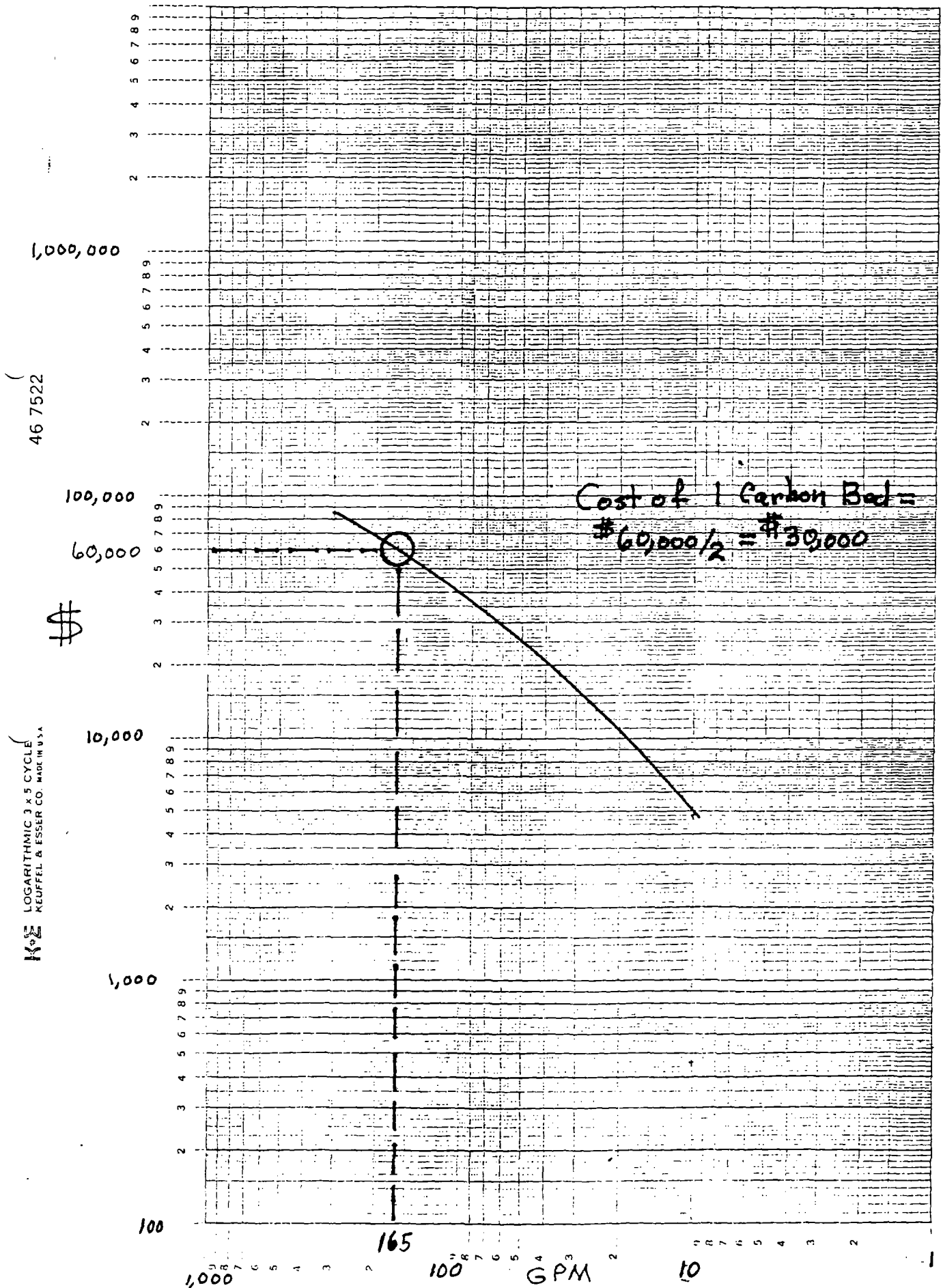
Appendix A
Graphs and Calculations
Pristine Inc. Treatment Plant

Metals Reaction System (Includes tanks and Mixers)

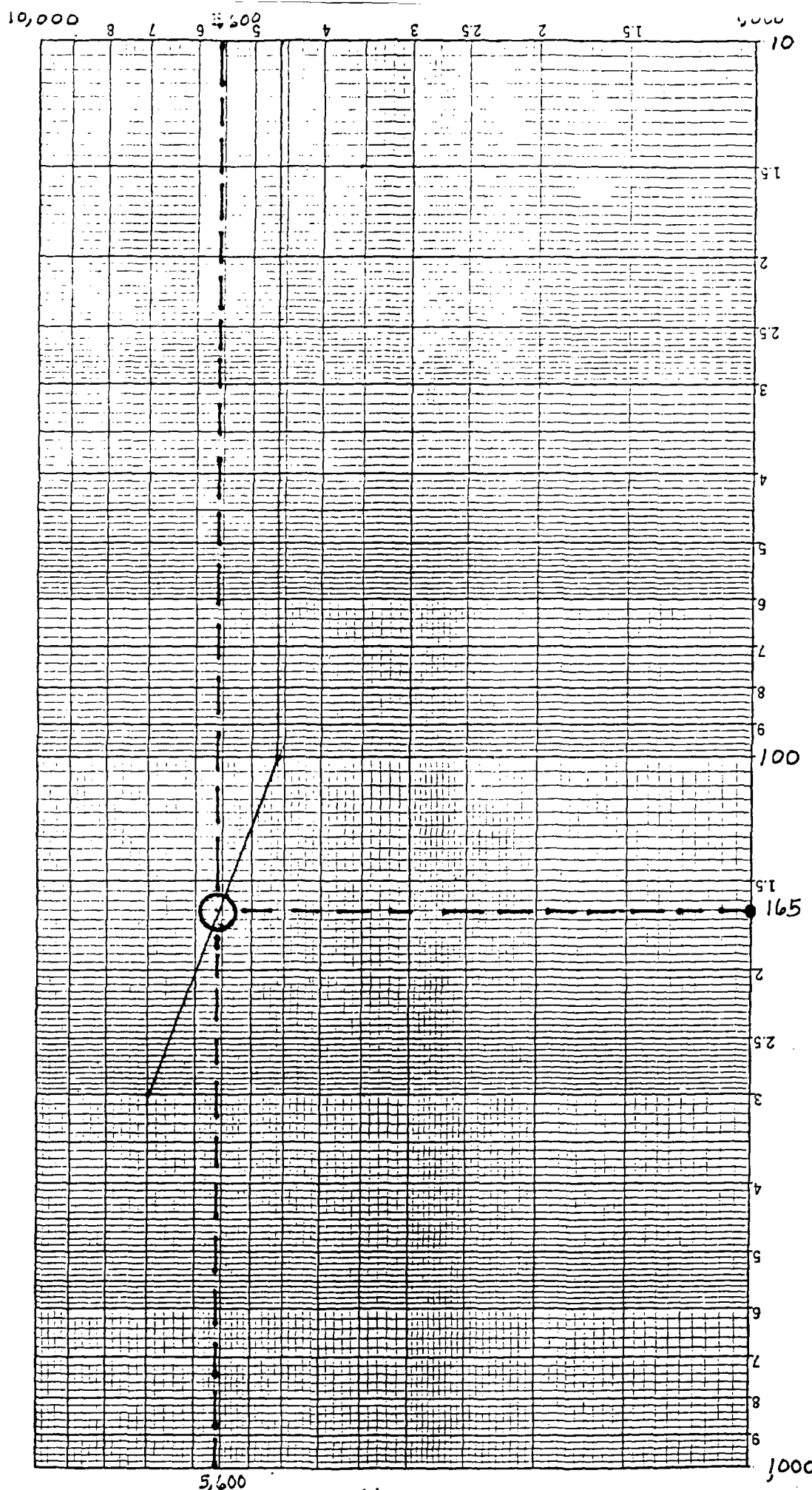


Source: B&V Data

2 Bed Carbon Adsorption System



Source: B&V Data



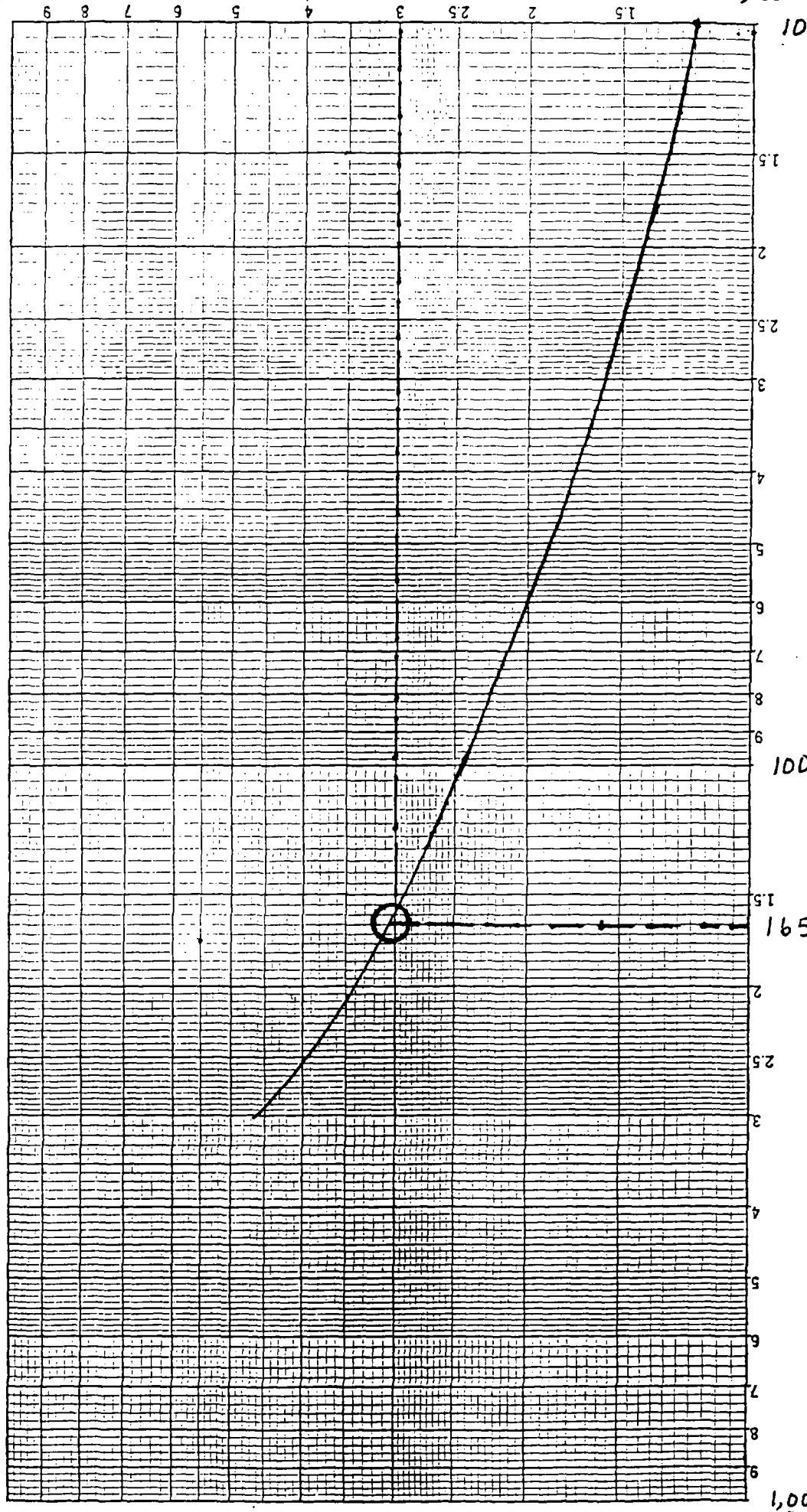
Chemical Feed
System (Includes
pumps, feed tanks,
etc.)

K&E LOGARITHMIC 358-103
KFULFILLER ENGINE CO. MADISON, S.A.
2 X 1 CYCLES

GPM

\$

Source: B&V Data



Water Pump
Costs

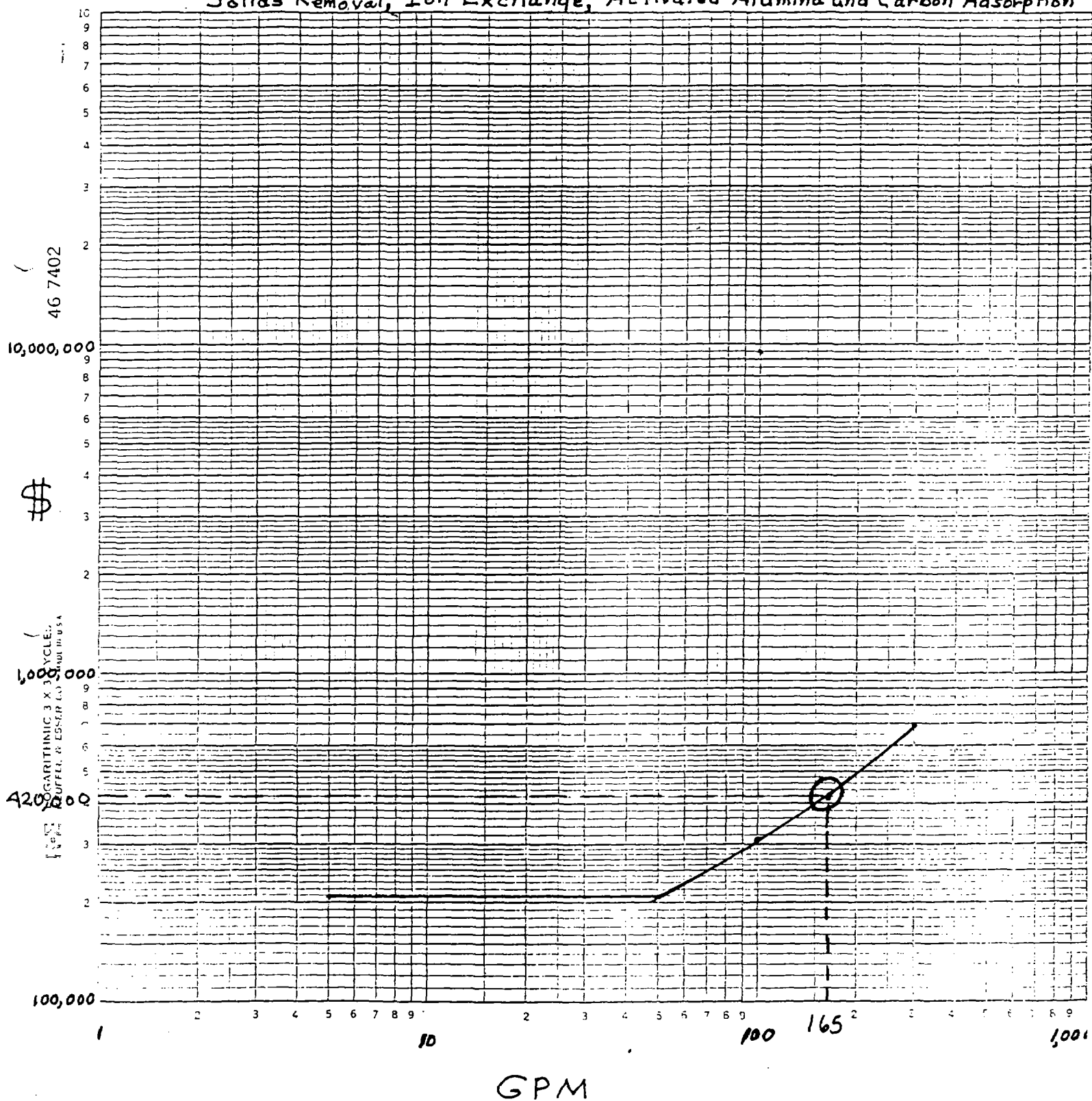
100 GPM

165

K&E LOGARITHMIC 358-103
KEUFFEL & ESSER CO. MADE IN U.S.A.
2 X 1 CYCLES

Source: B & V Data

Annual Operations and Maintenance for Additional Solids Removal, Ion Exchange, Activated Alumina and Carbon Adsorption



Source: B & V Data

Appendix B
Quotations for Ion Exchange
and
Activated Alumina Adsorption Systems
Pristine Inc. Treatment Plant



trionetics, inc.

2021 Midway Drive • Twinsburg, Ohio 44087 • (216) 425-2846 • Fax (216) 425-2908

August 30, 1995

Black and Veatch Waste Science Inc.
101 North Wacker Drive
Suite 100
Chicago, IL 60606
Attention: Mr. Richard McAvoy
Facsimile: (312) 346-3775
Telephone: (312) 346-4781

Trionetics, Inc. Budgetary Proposal Number 9508301-0970-30-00

Dear Mr. McAvoy:

Thank you for the opportunity to supply a budgetary proposal for the groundwater treatment project for your clients waste stream. Trionetics, Inc. is incorporating multiple recovery disciplines to obtain the desired concentrations leaving the facility with the least amount of waste requiring pretreatment and disposal.

I would advise you that due to nature of the discharge requirements, the waste stream should be evaluated thoroughly using a treatability study. Trionetics, Inc. has supplied the cost for a Treatability Study in Section 3.0. Additionally, a pilot study encompassing onsite evaluation of the principal technologies involved, merits consideration before final configuration of a comprehensive waste reduction plan.

The selective arsenic removal that Trionetics, Inc. recommends is based on activated alumina. This can be performed using the alumina as a powder added to the pretreatment process or in the post filtration following the IX system. The option of a post filter has been provided for your review.

Trionetics, Inc. was formed in 1988. Trionetics, Inc. intent was to design, fabricate, and service a line of environmental products geared towards metal removal and recovery from industrial waste streams. After evaluating equipment that was emerging as a viable treatment option (ion exchange and electrowinning), Trionetics, Inc. reviewed potential shortcomings of the technology and engineered an IX concept that addressed them.

August 30, 1995

Trionetics, Inc. developed an IX system that was based on removing operator involvement and control of critical system operations. Programmable Logic Controllers (PLC's) were used to watchdog operation and system functions. Modem diagnostics and program correction were added to the system. This advancement allowed quick analysis of potential system problems, assistance operators following system start-up improving familiarity with the equipment, and finally created a mechanism to correct or update program format without a site visit.

During the initial startup phase of a system, operators require a period of time to familiarize themselves with all system functions. Trionetics, Inc. diagnostic modem technology acts as a teaching aid to assist diagnosing proper system function from failures. It is an invaluable and powerful tool for service and support.

Trionetics, Inc. systems offer advantages that improve the Ion Exchange process. Unique features to our product include:

- Use of compressed air to separate process cycles and minimize regenerant volume and permitting regenerant reuse.
- Electric actuated, multiported 5-way valves simplifying valving and minimize spare part requirements.
- PLC control
- Modem diagnostics

Additionally, Trionetics, Inc. sought to enhance the worthiness of the product by selecting superior components that industrially hardened our product. These include:

- All Stainless Steel construction
- Stainless Steel and Teflon valves
- Conformance to UL ratings on panels and components

Mr. Richard McAvoy

August 30, 1995

Black and Veatch Waste Science, Inc. Page 3

Trionetics, Inc. Proposal No. 9508301-0970-30-00

Trionetics, Inc. has built recovery equipment for AT&T Microelectronics in Richmond, VA, private labels systems for U.S. Filter, an engineering firm, that are running at Eaton Corporation, and IBM facilities.

Trionetics, Inc. private labels electrolytic recovery equipment for Engelhard Corporation which is used in their Gold Mizer[™] recovery program. Trionetics, Inc. has engineered and fabricated systems for numerous Printed Circuit facilities, Anodizing and Plating shops. Trionetics, Inc. has supplied ion exchange/electrowinning systems for Hewlett Packard, 3M, Hughes Missile Systems and RCA/Thomson in facilities both domestically and overseas.

Trionetics, Inc. can arrange visitations to any of these facilities when the project requires. We are looking forward to working on the next phase of this project with Black and Veatch.

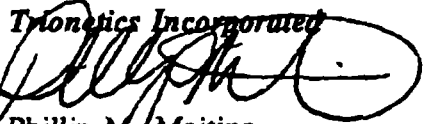
Confidentiality Agreement

This proposal is confidential and contains proprietary information. It is not to be disclosed to any third party without written consent of Trionetics, Incorporated.

We thank you for the opportunity to provide this quotation for your waste minimization needs. If you have any questions or comments on this proposal or it's technical contents, please contact the writer at your convenience.

Sincerely,

Trionetics Incorporated



Phillip M. Maitino
Applications Engineering Manager

PMM/lmp

cc: Authorized Sales Representative

Mr. Ed Casmere
W. E. Watt and Associates
675 E. Irving Park Road
Suite 203
Roselle, IL 60172
Telephone: (708) 582-2159
Facsimile: (708) 582-4654

August 30, 1995

Section 1.0 Basis of Design

1.1 Physical Design Basis

The following design assumptions are the basis for this proposal. Should actual conditions be significantly different, a modification of this proposal would be required.

- **Hours of operation**

<u>24</u>	Hours/Day
<u>7</u>	Days/Week
<u>52</u>	Weeks/Year

- **Influent Parameters (Supplied by Facility)**

Flowrate	<u>165 {Max}</u>	GPM
Waste stream characterization	As supplied on P.3 and P.4 of Customer Fax date 8-24-95.	

- **Effluent Parameters (Supplied by System)**

As supplied on P.3 and P.4 of Customer Fax date 8-24-95.		
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- **Site Specifications**

Installation Site	<u>Indoors</u>	
Temperature {max.}	<u>100°</u>	Degrees F°.
Space allocation	<u>TBD</u>	WxLxH [ft.]

- **System Specifications**

Clearance height	<u>120</u>	Inches
Service clearance	<u>36</u>	Inches
Electrical requirements	<u>460/3Ø</u>	Voltage/Phase
Service disconnect	<u>60</u>	Amps
PLC	<u>GE Fanuc</u>	
Interface	<u>Nematron</u>	
Service Water	<u>60</u>	Pressure
	<u>City</u>	Source
	<u>80</u>	GPM
Pipe	<u>PVC 80</u>	

Mr. Richard McAvoy

August 30, 1995

Black and Veatch Waste Science, Inc. Page 5

Trionetics, Inc. Proposal No. 9508301-0970-30-00

2.0 Equipment Specification

2.1 Metal Selective IX System { Two Duplex Train }

- 165 GPM maximum capacity
- Stainless steel chassis {Grade 304}
- NEMA 4 control panel with OIT control for full system operation
- Four [4] 42"x 72" Polyglass reinforced tanks schedule 80 PVC laterals.
- Two hundred [200] cubic feet of Weak Acid Chelating resin
- Ten [10] electrically actuated 316 SS 5 way valves 1.5"
- Fiberglass grating for entire skid surface
- Check valves with viton seals
- Four [4] Stainless Steel 0-100 PSI glycerin filled pressure gauges
- Two [2] 5 HP 304 construction, TEFC, stainless steel centrifugal process pumps
- Shielded Control voltage transformer
- Two [2] PVC 80 Eductor for regenerant brine transfer
- One [1] 1 HP TEFC driven, water boost pump
- GE Series 90-30 PLC
- Nematron operator interface
- Modem diagnostics
- Two [2] Solid State pressure transducers
- One [1] SS bag filtration system

(5 - 7) yrs @ \$425 / hr³

6500 gal / system

Mr. Richard McAvoy

August 30, 1995

Black and Veatch Waste Science, Inc. Page 6

Trionetics, Inc. Proposal No. 9508301-0970-30-00

2.2 Metal Selective IX System {One Triplex Train}

- 165 GPM maximum capacity
- Stainless steel chassis {Grade 304}
- NEMA 4 control panel with OIT control for full system operation
- Three [3] 63"x 86" Polyglass reinforced tanks schedule 80 PVC laterals.
- Two hundred [200] cubic feet of Weak Acid Chelating resin
- Six [6] electrically actuated 316 SS 5 way valves 2.5"
- Fiberglass grating for entire skid surface
- Check valves with viton seals
- Four [4] Stainless Steel 0-100 PSI glycerin filled pressure gauges
- Two [2] 10 HP 304 construction, TEFC, stainless steel centrifugal process pumps
- Shielded Control voltage transformer
- Two [2] PVC 80 Eductor for regenerant transfer
- One [1] 2 HP TEFC driven, water boost pump
- GE Series 90-30 PLC
- Nematron operator interface
- Modem diagnostics
- Two [2] Solid State pressure transducers
- One [1] SS bag filtration system

Mr. Richard McAvoy

August 30, 1995

Black and Veatch Waste Science, Inc. Page 7

Trionetics, Inc. Proposal No. 9508301-0970-30-00

2.3 Alcoa Sorbplus® Adsorbent System for Arsenic Removal {Duplex Train}

- 165 GPM maximum capacity
- Stainless steel chassis {Grade 304}
- NEMA 4 control panel with OIT control for full system operation
- Two [2] 63"x 86" Polyglass reinforced tanks schedule 80 PVC laterals.
- One hundred thirty [130] cubic feet of Sorbplus® granular adsorbent
- Four [4] electrically actuated 316 SS 5 way valves 2.5"
- Fiberglass grating for entire skid surface
- Check valves with viton seals
- Two [2] Stainless Steel 0-100 PSI glycerin filled pressure gauges
- Shielded Control voltage transformer
- Two [2] PVC 80 Eductor for regenerant transfer
- GE Series 90-30 PLC
- Nematron operator interface
- Modem diagnostics
- Two [2] Solid State pressure transducers

- 3 yrs -

\$225 / yr

400 - 4,200

Mr. Richard McAvoy

August 30, 1995

Black and Veatch Waste Science, Inc. Page 8

Trionetics, Inc. Proposal No. 9508301-0970-30-00

Section 3.0 Engineering Services

Trionetics, Incorporated shall provide the following Engineering Services with respect to the equipment and systems listed in Section 2.0 of this proposal.

3.1 Drawings/Manuals

- | | |
|----------------------------------|-----------|
| ● Process Flow Diagram (PFD) | Three (3) |
| ● Electrical Wiring Schematic | Three (3) |
| ● Equipment Outline Drawings | Three (3) |
| ● Operation & Maintenance Manual | Three (3) |

3.2 Project Management

Trionetics, Inc. shall provide a full time Project Manager to direct the execution, monitor progress, control costs, and schedule throughout all phases of engineering, procurement, manufacturing, construction and start-up. The Project Manager shall serve as a primary contact to the customer. Periodically, as requested by the customer, the Project Manager shall submit updates to the progress schedule and identify any deviations and corrective actions. The price for the systems specified into this proposal allow for one [1] pre-shipment site visit to the customers facility to ensure site readiness, and identify ingress alternatives for pre-shipment preparations to skids.

3.3 Installation Services

At the request of the customer, Trionetics, Inc. would be pleased to provide a quotation to provide installation services for the system(s) specified in this proposal. Installation services offered are complete mechanical installation electrical interconnection, and facility layout and trenching engineering services.

August 30, 1995

3.4 Start-Up /Shakedown Service

Start-up and/training services can be provided for the following:

- Pre-Start checkout / Troubleshooting for all equipment.
- Supervision of system start-up
- Instruction of operating personnel in system maintenance and operation.

Customer shall ensure that qualified operator will be available to Trionetics, Inc. on-site technician throughout entire start-up period. Startup and/or technical field service work are available at a cost of \$650.00 per eight [8] hour day {portal to portal}, plus travel & living expenses paid out of pocket.

3.5 Treatability Study /Laboratory Services

Trionetics, Incorporated reserves the right to perform treatability testing prior to formal acceptance of any order resulting from this proposal. This will provide both parties with protection against potential compliance problems. If the customer chooses, Trionetics, Inc. can perform the treatability work immediately for a fee of \$485.00, which would be credited against your purchase order for the proposed equipment of system.

Mr. Richard McAvoy
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Trionetics, Inc. Proposal No. 9508301-0970-30-00

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4.0 Warranty

4.1 Process Warranty

For a period of one (1) year from shipment of Trionetics, Inc. ion exchange system, the system, when maintained in satisfactory condition with no modification, unauthorized repair, accident, abuse or misapplication, and when operated in accordance with instructions and Trionetics, Inc. operating manual, as it may be supplemented from time to time, will generate effluents to the sewer system which will meet limits as contained in this quotation, per Section 2.0, Effluent Parameters. The foregoing is the only effluent guarantee made by Trionetics, Inc., and is dependent upon the accuracy of all information and data supplied by the Customer to Trionetics, Inc.

Trionetics, Inc. is not liable for any incidental or consequential damages including but not limited to, lost property, loss of business, or Third-Party claims whether foreseeable or not during the period of installation.

4.2 Service and Limited Warranty

The system shall be warranted for workmanship and defects for a period of twelve [12] months from shipment date from vendors facility. Any system components that are considered wear related items and not covered by the equipment warranty shall be specified in the equipment manual. This warranty gives the owner specific rights. These are specified in greater detail in Section 10 of this document.

4.3 Performance Testing

Upon completion of system start-up, the system will be subjected to a five [5] day performance test in order to verify proper system design and performance of the system. The performance test shall consist of influent and effluent sample collection using a discrete sampler and compositing samples on a twenty four [24] hour basis with analysis of regulated parameters. The samples shall be split to allow for independent analysis by both the owner and Trionetics, Inc. In the event that the analytical reports conflict, a neutral referee laboratory will be chosen by agreement between the owner and Trionetics, Inc. to perform additional analysis to determine if performance compliance has been achieved. Trionetics, Inc. may or may not, at its sole discretion, choose to be present during the performance test to ensure correct operating procedures have been followed. All labor, utilities, and material required to conduct the performance test shall be provided by the owner.

All analytical costs are to be borne by the individual parties, except in the case of the independent analysis by referee laboratory, at which point, costs are to be borne entirely

00-30-93 WED 11:03 TRIONETICS UNIT FAX NO. 21042021
Mr. Richard McAvoy
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Trionetics, Inc. Proposal No. 9508301-0970-30-00

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by Trionetics, Incorporated. During this time period, the electrolytic metal recovery cells, if applicable, will be operated and demonstrated to reduce metal concentrations in the electrolyte at the rate indicated by the design basis information.

Mr. Richard McAvoy

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Trionetics, Inc. Proposal No. 2508301-0970-30-00

5.0 Price & Payment Terms

5.1 Prices

The price of the 165 GPM IX system, as specified in Section 2.1 of this proposal is: **TWO HUNDRED SEVENTY NINE THOUSAND NINE HUNDRED FOUR DOLLARS**

..... **\$ 279,904.00**

OR

The price of the 165 GPM IX system, as specified in Section 2.2 of this proposal is: **TWO HUNDRED SEVENTY THREE THOUSAND SEVEN HUNDRED TWENTY EIGHT DOLLARS**

..... **\$ 273,728.00**

The price of the 165 GPM Arsenic removal Adsorbent system, as specified in Section 2.3 of this proposal is: **NINETY NINE THOUSAND FOUR HUNDRED FIFTY DOLLARS**

..... **\$ 99,450.00**

The above prices are quoted in U.S. Dollars, are firm for thirty [30] days, and exclude any applicable taxes or permits. Acceptance of order is subject to credit approval.

5.2 Payment Schedule

The payment schedule for the equipment listed in this proposal is as follows:

- 30% of total value of Purchase Order with submittal of such
- 30% of total value of with submittal of approval drawings
- 30% of total value prior to shipment
- 10% upon successful start-up, or thirty [30] days after shipment of equipment, which ever occurs first

Invoices will be issued on the Payment Schedule above.

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Section 6.0 Projected Schedule

Shipment: 14-18 weeks from receipt and formal acceptance of Purchase Order by Trionetics, Inc.

FOB Twinsburg, Ohio (shipped Direct freight collect unless otherwise arranged) Packing is included.

August 30, 1995

Section 7.0 Terms & Conditions-Detail

7.1 Purchase Terms

Trionetics, Inc. shall retain a security interest in all equipment shipped to the Customer. Until such time as final payment has been made, all equipment shall remain the property of Trionetics, Incorporated, and Customer will not suffer or permit the attachment of any lien of encumbrance of any kind against such equipment and will pay when due, all assessments, taxes, franchise fees, levies, or other charges against the equipment or its use. The Customer's failure to pay any amounts when due of the occurrence of any other event of default shall give Trionetics, Inc. the right, in addition to any other remedies, to repossess and remove the equipment at any time.

7.2 Equipment Warranty

Trionetics, Inc. warrants that all Trionetics, Inc. equipment described in this Proposal and delivered to Customer ("Equipment") will be free from any defects in materials and workmanship and will perform as described in the Proposal for a period of one (1) year from the shipment date ("Warranty Period") Anodes are pro-rated on a monthly basis. If the equipment is maintained in satisfactory condition and operated in accordance with Trionetics' instructions, and if the Equipment malfunctions during the Warranty Period because of faulty material or workmanship, Trionetics, Inc. will, at its option, either repair or replace the equipment to whatever extent Trionetics, Inc. deems necessary to restore the Equipment to proper operating condition. Customer's exclusive remedy and Trionetics, Inc. sole liability for failure of the Equipment to operate during the Warranty Period as warranted including but not limited to the failure of the effluent to meet the limits for metals as agreed upon in this Quotation under Section 2.0, Effluent Parameters, as of the date of this Quote, or for claims or damages arising from Trionetics, Inc. performance or non-performance of installation or maintenance services will be limited to (i) the adjustment, repair or, at Trionetics, Inc. option, the replacement by Trionetics, Inc. of the Equipment, or (ii) if after repeated efforts Trionetics, Inc. is unable to repair or replace the Equipment as warranted, recovery of actual or direct damages not to exceed the amount paid to Trionetics, Inc. for the Equipment. If in the opinion of Trionetics, Inc., there has been a modification, unauthorized repair, accident, abuse or misapplication of the Equipment, the responsibility for the failure of any Equipment or the operation of the system, is assumed by the Customer and Trionetics, Inc. will have no liability therefore.

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THE WARRANTIES SET FORTH IN THIS AGREEMENT ARE THE SOLE AND EXCLUSIVE WARRANTIES MADE, AND ARE IN LIEU OF, AND CUSTOMER HEREBY WAIVES, ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CUSTOMER AGREES THAT IN NO EVENT WILL TRIONETICS, INC. BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDING BUT NOT LIMITED TO LOST BUSINESS, LOST PROFITS OR THIRD-PARTY CLAIMS, WHETHER FORESEEABLE OR NOT, EVEN IF TRIONETICS, INC. HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, IN CONNECTION WITH THE DELIVERY, INSTALLATION, USE OR PERFORMANCE OF THE EQUIPMENT OF THE PROVIDING OF MAINTENANCE SERVICES BY TRIONETICS, INC.

This warranty does not apply if equipment and/or components have been damaged by accident, abuse, misuse or misapplication, or have been modified or repaired without the permission of Trionetics, Inc.

Cation Loading Calculation Sheet

Element	Conc. ug/L	Valence eq/mol	MW g/mol	Conc. ueq/L
Al	94	3	26.982	10.45141
Ba	23	2	137.33	0.33496
Cr		3	51.996	0
Cd	20	2	112.41	0.35584
Co	17	2	58.933	0.576926
Cu	22	2	63.546	0.692412
Fe	356	3	55.847	19.12368
Ni	46	2	58.69	1.567558
Pb	3.5	2	207.2	0.033784
Sn		2	118.71	0
Zn	79	2	65.39	2.416272
Total Cation Conc.				35.55284

Flow Rate 165 GPM

Hours/Day

24

Col. Size 65 Cuft

Days/Wk

7

Capacity 1.2 eq/L

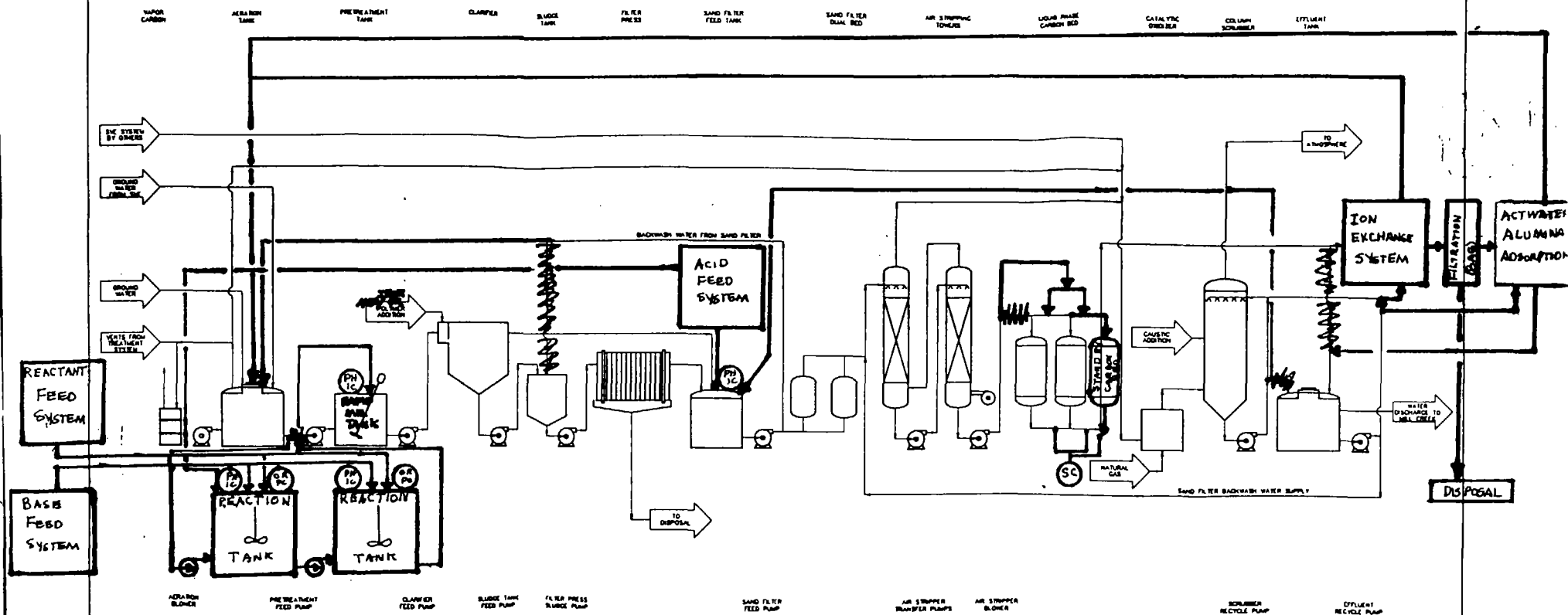
Total Cap 2205.403 eq

Total Capacity Reached in

50%	60%	80%	100%	
0.6	0.72	0.96	1.2	Capacity in
31015851	37219021	49625361	62031701	Gallons
63792.37	76550.84	102067.8	127584.7	Bed Volum
3132.914	3759.497	5012.663	6265.828	Hours
130.5381	156.6457	208.8609	261.0762	Days
18.6483	22.37796	29.83728	37.2966	Weeks

Appendix C
Schematic Flow Diagram
Pristine Inc. Treatment Plant

Schemate Flow Diagram



Generic Process Changes

Rev	Description	Date	By	Appr
1	PRELIMINARY DESIGN REPORT	10/1/88	JPC	
2	GROUNDWATER TREATMENT AND SVE SYSTEM - PROCESS FLOW	10/1/88	JPC	

PRISTINE, INC. SITE
PRELIMINARY DESIGN REPORT
GROUNDWATER TREATMENT AND SVE
SYSTEM - PROCESS FLOW

CRA
CONESTOGA-ROVERS & ASSOCIATES
Project No. 3250
Sheet No. P2