PURCHASE AGREEMENT

THIS AGREEMENT is made and entered into this _____ day of _____, 2019, by and between the **CITY OF BILLINGS, MONTANA**, a municipal corporation organized and existing under the laws of the State of Montana, P.O. Box 1178, Billings, Montana 59103, hereinafter referred to as "City," and, **Trojan Technologies Group, ULC**, hereinafter referred to as "Seller."

In consideration of the mutual covenants and agreements herein contained, the receipt and sufficiency whereof being hereby acknowledged, the parties hereto agree as follows:

1. **PRODUCT PURCHASED:** Seller agrees to sell and City agrees to purchase the goods ("Product") as described below and per written City's specifications and Seller's proposal attached hereto as Exhibit "A," inclusive of Seller's terms and conditions of sale. In the event of conflict between this Agreement and Seller's terms, this Agreement shall take precedence. The Product being purchased consists of:

Item	Price
Ultraviolet Disinfection Equipment Trojan System UV3000Plus	$375,400.00

2. **Price:** The City agrees to pay Three Hundred Seventy Five Thousand Four Hundred and No/100 Dollars ($375,400.00) as the purchase price. All prices are inclusive of any applicable local, state or federal taxes that may be applied to the product to be purchased. The purchase price is free on board at the place of delivery and Seller may not impose any additional, shipping, delivery or storage charges.

3. **Delivery and Payment:** Seller agrees to deliver the above-described goods or product to City by December 31, 2019 unless otherwise provided in this Agreement. Delivery will occur at **City of Billings, MT Water Reclamation Facility** or at a place otherwise selected by City. Upon delivery, City may inspect the goods or product to ensure that it meets City specifications, and Seller may obtain specifications from City upon request. If the Product meets City specifications, City shall tender the purchase price stated above to Seller through the City's normal claim process.

4. **Specifications:** Seller agrees that this Product complies with the City's specifications provided to Seller and with the Seller's proposal thereto as accepted by the City. Unless otherwise agreed to by the City, the City's specifications govern and control in the event of inconsistencies with the Seller's response to the same.

5. **Indemnity, Insurance and Bonds:** Seller agrees to indemnify, defend and save City, its officers, agents and employees harmless from any and all losses, damage and liability to the extent caused by any intentional or negligent act on the part of Seller or its agents or employees. **For this purpose, Contractor shall provide City with proof of both Commercial General liability and automobile insurance each issued by a reliable company or companies for personal injury and property damage, in an amount not less than $1.5 million per occurrence. The City shall be named as an additional insured on all policies other than professional liability and worker's comp. The insurance must be in a form suitable to City.**

Seller shall furnish an approved Performance Bond and a Labor and Materials Payment Bond, each in the amount of one hundred percent (100%) of the contract amount.

Limitation on Liability: The total liability of Seller and its subsidiaries, affiliates, employees, directors, officers and agents arising out of performance, nonperformance, or obligations in connection with the design, manufacture, sale, delivery, and/or use of goods and/or services in no circumstance includes an liquidated, penalty, incidental or consequential damages of an kind, nor exceed the total amount of compensation actually paid to Seller under the Agreement, except only in the case of damages arising due to Seller's willful misconduct.

6. **Nondiscrimination:** Seller agrees that all hiring by Seller of persons performing this Agreement will be on the basis of merit and qualification and will not discriminate on the basis of race, color, religion, creed, political ideas, sex, age, marital status, physical or mental disability, or national origin.

The Contractor and subcontractor shall abide by the requirements of 41 CFR 60-300.5(a) and 41 CFR 60-741.5(a), which prohibit discrimination against qualified protected veterans and/or qualified individuals on the basis of disability, and requires affirmative action by covered prime contractors and subcontractors to employ and advance in employment qualified protected veterans and individuals with disabilities.

7. **Default and Termination:** If Seller fails to deliver the goods or product as set forth in Paragraphs 2 and 3 above, or violates any provision of this Agreement, or if the goods or product fails to meet City's specifications, City may, at its option, declare the Seller in default and immediately cancel and rescind this Agreement. Thereafter, City may procure substitute goods or product to replace the goods or product described herein. In such event, Seller is liable to City for the difference between the price set forth herein and the price paid by City for replacement goods or product. Additionally, the City may pursue any other remedy it has at law or in equity.

8. **Warranty:** Warranty shall be per Specification Section 46 66 11 as further defined by Seller's proposal. Seller expressly disclaims any remedies of "cover" and any warranties implied by law, including but not limited to any warranty of merchantability or fitness for a particular purpose. All equipment warranties set forth herein (and any related guarantees, performance bonds, and the like shall only be enforceable if (a) all equipment is properly installed, inspected regularly, and is in good working order, (b) all operations are consistent with Trojan recommendations, (c) operating conditions at the Customer site have not materially changed and remain within anticipated specifications, and (d) no reasonably unforseeable circumstances exist or arise.

9. **Assignment:** Seller may not assign this Agreement or any of its rights hereunder without the express written consent of City.

10. **Entire Agreement:** This Agreement, including its appendices, if any, is the entire understanding between the parties relating to the subject matter contained herein. No agent or representative of either party has authority to make any representations, statements, warranties or agreements not herein expressed and all modifications or amendments of this agreement, including the appendices, must be in writing and signed by an authorized representative of each of the parties hereto.

11. **Governing Law and Venue:** This Agreement shall be construed and enforced in accordance with the laws of the State of Montana. Venue for any suit between the parties arising out of this Agreement shall be the State of Montana Thirteenth Judicial District Court, Yellowstone County.

IN WITNESS WHEREOF, the parties hereto have executed this instrument the day and year first above written.

CITY OF BILLINGS, MONTANA

By_____
WILLIAM A. COLE
MAYOR

APPROVED AS TO FORM

By_____
BRENT BROOKS, City Attorney

_____
SELLER (Print Business Name Above)

By_____

Print Name _____

Print Title_____

Terms and Conditions Covering All Trojan Sales

1. CONSTRUCTION AND LEGAL EFFECT

The sale by Trojan Technologies ("Trojan") to the purchaser ("Customer") of the goods, products, equipment (individually or collectively the "Equipment") and/or the services (the "Services") listed in any quotation, proposal, bid, scope of supply, and /or similar document, as may be amended by any applicable change agreed by Trojan (individually or collectively the "Quotation") will be solely upon the terms and conditions set out herein. These terms and conditions shall supercede all prior agreements and communications, written or oral, with respect to such sale. Any purchase order shall not be effective until accepted by Trojan, and any additional or different terms and conditions contained in any purchase order, order acknowledgement or other communication of the Customer, and any waiver or modification of any terms and conditions set out herein, shall be deemed objected to without effect and will not be binding on Trojan unless specifically consented to in writing by an authorized representative of Trojan. A purchase order accepted by Trojan shall constitute an agreement between Trojan and the Customer, the terms and conditions of which are set out herein. The receipt of these terms by a Customer following a purchase order not in response to, or inconsistent with, a Quotation, shall be deemed a notification of objection to all inconsistent terms in that purchase order.

2. EQUIPMENT AND SERVICES SUPPLIED

Trojan will supply only the specific Equipment and Services specifically listed in the Quotation. Trojan assumes no responsibility to supply other equipment or services.

3. PRICES AND EXPIRATION

Prices for the Equipment and Services are as specified in the Quotation. If Trojan's delivery of Equipment and/or Services surpasses one (1) year in length, then at least on an annual basis, or if changes to the Equipment or Services are requested or needed, the parties shall conduct good faith discussions regarding changes to the prices for the Equipment and/or Services, to reflect Trojan's increased costs for which Supplier shall be entitled to additional fair and appropriate compensation. Installation, maintenance and any other services which relate to the Equipment are not included unless specifically provided for in the Quotation. The amount of any present or future excise, sales, use, value-added or similar tax, duty or other governmental charge applicable to the production, sale, shipment or use of Equipment or Services will be the responsibility of Customer and will be in addition to the prices set out in the Quotation. Any Quotation is valid for ninety (90) days from issuance, unless specifically consented to in writing by an authorized representative of Trojan.

4. PAYMENT

4.1 Customer shall pay all invoiced amounts due to Trojan within 30 days from the date of Trojan's invoice. Late payments are subject to subject to a monthly late payment assessment of up to 1.5% of the outstanding balance per month. Notwithstanding the foregoing, if Trojan believes timely payments from Customer will not follow, and/or if the level of costs incurred by Trojan for custom work or pass-through items is high, and/or if lead times are long, as determined by Trojan in its sole discretion, then Trojan may require payment on different terms, including but not limited to prepayment in full. For the avoidance of doubt, the final 5% of the purchase price is due no later than 30 days following the Acceptance Date, regardless of any delays in start-up of the Equipment.

4.2 Where the Customer is responsible for any delay in shipment by Trojan, the date on which the Equipment is ready for shipment by Trojan may be treated by it as the Delivery Date for purposes of determining the time of payment of the purchase price. In such event, the Equipment ready for shipment shall be held at the cost of the Customer and the Customer will be responsible for reasonable storage and insurance expenses with respect to such Equipment.

4.3 Customer and Trojan both recognize that there is a risk of wire fraud when individuals impersonating a business demand immediate payment under new wire transfer instructions. To avoid this risk, Customer must verbally confirm any new or changed wire transfer instructions by calling Trojan and speaking with Trojan's Credit Manager before transferring any monies using the new wire instructions. Both parties agree that they will not institute wire transfer instruction changes and require immediate payment under the new instructions but will instead provide a ten (10) day grace period to verify any wire transfer instruction changes before any outstanding payments are due using the new instructions.

5. DELIVERY TERMS, PACKAGING, SHIPPING, SITE STORAGE AND HANDLING

Unless otherwise specified in writing by the Customer and consented to in writing by an authorized representative of Trojan, terms of Equipment delivery shall be "Ex Works" at the point of shipment, and:

(a) Equipment will be boxed or crated as determined appropriate by Trojan for protection against normal handling and there will be an extra charge to the Customer for additional packaging required by the Customer with respect to waterproofing or other added protection,

(b) the manner and routing of shipments will be at Trojan's discretion,

(c) responsibility for payment of shipping costs to the project site will be as specified in the Quotation,

(d) any insurance to be arranged with respect to shipping of the Equipment will be as specified in the Quotation,

(e) delivery of Equipment to the initial carrier will constitute delivery and title passing to the Customer and Equipment will be shipped at the Customer's risk; any claim of the Customer for loss or damage in transit must be placed with the carrier and pursued by the Customer, and

(f) Customer has sole responsibility for off-loading, storage and handling of the Equipment at the site.

6. DELIVERY

6.1 Trojan's quotation will provide a firm date for delivery of the Equipment (the "Delivery Date") which Trojan will then use to establish the production schedule for the Equipment. The Delivery Date will then be binding on the Customer except for any changes agreed in writing between Trojan and Customer.

7. CANCELLATION AND RETURN OF EQUIPMENT

The whole or any part of this order for the Equipment may be cancelled only with the prior written consent of Trojan. If Trojan does consent to a cancellation, such consent will be given only upon payment of reasonable cancellation charges in an amount determined by Trojan. In addition, with respect to any Equipment which is returned on a cancellation consented to by Trojan, the Customer will pay Trojan's cost of placing the returned Equipment in a saleable condition, sales expenses incurred by Trojan in connection with such returned Equipment, a reasonable restocking charge and freight costs incurred in connection with the original shipment and in connection with returning such Equipment to Trojan, all in such amounts as are advised to the Customer by Trojan.

8. ACCEPTANCE

Customer shall have no longer than thirty (30) days following receipt of a shipment of Equipment to inspect the Equipment. Customer may reject Equipment, in whole or in part, where the inspection reveals the Products are damaged, or are materially defective in workmanship or material. If Customer fails to timely reject Equipment or places the Equipment into operational use, the Products shall be deemed accepted.

9. START-UP

9.1 For Equipment requiring start-up in the quotation, Trojan may request the Customer to provide a firm date for start-up of the Equipment (the "Start-Up Date"). Trojan may then schedule its technician to be on-site for the Start-up Date. The Start-up Date is binding except for any changes made as agreed between Customer and Trojan.

9.2 On the Start-up Date, Customer must have the Equipment and site ready, and must have paid all amounts then due and payable to Trojan.

9.3 Customer is the operator and in full control of its premises, including those areas where Trojan employees or contractors are performing service, repair and maintenance activities. Customer will ensure that all necessary

measures are taken for safety and security of working conditions, sites and installations during the performance of Services. Customer is the generator of any resulting wastes, including without limitation hazardous wastes. Customer is solely responsible to arrange for the disposal of any wastes at its own expense. Customer will, at its own expense, provide Trojan employees and contractors working on Customer's premises with all information and training required under applicable safety compliance regulations and Customer's policies. If Customer requires Trojan employees or contractors to attend safety or compliance training programs provided by Customer, Customer will pay Trojan the standard hourly rate and expense reimbursement for such training attended. The attendance at or completion of such training does not create or expand any warranty or obligation of Trojan and does not serve to alter, amend, limit or supersede any part of this Contract.

10. EXCUSABLE DELAYS

Trojan shall not be liable for any failure to meet the Delivery Date or the Start-up Date and/or meet any other obligations hereunder if such failure is due to reason(s) beyond Trojan's reasonable control including, without limitation, acts or omissions of carriers, labour difficulties, shortages, strikes or work stoppages of any type, fire, accident, explosion, flood, defaults or delays of suppliers, governmental acts or omissions, acts of God, acts of civil or military authorities, incomplete or inaccurate information supplied by Customer or any other cause beyond Trojan's reasonable control. In any such event, the Delivery Date and Start-up Date and/or other obligation due date shall be extended on a day for day basis to the extent of such delay.

11. WARRANTY

11.1 Trojan warrants the Equipment in accordance with its then-current warranty covering the specific Equipment ordered, generally under which Trojan warrants to the Customer that during the period ending 18 months after the Delivery Date or 12 months after the Start-up Date, whichever occurs first, Equipment which is manufactured by Trojan will be free from defects in material and workmanship and will function in accordance with the specifications specified in the Quotation.

11.2 This warranty shall not apply to any failure or defect which results from the Equipment not being operated and maintained in strict accordance with instructions specified in Trojan's Operation and Maintenance manual or which results from mishandling, misuse, neglect, improper storage, improper operation of the Equipment with other equipment furnished by the Customer or by other third parties or from defects in designs or specifications furnished by or on behalf of the Customer by a person other than Trojan. In addition, this warranty shall not apply to Equipment that has been altered or repaired after start-up by any one except:

(a) authorized representatives of Trojan, or

(b) Customer acting under specific instructions from Trojan.

All Equipment warranties set forth herein (and any related guarantees, performance bonds, and the like) shall only be enforceable if (a) all equipment is properly installed, inspected regularly and is in good working order, (b) all operations are consistent with Trojan recommendations, (c) operating conditions at the Customer site have not materially changed and remain within anticipated specifications, and (d) no reasonably unforeseeable circumstances exist or arise.

11.3 Customer must notify Trojan in writing within 5 days of the date of any Equipment failure. This notification shall include a description of the problem, a copy of the operator's log, a copy of the Customer's maintenance record and any analytical results detailing the problem. If Customer has not maintained the operator's log and maintenance record in the manner directed in the Operation and Maintenance manual, or does not notify Trojan of the problem as specified above, this warranty may, in Trojan's discretion, be invalid.

11.4 Customer will fully cooperate with Trojan, in the manner requested by Trojan, in attempting to diagnose and resolve the problem by way of telephone support. If the problem can be diagnosed by telephone support and a replacement part is required, Trojan will either, at Trojan's expense, ship a repaired, reworked or new part to the Customer who will install such part as directed by Trojan or will direct Customer to acquire, at Trojan's expense, such part from a third party and then install such part as directed by Trojan.

11.5 If Trojan determines that the problem cannot be resolved by way of telephone support and/or shipment by Trojan, or acquisition by the Customer, of a replacement part for installation by the Customer, Trojan will send one or more persons to make an on-site inspection of the problem. If an on-site visit is made, Trojan personnel will evaluate the problem and repair or replace any Equipment determined to be in breach of this warranty. If the problem is not attributable to a breach of this warranty, Trojan reserves the right to invoice the Customer for this service.

11.6 Components of the Equipment which are manufactured by a third party but furnished to Customer by Trojan are warranted by the original manufacturer, only to the extent of the original manufacturer's warranty, and are not covered by this warranty.

11.7 This warranty is the exclusive remedy of the Customer for all claims based on a failure of or defect in the Equipment, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is lieu of all other warranties whether written, oral, implied or statutory. Trojan expressly disclaims any remedies of "cover" and any warranties implied by law, including but not limited to any warranty of merchantability or fitness for a particular purpose.

11.8 Lamp and lamp driver warranties, and obligations of Trojan concerning lamp replacements, are set out in separate lamp and lamp driver warranty documents.

12. LIMITATIONS OF LIABILITY

12.1 Trojan does not assume any liability for monetary damages, personal injury or property damage caused by use or misuse of the Equipment. Trojan has no responsibility for the supervision or actions of Customer's employees or contractors or for non-Trojan items (e.g., chemicals, equipment) and disclaims all liability and responsibility for any loss or damage that may be suffered as a result of such actions or items, or any other actions or items not under Supplier's control. Trojan shall not in any event be liable for liquidated, penalty, special, incidental, indirect or consequential damages including, without limitation, lost profits, lost business opportunities, lost revenue or loss or depreciation of goodwill, even if it has been advised of the possibility thereof. Trojan's liability shall, in all instances, be limited to repair or replacement of Equipment in breach of the above warranty and shall not exceed the cost of such repair or replacement. This liability with respect to repair or replacement will terminate upon the expiration date of the above warranty.

12.2 In addition to the foregoing, in no event shall Trojan's liability exceed that portion of the purchase price actually paid to it.

12.3 This limitation of liability shall survive any termination of any agreement based on its Quotation.

13. COMPLIANCE AND OTHER OBLIGATIONS

Trojan shall not be responsible for verifying that any agreement and/or the supply of Equipment and Services, is in compliance with all applicable laws, ordinances, regulations, codes and orders. If the Customer fails to notify Trojan in writing that the agreement or such supply is not in compliance with any applicable law, ordinance, regulation, code or order, the Customer shall be responsible for and hereby agrees to indemnify Trojan against all claims, demands, losses, liabilities, costs and expenses incurred by it as a result of such non-compliance. Unless otherwise expressly agreed, Customer is responsible for obtaining any required export or import licenses necessary for Equipment delivery. Customer will comply with all laws and regulations applicable to the installation or use of all Equipment, including applicable import and export control laws and regulations of the U.S., E.U. and any other country having proper jurisdiction, and will obtain all necessary export or import licenses in

connection with any subsequent export, re-export, transfer and use of all Equipment and technology delivered hereunder. Customer will not sell, transfer, export or re-export any Trojan Equipment or technology for use in activities which involve the design, development, production, use or stockpiling of nuclear, chemical or biological weapons or missiles, nor use Trojan Equipment or technology in any facility which engages in activities relating to such weapons. Customer will comply with all local, national, and other laws of all jurisdictions globally relating to anti-corruption, bribery, extortion, kickbacks, or similar matters which are applicable to Customer's business activities in connection with this Contract, including but not limited to the U.S. Foreign Corrupt Practices Act of 1977, as amended (the "FCPA"). Customer agrees that no payment of money or provision of anything of value will be offered, promised, paid or transferred, directly or indirectly, by any person or entity, to any government official, government employee, or employee of any company owned in part by a government, political party, political party official, or candidate for any government office or political party office to induce such organizations or persons to use their authority or influence to obtain or retain an improper business advantage for Customer or for Trojan, or which otherwise constitute or have the purpose or effect of public or commercial bribery, acceptance of or acquiescence in extortion, kickbacks or other unlawful or improper means of obtaining business or any improper advantage, with respect to any of Customer's activities related to this Contract. Trojan asks Customer to "Speak Up!" if aware of any violation of law, regulation or our Standards of Conduct ("SOC") in relation to this Contract. See http://danaher.com/integrity-andcompliance and www.danaherintegrity.com for a copy of the SOC and for access to our Helpline portal. Customer is not an agent or representative of Trojan businesses and will not present itself as such under any circumstance unless and to the extent it has been formally screened by Trojan compliance department and received a separate duly-authorized letter from Trojan Technologies setting forth the scope and limitations of such authorization.

14. INSPECTION

Inspection of Equipment by the Customer or its representative at Trojan's plant may be permitted provided that it is conducted under principles of confidentiality and does not unduly interfere with Trojan's production workflow and that complete details of the desired inspection are provided to Trojan in writing with sufficient advance notice.

15. PATENT INDEMNIFICATION

15.1 Trojan will not be liable with respect to any claim of patent or other intellectual property infringement made regarding any Equipment unless such claim is based on an assertion that Equipment manufactured by Trojan, in the form in which such Equipment is supplied to the Customer, infringes any United States or Canadian patent. Trojan's obligations hereunder shall not apply to Equipment modified, or used in an unauthorized manner, by the Customer or to the extent that infringement arises as a result of combining the Equipment with any other equipment, whether or not supplied by Trojan. Subject to the foregoing, provided that the Customer notifies Trojan promptly in writing of any such claim of infringement and authorizes Trojan to exercise sole control over the defence and/or settlement of any such claim, Trojan will indemnify the Customer against the reasonable expenses of defending such claim as well as any resulting damages finally awarded against Customer or agreed to in any settlement but only up to a maximum amount not exceeding the purchase price actually paid to Trojan for the allegedly infringing Equipment.

15.2 If an injunction is obtained against the further use of allegedly infringing Equipment, Trojan shall, at its option and expense, use its reasonable efforts to:

(a) procure for the Customer the right to continue using the Equipment,

(b) modify the Equipment so that it is no longer infringing,

(c) replace the allegedly infringing Equipment with non-infringing Equipment, or

(d) refund the purchase price paid to Trojan for the Equipment, less reasonable depreciation as determined by Trojan.

15.3 The foregoing provisions constitute Trojan's sole responsibility and liability, and the Customer's sole remedy, with respect to actual or alleged infringement of patents or other intellectual property.

15.4 The Customer hereby agrees to indemnify Trojan against all claims relating to or resulting from any actual or alleged patent infringement by Trojan which arises out of the manufacture and/or supply by Trojan of Equipment manufactured according to a design and/or specifications furnished to Trojan by the Customer or on behalf of the Customer by a person other than Trojan.

16. SPECIAL TOOLS, DIES, JIGS, FIXTURES AND PATTERNS

Any tools, dies, jigs, fixtures, patterns and similar items which are included or required in connection with the manufacture and/or supply of the Equipment will remain the property of Trojan without credit to the Customer. Trojan assumes the cost for maintenance and replacement of such items and shall have the right to discard and scrap any such item after it has been inactive for a minimum of one year, without credit to the Customer.

17. INTELLECTUAL PROPERTY & SOFTWARE.

All Trojan contributions to the Equipment and Services, the results of the Services, and any other work Equipment designed or provided by Trojan hereunder may contain or result in statutory and non-statutory Intellectual Property, including but not limited to patentable subject matter or trade secrets; and all such Intellectual Property remains the sole property of Trojan; and Customer shall not disclose (except to the extent inherently necessary during any resale of Equipment sold hereunder), disassemble, decompile, or otherwise reverse engineer said contributions, or any results of the Services, or any work Equipment, or otherwise attempt to learn the underlying processes, source code, structure, algorithms, or ideas.

All licenses to Trojan's separately-provided software Equipment may be subject to the separate software license agreement(s) accompanying the software media. In the absence of such terms and for all other software, Trojan grants Customer only a personal, non-exclusive license to access and use the software provided by Trojan with Equipment purchased hereunder solely as necessary for Customer to enjoy the benefit of the Equipment. A portion of the software may contain or consist of open source software, which Customer may use under the terms and conditions of the specific license under which the open source software is distributed. Customer agrees that it will be bound by any and all such license agreements. Title to software remains with the applicable licensor(s).

18. RECORDS & AUDITS

Unless otherwise specifically agreed in writing by an authorized representative of Trojan, neither the Customer nor any representative of the Customer shall have the right to examine or audit any books, records or accounts of Trojan; or be entitled to, or have control over, any engineering or production prints, drawings or technical data which Trojan, in its sole discretion, considers to be of a confidential nature.

19. ASSIGNMENT

All rights and obligations of Trojan and the Customer will enure to the benefit of and be binding upon their respective successors and permitted assigns. The rights and obligations of Customer hereunder shall not be assignable without the prior written consent of Trojan. All rights and obligations of Trojan may be assigned in whole or in part to any Affiliate or to any person acquiring any assets of Trojan outside the ordinary course of business. An "Affiliate" shall mean any entity which controls, is controlled by or is under common control with Trojan, whether directly or indirectly. Any attempted assignment in violation of the provisions of this section shall be void.

20. CONFIDENTIALITY

20.1 All technical information, specifications, drawings, documentation

and knowhow of every kind and description disclosed by Trojan to the Customer and which is identified by Trojan as confidential shall be deemed to constitute "Confidential Information" of Trojan unless such information:
(a) becomes part of the public domain through no fault of the Customer,
(b) is disclosed to the Customer by a third party without breach of any obligation or other restriction,
(c) is known to the Customer at the time of disclosure and has been documented as such, or
(d) is required to be disclosed by legal, judicial or administrative proceeding.
20.2 All Confidential Information shall be owned by, and remain the exclusive property of, Trojan.
20.3 All Confidential Information shall be held in confidence by the Customer and, if in any form of physical media, returned by the Customer to Trojan upon request. The Customer shall not:
(a) reproduce the Confidential Information without the written consent of Trojan, or
(b) use the Confidential Information for any purpose other than in connection with the operation and maintenance of the Equipment.
20.4 The Customer shall be liable for and shall indemnify Trojan against all claims, demands, liabilities, losses, costs and expenses arising from any failure to comply with the terms hereof relating to Confidential Information. The Customer acknowledges that monetary damages may not be adequate in the event of any such failure to comply and that Trojan shall be entitled to injunctive relief in the event of any such non-compliance.

21. GOVERNING LAW
All issues relating to the construction, validity, interpretation, enforcement and performance of this agreement and the rights and obligations of Trojan and the Customer hereunder shall be governed by the laws of the Province of Ontario and the federal laws of Canada applicable therein. Any provisions of the *International Sale of Goods Act* or any convention on contracts for the international sale of goods shall not be applicable to this agreement. The parties submit to and consent to the non-exclusive jurisdiction of courts located in the Province of Ontario.

22. MODIFICATION/WAIVER
These terms incorporate and/or replace all prior terms whether oral or written, and may not be changed by either party except by a writing signed by both parties. The failure by Trojan to enforce at any time any of the provisions of this contract, or to exercise any election or option provided herein, shall in no way be construed as a waiver of such provision or option, nor in any way affect the validity of this contract (or any part hereof), or the right of Trojan thereafter to enforce each and every such provision. If any provision hereof is held by a court of competent jurisdiction to be unenforceable the remaining terms and provisions shall be unaffected and remain in full force and effect.

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Additional Terms and Conditions Covering Trojan Sales of Configured-to-Order Projects and Systems

In addition to all terms and conditions above, the following Sections 104, 106, 108, and 109 apply to Trojan sales of Configured-to-Order Projects, Systems, and the like:

104. PAYMENT

Unless otherwise noted in the Quotation, 10% of the purchase price for the Equipment is due 30 days after approval of engineering submittals, 85% of the purchase price is due 30 days after the Delivery Date (as defined below) and 5% of the purchase price is due 30 days after the Acceptance Date (as defined below), provided that if the Start-Up Date is less than 30 days after the Acceptance Date, 90% of the purchase price is due on or before the Start-Up Date.

106. DELIVERY

106.1 Trojan will request the Customer to provide a firm date for delivery of the Equipment to the project site (the "Delivery Date") which Trojan will then use to establish the production schedule for the Equipment. The Delivery Date will then be binding on the Customer except for any changes made in accordance with the provisions below.

106.2 The Customer can request a rescheduling of the Delivery Date on one occasion only by notifying Trojan in writing not less than four weeks prior to the scheduled Delivery Date. The Customer may request that the Delivery Date be extended by a period up to six weeks, without penalty, but may not request that the Delivery Date be moved forward. The Customer may also request that the Delivery Date be extended beyond a six week period but, Trojan may not agree to such extension, beyond the maximum six week extension period

106.3 Trojan may, in its sole discretion, agree to change the Delivery Date on more than one occasion or if less than four weeks' prior notice is provided of a requested change, but is under no obligation to do so.

106.4 Trojan reserves the right to reschedule the Delivery Date to a date prior to or subsequent to the scheduled Delivery Date in order to accommodate its shipping, production or other requirements. This right to reschedule will be applicable unless otherwise agreed in writing by an authorized officer of Trojan. Trojan will provide the Customer or its representative with a minimum of 24 hours notice of any such rescheduling.

106.5 Where any change to the Delivery Date is made at Customer's request, for all purposes with respect to the warranty and payment provided by Trojan in connection with the Equipment, the initial Delivery Date will be considered to be the Delivery Date regardless of any change later made to the Delivery Date.

108. ACCEPTANCE

108.1 During the period between the Delivery Date and the Start-up Date, the Customer shall prepare the Equipment and the project site for installation and start-up and, unless otherwise agreed in writing by an authorized representative of Trojan, shall complete acceptance testing with respect to the Equipment. The Equipment shall be deemed to be accepted on the earliest to occur of the following dates (the "Acceptance Date"):

(a) that date on which the Equipment can function in either manual or automatic operation and provide disinfection in accordance with criteria specified in the Quotation, or

(b) 60 days after the Delivery Date.

108.2 All amounts which remain owing by the Customer for the Equipment, including any amount which is specified to be payable on the Acceptance Date, will be paid by the Customer to Trojan within 30 days after the Acceptance Date, unless otherwise agreed in writing by an authorized representative of Trojan.

108.3 Written notification must be given by the Customer to Trojan within seven days after the Acceptance Date listing any outstanding deficiencies with respect to the Equipment and Trojan will use all reasonable efforts to correct such deficiencies promptly.

109. START-UP

109.1 Trojan will request the Customer to provide a firm date for start-up of the Equipment (the "Start-Up Date"). Trojan will then schedule its technician to be on-site for the Start-up Date. The Start-up Date is binding except for any changes made in accordance with the provisions below.

109.2 On the Start-up Date, Customer must have the Equipment and site ready as provided in the Installation Preparation Checklist contained in the Contractor Installation Package sent to Customer, and must have paid all amounts then due and payable to Trojan.

109.3 Customer can request a rescheduling of the Start-up Date by notifying Trojan in writing not less than three weeks prior to the Start-up Date. Customer may request that the Start-up Date be extended, but may not request that the Start-up Date be moved forward. Trojan requires a minimum extension period of two weeks between the existing Start-up Date and the requested new Start-up Date in order to reschedule its technician.

109.4 Trojan may, in its sole discretion, agree to reschedule the Start-up Date where a Customer requests less than a two week extension but is under no obligation to do so. In the event that Trojan does agree to less than a two week extension or that Customer requests more than two changes to the Start-up Date, Customer will be charged an administration fee in an amount determined by Trojan.

109.5 Trojan reserves the right to reschedule the Start-up Date to a date which is prior to or subsequent to the scheduled Start-up Date in order to accommodate its resource availability. This right to reschedule will be applicable unless otherwise agreed in writing by an authorized officer of Trojan. Trojan will provide Customer or its representative with a minimum of 72 hours notice of any such change to the Start-up Date.

109.6 In the event that Trojan's technician arrives at the project site and finds that the Equipment or the project site is not ready for start-up as defined in the Contractor Installation Package, or any amounts then due and payable to Trojan remain unpaid, Customer may either:

(a) provided all amounts then due and payable to Trojan have been paid, issue a purchase order for all costs involved in having Trojan correct the deficiencies, or

(b) have Trojan's technician leave the site and then reschedule the Start-up Date to a date when all deficiencies will be corrected and the Equipment will be ready for start-up as defined in the Contractor Installation Package. If Customer selects this option, the cost of rescheduling will be not less than a minimum amount specified by Trojan, with the final cost being determined by Trojan based on its costs and expenses incurred in connection with the rescheduling.

###

Exhibit A 1/37

TROJAN UV
WATER CONFIDENCE™

SCOPE OF SUPPLY FOR CITY OF BILLINGS, MT – 3RD CHANNEL EXPANSION

ULTRAVIOLET DISINFECTION EQUIPMENT – TROJAN SYSTEM UV3000*Plus*™

Prepared for:	General Contractors	
Project Name:	City of Billings, MT – 3rd Channel UV System Expansion	
Specification Section:	46 66 11 (May 2019)	
Including Addendum:	N/A	
Submitted by:	Trojan Technologies	
Trojan Quote:	LBGR1165	
Design Criteria:	Channel Design Peak Flow:	20 MGD (US)
	UV Transmission:	65 %, minimum
	Total Suspended Solids:	30 mg/l maximum
	Discharge Limit:	126 E-coli coliform/100 ml, 30 day geometric mean & 252 E-coli coliform/100 ml, 7 day geometric mean

We are pleased to submit the following scope of equipment based on the above criteria. The equipment described herein is named as the basis for the design.

The purchaser is responsible for reading all information contained in this Supply Contract. Trojan will not be held accountable for the supply of equipment not specifically detailed in this document. Supplemental Terms and Conditions are attached to this document. Detailed installation instructions are provided with the shop drawings and are available upon request. Changes to the attached Scope of Supply that affect selling price will be handled through a change order.

Please refer all inquiries to Trojan Manufacturer's Representative:

Scott Forsling
The Coombs-Hopkins Company
Phone: (435) 659-7199

This proposal has been respectfully submitted by,
Trojan Technologies

Tim Proctor

Proctor, Tim
Regional Sales Manager

The proposed third channel requires idenitcal channel dimensions as the existing two channels.

ULTRAVIOLET MODULES

Trojan's Responsibility:
Each module supplied shall be completely assembled containing lamps, quartz sleeves and be electrically wired to each electronic ballast. Modules are shipped in a support rack and crated.

Model and Make:	Standard System UV3000*Plus*™
Quantity:	Twenty (20) UV modules will be supplied each containing 8 Lamp - 4.0" Spacing lamps
Material of Construction:	316 stainless steel frame
Approximate Weight:	50 kg per module

SYSTEM CONTROL CENTER

Trojan's Responsibility:
The existing System Control Center (SCC) will also be used to control and operate the third channel. The control center will be reprogrammed and tested by Trojan to ensure correct monitoring and control of the 3rd channel as well as full integration of the third channel with the existing channels.

POWER DISTRIBUTION CENTERS

Trojan's Responsibility:
The Power Distribution Center (PDC) distributes power to the modules from the electrical service entrance provided and shall consist of the following:

Quantity Supplied:	Two (2) PDC's will be supplied
Material of Construction:	304 stainless steel
Enclosure Rating:	Type 4X
Approximate Weight:	150 kg each

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for setting in place and bolting the Power Distribution Centers to the top of channel. The Installation Contractor to be responsible for the supply, installation and connection of the following at the Power Distribution Centers:

1. One (1) 480Y/277 Volt, 3 phase, 4 wire (plus ground), 8.6 kVA power feed with local disconnect to the PDCs
2. One (1) Ground Link 14 gauge minimum, TWH stranded single wire from the HSC.
3. One (1) communication link consisting of one (1) shielded twisted pair from the SCC and daisy chained to the PDCs.
4. One (1) pair of 12Volt DC, 18 gauge minimum discrete signal to the Water Level Sensor from PDC closest to the sensor.
5. One (1) pair of 24Volt DC, 18 gauge remote I/O to the HSC.
6. Connection of communication, power cables and hydraulic lines from the UV Modules

HYDRAULIC SYSTEMS CENTER

The existing Hydraulics System Center (HSC) will also be used to operate the quartz sleeve cleaning system for the 3rd channel.

Installation Contractor's Responsibility:
The Installation Contractor shall be responsible for the connection and installation of the following at the Hydraulic Systems Center:

1. Connection of the hydraulic hoses from third channel PDC cabinets. Hoses and connections will be supplied by Trojan.
2. One (1) serial communication link of one (1) twisted, shielded pairs, 18 gauge maximum cable from the SCC and daisy chained to the PDCs.

SUPPORT RACKS

Trojan's Responsibility:
Support racks are provided to support UV modules in the effluent channel.

Quantity Supplied:	Four (4) racks will be supplied
Material of Construction:	304 stainless steel
Approximate Weight:	25 kg each

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for setting in place and bolting the support racks to the channel walls and bottom. The contractor will be required to supply twelve 90mm expansion anchor bolts per rack.

WEIR GATE LEVEL CONTROLLER

Trojan's Responsibility
Level control devices are required to maintain and control the effluent level in the channel, regardless of flow rate.

Quantity Supplied:	One (1) level controller to be supplied W/ ACTUATOR
Description:	Modulating Level Control Weir Gate – same as existing two channels w/ Auma Actuator – Model SA(R) 10.2.
Material of Construction:	304 stainless steel frame and yoke
Approximate Weight:	1000 pounds each

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for setting in place, grouting and sealing the level control weir gate and the installation of the following connections:

1. One 480 Volt, 3 phase, 3 wire, 5 AMP (plus ground) feed to the weir gate.
2. Open command discrete output, two (2) conductors, 20 gauge minimum, from SCC to weir gate.
3. Close command discrete output, two (2) conductors, 20 gauge minimum, from SCC to weir gate.
4. Remote mode discrete input, two (2) conductors, 20 gauge minimum, to SCC from weir gate.
5. Gate position analog input, one (1) twisted shielded pair, 24 gauge minimum, to SCC from each weir gate.

ULTRASONIC CHANNEL LEVEL SENSOR

Trojan's Responsibility:
An ultrasonic level sensor will be supplied (to match same model as the existing two channels) to monitor the effluent levels within each UV Channel specifically for weir gate control. The transducer will be supplied with a sufficient length of cable to distribute to the monitor panel along with a mounting bracket.

Installation Contractor's Responsibility:
The Contractor shall be responsible for mounting the transducer and bracket in the UV Channel, the monitor panel adjacent to the channel, and distributing the following cable/wiring between these two components and to SCC in appropriate conduit:

1. One (1) 120 Volt, 1 phase, 2 wire, 15 VA (plus ground) from a Distribution Panel (by others) to the Level Sensor Monitor.
2. One (1) 4-20mA analog signal from the Level Sensor Monitor to the System Control Center (SCC).
3. One (1) communication link using 30 feet of cable (supplied by Trojan) from the Level Sensing Transducer to the Level Sensor Monitor.

SPARE PARTS AND SAFETY EQUIPMENT

Trojan's Responsibility:
The following spare parts and safety equipment will be supplied with the UV system:

Sixteen (16)	Lamp holder seals
Sixteen (16)	Wiper seals
One (1)	Operators Kit (including face shield, gloves and cleaning solution)
Two (2)	UV intensity sensors
Four (4)	Gallons of Acti-Clean get

ADDITIONAL EQUIPMENT

WATER LEVEL SENSOR KIT

Trojan's Responsibility:
A low water level sensor will be provided ((to match same model as the existing two channels). The water level sensor is located downstream of the UV System and provides a digital signal to shut down & protest the UV System in the event of a channel low water level.

Quantity Supplied:	One (1) water level sensor to be supplied
Enclosure Rating:	Type 4X
Approximate Weight:	10 pounds (panel)

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for setting in place and bolting the water level sensor panel to the effluent channel wall. The Installation Contractor shall also be responsible for the supply of mounting hardware, watertight conduit and supply and connection of one discrete signal (pair of 12V DC, 14 gauge) from the water level sensor probe to each PDC.

STILLING PLATE

Trojan's Responsibility:
In order to ensure flow distribution to the UV System stilling plates (to match existing stilling plates) will be supplied for the 3rd channel as well.

Material of Construction:	304 Stainless Steel
Approximate Weight:	120 lb each
Anchor Bolts Req'd:	8 - 3/8" dia x 4" long / Plate

Installation Contractor's Responsibility:
Contractor shall be responsible for mounting L-frames to channel walls.

AUTOMATIC GATE ACTUATORS

Trojan's Responsibility

Quantity Supplied:	Two (2) gate actuators. (One to be provided for existing UV-GATE-CHNL3-1 and for existing UV-GATE-CHNL3-2)
Description:	Auma Actuator – Model SA(R) 10.2.

Installation Contractor's Responsibility:
The Installation Contractor to be responsible for installing the new actuators onto the existing gates and the installation of the following connections:

1. One 480 Volt, 3 phase, 3 wire, 5 AMP (plus ground) feed to each slide gate.
2. Open and close command discrete outputs from/ to SCC to the slide gates.
3. Remote mode discrete inputs to SCC from slide gates

DOCUMENTATION (SHOP DRAWINGS AND O & M MANUALS)

Trojan's Responsibility:
The following documentation will be supplied to the contractor by Trojan per the following schedule:
One (1) electronic copy of submittal shop drawings 4-6 weeks after receipt of written purchase order
One (1) draft copy of the O&M manual at time of delivery and one (1) electronic copy and two (2) hard copies of the final O&M manuals including all components of final submittal shop drawings.

START-UP AND INSTRUCTION

Trojan's Responsibility:
The following services will be supplied by Trojan:

- Installation assistance as required by phone or fax.
- Inspection and certification of the installation.
- Three (3) days for functional testing the UV equipment.
- One (1) day for pre-startup classroom or jobsite training of Owner's personnel.
- Up to three (3) days for performance testing support

WARRANTY

Trojan's Responsibility:
Trojan Technologies will warrant the equipment and parts for twelve (12) months after start-up or eighteen (18) months after shipment, whichever comes first.

MICROBIOLOGICAL PERFORMANCE TESTING

Trojan's Responsibility:
Trojan will supply a performance testing protocol to the Contractor to be forwarded to the engineer for approval. Trojan will produce the final test report (based on data supplied by the independent lab) and will forward the final report to the Contractor.

Installation Contractor's Responsibility:
The Installation Contractor to cover all associated on site costs for performance testing (independent lab services, bottles, shipment, etc.). The Contractor to be responsible for completing the performance testing as per the testing protocol supplied by Trojan and approved by the Engineer.

SELLING PRICE: $375,400.00USD

PAYMENT TERMS

10% after approved submittal
80% upon delivery of equipment to site
10% after equipment acceptance
Net 30 Days
F.O.B. Factory; Freight paid to jobsite.
Selling price does not include any duties or taxes, which may be applicable.
Please refer to the attached standard terms and conditions

Exhibit A 6/37

City of Billings

BILLINGS, MT

W.O. 19-34: Water Reclamation Facility UV Equipment Procurement

Contract Documents and Specifications

May 2019

HDR Project No. 233305

Exhibit A 7/37

SECTION 01 33 00
SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Mechanics and administration of the submittal process for:
      a. Shop Drawings.
      b. Samples.
      c. Informational submittals.
   2. General content requirements for Shop Drawings.

B. Related Specification Sections include but are not necessarily limited to:
   1. Section 01 33 04 – Operations and Maintenance Manuals.
   2. Section 46 66 11 – Open Channel Ultraviolet (UV) Disinfection System Equipment – Horizontal.

1.2 DEFINITIONS

A. Shop Drawings:
   1. See General Conditions.
   2. Product data and samples are Shop Drawing information.

B. Informational Submittals:
   1. Submittals other than Shop Drawings and samples required by the Contract Documents that do not require review and/or approval by the Engineer.
   2. Representative types of informational submittal items include but are not limited to:
      a. Installed equipment and systems performance test reports.
      b. Manufacturer's installation certification letters.
      c. Warranties.
      d. Service agreements.
   3. For-Information-Only submittals upon which the Engineer is not expected to conduct review or take responsive action may be so identified in the Contract Documents.

1.3 PREPARATION OF SUBMITTALS

A. General:
   1. All submittals and all pages of all copies of a submittal shall be completely legible.
   2. Submittals which, in the Engineer's sole opinion, are illegible will be returned without review.
   3. Minimize extraneous information for equipment and products not relevant to the submittal.
   4. Supplies written comments on the submittal drawings shall be in **GREEN.**
   5. **SHOP DRAWINGS ARE REQUIRED TO BE SUBMITTED ELECTRONICALLY IN BLACK AND WHITE. COLOR ONLY TO BE USED IF REQUIRED FOR CLARITY.**
      a. Maximum electronic file size is 10 megabytes for transmittal via email. Electronic files larger than 10 megabytes can be broken up for emailing or copied onto HDR's FTP site or guest transfer drive with follow up by and email notice indicating delivery of the shop drawing.

B. Shop Drawings, Product Data, and Samples:
   1. Scope of any submittal and letter of transmittal:
      a. Limited to one (1) Specification Section.
      b. Submittals with more than one Specification section included will be rejected.

c. Do not submit under any Specification Section entitled (in part) "Basic Requirements" unless the product or material submitted is specified, in total, in a "Basic Requirements" Specification Section.

2. Numbering letter of transmittal:
   a. Include as prefix the Specification Section number followed by a series number, "-xx", beginning with "01" and increasing sequentially with each additional transmittal for that Specification Section.
   b. If more than one (1) submittal under any Specification Section, assign consecutive series numbers to subsequent transmittal letters.
3. Describing transmittal contents:
   a. Provide listing of each component or item in submittal capable of receiving an independent review action.
   b. Identify for each item:
      1) Manufacturer and Manufacturer's Drawing or data number.
      2) Contract Document tag number(s).
      3) Unique page numbers for each page of each separate item.
   c. When submitting "or-equal" items that are not the products of named manufacturers, include the words "or-equal" in the item description.
4. Supplier's certification of review and approval:
   a. Supplier shall execute Exhibit AA, Supplier's Submittal Certification form, to indicate Supplier has reviewed and approved the submittal contents.
      1) Clearly identify the person who reviewed the submittal and the date it was reviewed."
   b. Submittals containing multiple independent items shall be prepared with each item listed on the letter of transmittal or on an index sheet for all items listing the discrete page numbers for each page of each item, which shall be stamped with the Supplier's review and approval stamp.
      1) Each independent item shall have a cover sheet with the transmittal number and item number recorded.
         a) Provide clear space of 3 IN SQ for Engineer stamping.
      2) Individual pages or sheets of independent items shall be numbered in a manner that permits the entire contents of a particular item to be readily recognized and associated with Supplier's certification.
5. Resubmittals:
   a. Number with original Specification Section and series number with a suffix letter starting with "A" on a (new) duplicate transmittal form.
   b. Do not increase the scope of any prior transmittal.
   c. Provide cover letter indicating how each "B", "C", or "D" Action from previous submittal was addressed and where the correction is found in the resubmittal.
   d. Account for all components of prior transmittal.
      1) If items in prior transmittal received "A" or "B" Action code, list them and indicate "A" or "B" as appropriate.
         a) Do not include submittal information for items listed with prior "A" or "B" Action in resubmittal.
      2) Indicate "Outstanding-To Be Resubmitted At a Later Date" for any prior "C" or "D" Action item not included in resubmittal.
         a) Obtain Engineer's approval to exclude items.
6. Supplier shall not use red color for marks on transmittals.
   a. Duplicate all marks on all copies transmitted, and ensure marks are photocopy reproducible.
   b. Engineer will use red marks or enclose marks in a cloud.
7. Transmittal contents:
   a. Coordinate and identify Shop Drawing contents so that all items can be easily verified by the Engineer.

b. Provide submittal information or marks defining specific equipment or materials utilized on the Project.
   1) Generalized product information, not clearly defining specific equipment or materials to be provided, will be rejected.
c. Identify equipment or material project use, tag number, Drawing detail reference, weight, and other Project specific information.
d. Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item submitted is in compliance with the Contract Documents.
e. Do not modify the manufacturer's documentation or data except as specified herein.
f. Submit items such as equipment brochures, cuts of fixtures, product data sheets or catalog sheets not exceeding 11 x 17 IN pages.
   1) Indicate exact item or model and all options proposed by arrow and leader.
g. When a Shop Drawing submittal is called for in any Specification Section, include as appropriate, scaled details, sizes, dimensions, performance characteristics, capacities, test data, anchoring details, installation instructions, storage and handling instructions, color charts, layout Drawings, rough-in diagrams, wiring diagrams, controls, weights and other pertinent data in addition to information specifically stipulated in the Specification Section.
   1) Arrange data and performance information in format similar to that provided in Contract Documents.
   2) Provide, at minimum, the detail specified in the Contract Documents.
h. If proposed equipment or materials deviate from the Contract Drawings or Specifications in any way, clearly note the deviation and justify the said deviation in detail in a separate letter immediately following transmittal sheet. Any deviation from plans or specifications not depicted in the submittal or included but not clearly noted by the Supplier may not have been reviewed. Review by the Engineer shall not serve to relieve the Supplier of the contractual responsibility for any error or deviation from contract requirements.

8. Samples:
   a. Identification:
      1) Identify sample as to transmittal number, manufacturer, item, use, type, project designation, tag number, Specification Section or Drawing detail reference, color, range, texture, finish and other pertinent data.
      2) If identifying information cannot be marked directly on sample without defacing or adversely altering samples, provide a durable tag with identifying information securely attached to the sample.
   b. Include application specific brochures, and installation instructions.
   c. Provide Supplier's review and approval certification stamp or Supplier's Submittal Certification form as indication of Supplier's checking and verification of dimensions and coordination with interrelated work.
   d. Resubmit revised samples of rejected items.

C. Informational Submittals:
   1. Prepare in the format and detail specified in Specification requiring the informational submittal.

1.4 TRANSMITTAL OF SUBMITTALS

A. Shop Drawings and Samples:
   1. Transmit all submittals to:
   2. Craig Habben: craig.habben@hdrinc.com
   3. Utilize two (2) copies of attached Exhibit A to transmit all Shop Drawings and samples.

B. Informational Submittals:
   1. Transmit under Supplier's standard letter of transmittal or letterhead.

2. Submit in triplicate or as specified in individual Specification Section.
3. Transmit to:
4. Craig Habben: craig.habben@hdrinc.com

C. Electronic Transmission of Submittals:
1. Transmittals shall be made electronically.
   a. Use email.
2. Provide documents in Adobe Acrobat Portable Document Format (PDF), latest version.
3. Create one (1) PDF file for each equipment Operation and Maintenance Manual.
4. Do not password protect or lock the PDF document.
5. Drawings or other graphics must be converted to PDF file format from the original drawing file format and made part of the PDF document.
   a. Scanning of drawings is to be used only where actual file conversion is not possible and drawings must be scanned at a resolution of 300 dpi or greater.
   b. Required signatures may be applied prior to scanning for transmittal.
6. Electronic drawings shall be formatted to be at full-scale (or half-scale when printed to 11x17).
   a. Do not reduce drawings by more than 50% in size.
   b. Reduced drawings shall be clearly marked "HALF-SIZE" and shall scale accurately at that size.
7. Rotate sheets that are normally viewed in landscape mode so that when the PDF file is opened the sheet is in the appropriate position for viewing.
8. Create bookmarks in the bookmarks panel for the Operation and Maintenance Manual cover, the Table of Contents and each major section of the Table of Contents.
9. Using Adobe Acrobat Standard or Adobe Acrobat Professional, set the PDF document properties, initial view as follows:
   a. Select File →Properties→Initial View.
   b. Select the Navigation tab: Bookmarks Panel and Page.
   c. Select the Page layout: Single Page.
   d. Select the Magnification: Fit Page.
   e. Select Open to page: 1.
   f. Set the file to open to the cover page with bookmarks to the left, and the first bookmark linked to the cover page.
10. Set the PDF file "Fast Web View" option to open the first several pages of the document while the rest of the document continues to load.
   a. To do this:
      1) Select Edit→Preferences→ Documents→Save Settings.
      2) Check the Save As optimizes for Fast Web View box.
11. File naming conventions:
   a. File names shall use a "ten dot three" convention (XXXXXX-YY-Z.PDF) where XXXXXX is the Specification Section number, YY is the Shop Drawing Root number and Z is an ID number used to designate the associated volume.
12. Labeling:
   a. As a minimum, include the following labeling on all CD-ROM discs and jewel cases:
      1) Project Name.
      2) Equipment Name and Project Tag Number.
      3) Project Specification Section.
      4) Manufacturer Name.
      5) Vendor Name.
13. Binding:
   a. Include labeled CD(s) in labeled jewel case(s).
      1) Bind jewel cases in standard three-ring binder Jewel Case Page(s), inserted at the front of the Final paper copy submittal.
      2) Jewel Case Page(s) to have means for securing Jewel Case(s) to prevent loss (e.g., flap and strap).

Exhibit A 11/37

1.5 ENGINEER'S REVIEW ACTION

A. Shop Drawings and Samples:
   1. Items within transmittals will be reviewed for overall design intent and will receive one (1) of the following actions:
      a. A - FURNISH AS SUBMITTED.
      b. B - FURNISH AS NOTED (BY ENGINEER).
      c. C - REVISE AND RESUBMIT.
      d. D - REJECTED.
      e. E - ENGINEER'S REVIEW NOT REQUIRED.
   2. Submittals returned with Action "A" or "B" are considered ready for fabrication and installation.
      a. If for any reason a submittal that has an "A" or "B" Action is resubmitted, it must be accompanied by a letter defining the changes that have been made and the reason for the resubmittal.
      b. Destroy or conspicuously mark "SUPERSEDED" all documents having previously received "A" or "B" Action that are superseded by a resubmittal.
   3. Submittals with Action "A" or "B" combined with Action "C" (Revise and Resubmit) or "D" (Rejected) will be individually analyzed giving consideration as follows:
      a. The portion of the submittal given "C" or "D" will not be distributed (unless previously agreed to otherwise at the Preconstruction Conference).
         1) One (1) copy or the one (1) transparency of the "C" or "D" Drawings will be marked up and returned to the Supplier.
            a) Correct and resubmit items so marked.
      b. Items marked "A" or "B" will be fully distributed.
      c. If a portion of the items or system proposed are acceptable, however, the major part of the individual Drawings or documents are incomplete or require revision, the entire submittal may be given "C" or "D" Action.
         1) This is at the sole discretion of the Engineer.
         2) In this case, some Drawings may contain relatively few or no comments or the statement, "Resubmit to maintain a complete package."
         3) Distribution to the Owner and field will not be made (unless previously agreed to otherwise).
   4. Failure to include any specific information specified under the submittal paragraphs of the Specifications will result in the submittal being returned to the Supplier with "C" or "D" Action.
   5. Calculations required in individual Specification Sections will be received for information purposes only, as evidence calculations have been stamped by the professional as defined in the specifications and for limited purpose of checking conformance with given performance and design criteria. The Engineer is not responsible for checking the accuracy of the calculations and the calculations will be returned stamped "E. Engineer's Review Not Required" to acknowledge receipt.
   6. Supplier shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Supplier shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Supplier to secure reimbursement for such charges.
   7. Transmittals of submittals which the Engineer considers as "Not Required" submittal information, which is supplemental to but not essential to prior submitted information, or items of information in a transmittal which have been reviewed and received "A" or "B" action in a prior submittal, will be returned with action "E. Engineer's Review Not Required."
   8. Samples may be retained for comparison purposes.
      a. Remove samples when directed.

b. Include in bid all costs of furnishing and removing samples.

9. Approved samples submitted or constructed, constitute criteria for judging completed work.
   a. Finished work or items not equal to samples will be rejected.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

END OF SECTION

Exhibit A 13/37

EXHIBIT A Shop Drawing Transmittal No. ____ - ____

(Spec Section) (Series)

Project Name:		Date Received:	
Project Owner:		Checked By:	
Supplier:	HDR Engineering, Inc.	Log Page:	
Address:	Address:	HDR No.:	
		Spec Section:	
		Drawing/Detail No.:	
Attn:	Attn:	1st. Sub	ReSub.
Date Transmitted:	Previous Transmittal Date:		

Item No.	No. Copies	Description	Manufacturer	Mfr/Vendor Dwg or Data No.	Action Taken*

Remarks:

* The Action designated above is in accordance with the following legend:

A - Furnish as Submitted

B - Furnish as Noted

C - Revise and Submit
1. Not enough information for review.
2. No reproducibles submitted.
3. Copies illegible.
4. Not enough copies submitted.
5. Wrong sequence number.
6. Wrong resubmittal number.
7. Wrong spec. section.
8. Wrong form used.
9. See comments.

D - Rejected

E - Engineer's review not required
1. Submittal not required.
2. Supplemental Information. Submittal retained for informational purposes only.
3. Information reviewed and approved on prior submittal.
4. See comments.
5. Delegated Design - Submittal received as requested by the Contract Documents. The Engineer did not review the engineering or technical content of the submittal.

Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Any deviation from plans or specifications not depicted in the submittal or included but not clearly noted by the Supplier may not have been reviewed. Review by the Engineer shall not serve to relieve the Supplier of the contractual responsibility for any error or deviation from contract requirements.

Comments:

By Date

Distribution: Supplier | File | Field | Owner | Other

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EXHIBIT AA

Supplier's Submittal Certification

Shop Drawing Transmittal No.: _____

Contract/Project Name: _____

_____

Company Name: _____

has

1. reviewed and coordinated this Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

2. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

3. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

4. determined and verified all information relative to Supplier's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

☐ This Submittal **does not** contain any variations from the requirements of the Contract Documents.

☐ This Submittal **does** contain variations from the requirements of the Contract Documents. A separate description of said variations and a justification for them is provided in an attachment hereto identified as:

"Shop Drawing Transmittal No. _____Variation and Justification Documentation"

Insert picture file or electronic signature of Authorized Representative

_____ _____

Authorized Representative Date

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Exhibit A 15/37

SECTION 01 33 04
OPERATION AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Administration of the submittal process for Operation and Maintenance Manuals.
   2. Content requirements for Operation and Maintenance Manuals.

B. Related Specification Sections include but are not necessarily limited to:
   1. Section 01 33 00 – Submittals.
   2. Section 46 66 11 – Open Channel Ultraviolet (UV) Disinfection System Equipment – Horizontal.

1.2 DEFINITIONS

A. Equipment Operation and Maintenance Manuals:
   1. Contain the technical information required for proper installation, operation and maintenance of process, electrical and mechanical equipment and systems.

1.3 SUBMITTALS

A. Operation and Maintenance Manuals:
   1. Draft and final electronic copies.
   2. Final paper copies: Two (2).

1.4 SUBMITTAL SCHEDULE

A. Draft Operation and Maintenance Manuals:
   1. Submit approvable draft manuals in electronic format (PDF) within 30 days following approval of the respective Shop Drawing.
      a. Include placeholders or fly sheet pages where information is not final or is missing from the draft manual.

B. Final Operation and Maintenance Manuals:
   1. Final approval of Operation and Maintenance Manuals in electronic format (PDF) must be obtained 45 days prior to equipment start-up.
   2. Provide paper copies and CD-ROMs of approved final Operation and Maintenance Manuals in electronic format (PDF), a minimum of 30 days prior to equipment start-up.
   3. Issue addenda to Final Approved Operation and Maintenance Manual to include:
      a. Equipment field testing data.
      b. Equipment start-up reports.

1.5 PREPARATION OF SUBMITTALS

A. General:
   1. All pages of the Operation and Maintenance Manual submittal shall be legible.
      a. Submittals which, in the Engineer's sole opinion, are illegible will be rejected without review.
   2. Identify each equipment item in a manner consistent with names and identification numbers used in the Contract Documents, not the manufacturer's catalog numbers.
   3. Neatly type any data not furnished in printed form.
   4. Operation and Maintenance Manuals are provided for Owner's use, to be reproduced and distributed as training and reference materials within Owner's organization.
      a. This requirement is:
         1) Applicable to both paper copy and electronic files.

2) Applicable to materials containing copyright notice as well as those with no copyright notice.

5. Notify supplier and/or manufacturer of the intended use of Operations and Maintenance Manuals provided under the Contract.

B. Operation and Maintenance Manual Format and Delivery:

1. Draft electronic submittals:
   a. Provide manual in Adobe Acrobat Portable Document Format (PDF), latest version.
   b. Create one (1) PDF file for each equipment Operation and Maintenance Manual.
   c. Do not password protect or lock the PDF document.
   d. Drawings or other graphics must be converted to PDF file format from the original drawing file format and made part of the PDF document.
   e. Scanning of drawings is to be used only where actual file conversion is not possible and drawings must be scanned at a resolution of 300 dpi or greater.
   f. Rotate sheets that are normally viewed in landscape mode so that when the PDF file is opened the sheet is in the appropriate position for viewing.
   g. Create bookmarks in the bookmarks panel for the Operation and Maintenance Manual cover, the Table of Contents and each major section of the Table of Contents.
   h. Using Adobe Acrobat Standard or Adobe Acrobat Professional, set the PDF document properties, initial view as follows:
      1) Select File →Properties→Initial View.
      2) Select the Navigation tab: Bookmarks Panel and Page.
      3) Select the Page layout: Single Page.
      4) Select the Magnification: Fit Page.
      5) Select Open to page: 1.
      6) Set the file to open to the cover page of the manual with bookmarks to the left, and the first bookmark linked to the cover page.
   i. Set the PDF file "Fast Web View" option to open the first several pages of the document while the rest of the document continues to load.
      1) To do this:
         a) Select Edit→Preferences→ Documents→Save Settings.
         b) Check the Save As optimizes for Fast Web View box.
   j. PDF file naming convention:
      1) Use the Specification Section number, the manufacturer's name and the equipment description, separated by underscores.
      2) Example: 46 66 11_Open Channel Ultraviolet (UV) Disinfection System Equipment - Horizontal.pdf.
      3) Do not put spaces in the file name.

2. Final electronic submittals:
   a. Submit two (2) copies in PDF file format on two (2) CD-ROM discs (one (1) copy per CD-ROM), each secured in a jewel case.
   b. CD-ROM Labeling:
      1) Provide the following printed labeling on all CD-ROM discs:
         a) Project name.
         b) Specification Section.
         c) Equipment names and summary of tag(s) covered.
         d) Manufacturer name.
         e) Date (month, year).
   c. CD-ROM Jewel Case Holder:
      1) Insert jewel cases containing labeled CD-ROM discs in three-ring binder holder (C-Line Products, www.c-lineproducts.com stock number CLI-61968 or equivalent) at the front of each final paper copy.

3. Final paper copy submittals:
   a. Quantity: Provide two (2) copies.
   b. Paper: 8.5 x 11 IN or 11 x 17 IN bright white, 20 pound paper with standard three-hole punching.

c. 3-Ring Binder:
   1) Provide D-ring binder with clear vinyl sleeves (i.e. view binder) on front and spine.
   2) Insert binder title sheet with the following information under the front and spine sleeves:
      a) Project name.
      b) Specification Section.
      c) Equipment names and summary of tag(s) covered.
      d) Manufacturer name.
      e) Date (month, year).
   3) Provide plastic sheet lifters prior to first page and following last page.
d. Drawings:
   1) Provide all drawings at 11 x 17 IN size, triple folded and three-hole punched for insertion into manual.
   2) Where reduction is not practical to ensure readability, fold larger drawings separately and place in three-hole punched vinyl envelopes inserted into the binder.
   3) Identify vinyl envelopes with drawing numbers.
e. Use plastic coated dividers to tab each section of each manual in accordance with the Table of Contents.

C. Equipment Operation and Maintenance Manual Content:
1. Provide a cover page as the first page of each manual with the following information:
   a. Manufacturer(s) Name and Contact Information.
   b. Vendor's Name and Contact Information.
   c. Date (month, year).
   d. Project Owner and Project Name.
   e. Specification Section.
   f. Project Equipment Tag Numbers.
   g. Model Numbers.
   h. Engineer's Name.
2. Provide a Table of Contents for each manual.
3. Provide Equipment Record sheets as follows:
   a. Printed copies of the Equipment Record (Exhibits B1, B2 and B3), as the first tab following the Table of Contents.
   b. Exhibits B1-B3 are available as Fillable PDF Form documents from the Engineer.
   c. Each section of the Equipment Record must be completed in detail; simply referencing the related equipment Operation and Maintenance Manual sections for nameplate, maintenance, spare parts or lubricant information is not acceptable.
   d. For equipment involving separate components (for example, a motor and gearbox), a fully completed Equipment Record is required for each component.
   e. Submittals that do not include the Equipment Record(s) will be rejected without further content review.
4. Provide a printed copy of the Manufacturer's Field Services report following the Equipment Record sheets.
5. Provide the following detailed information, as applicable:
   a. Use equipment tag numbers from the Contract Documents to identify equipment and system components.
   b. Equipment function, normal and limiting operating characteristics.
   c. Instructions for assembly, disassembly, installation, alignment, adjustment, and inspection.
   d. Operating instructions for start-up, normal operation, control, shutdown, and emergency conditions.
   e. Lubrication and maintenance instructions.
   f. Troubleshooting guide.
   g. Mark each sheet to clearly identify specific products and component parts and data applicable to the installation for the Project; delete or cross out information that does not specifically apply to the Project.

h. Parts lists:
   1) A parts list and identification number of each component part of the equipment.
   2) Exploded view or plan and section views of the equipment with a detailed parts callout matching the parts list.
   3) A list of recommended spare parts.
   4) List of spare parts provided as specified in the associated Specification Section.
   5) A list of any special storage precautions which may be required for all spare parts.
i. General arrangement, cross-section, and assembly drawings.
j. Electrical diagrams, including elementary diagrams, wiring diagrams, connection diagrams, and interconnection diagrams.
k. Test data and performance curves.
l. As-constructed fabrication or layout drawings and wiring diagrams.
m. Copy of the equipment manufacturer's warranty meeting the requirements of the Contract.
n. Copy of any service contracts provided for the specific piece of equipment as part of the Contract.

6. Additional information as required in the associated equipment or system Specification Section.

1.6 TRANSMITTAL OF SUBMITTALS

A. Operation and Maintenance Manuals.
   1. Transmit all submittals to:
      a. The address specified in Specification Section 01 33 00 - SUBMITTALS.
   2. Transmittal form: Use Operation and Maintenance Manual Transmittal, Exhibit A.
   3. Transmittal numbering:
      a. Number each submittal with the Specification Section number followed by a series number beginning with "-01" and increasing sequentially with each additional transmittal, followed by "-OM" (for example: 46 66 11-01-OM).
   4. Submit draft and final Operation and Maintenance Manual in electronic format (PDF) to Engineer, until manual is approved.

1.7 ENGINEER'S REVIEW ACTION

A. Draft Electronic (PDF) Submittals:
   1. Engineer will review and indicate one of the following review actions:
      a. A - ACCEPTABLE
      b. B - FURNISH AS NOTED
      c. C - REVISE AND RESUBMIT
      d. D - REJECTED
   2. Submittals marked as Acceptable or Furnish As Noted will be retained; however, the transmittal form will be returned with a request for the final paper and electronic documents to be submitted.
   3. Copies of submittals marked as Revise and Resubmit or Rejected will be returned with the transmittal form marked to indicate deficient areas.
   4. Resubmit until approved.

B. Final Paper Copy Submittals:
   1. Engineer will review and indicate one (1) of the following review actions:
      a. A - ACCEPTABLE
      b. D - REJECTED
   2. Submittals marked as Acceptable will be retained with the transmittal form returned as noted.
   3. Submittals marked as Rejected will be returned with the transmittal form marked to indicate deficient areas.
   4. Resubmit until approved.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

END OF SECTION

Exhibit A 20/37

EXHIBIT A **Operation and Maintenance Manual Transmittal _____-_____ - OM**
(Spec Section) (Series)

Project Name: Date Received:

Project Owner: Checked By:

Supplier: Owner: Log Page:

Address: Address: HDR No.:

Attn: Attn:

1st. Sub. ReSub.

Date Transmitted: Previous Transmittal Date:

No. Copies	Description of Item	Manufacturer	Dwg. or Data No.	Action Taken*

Remarks:

To: From:
HDR Engineering, Inc.

Date:

* The Action designated above is in accordance with the following legend:
A - Acceptable
B - Furnish as Noted
C - Revise and Resubmit
D - Rejected

Comments:

By Date

Distribution: Supplier | | File | | Field | | Owner | | Other | |

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Exhibit A 21/37

EXHIBIT B1

Equipment Record

Equipment Data and Spare Parts Summary

Project Name				Specification Section:
Equipment Name				Year Installed:
Project Equipment Tag No(s).				
Equipment Manufacturer				Project/ Order No.
Address				Phone
Fax	Web Site		E-mail	
Local Vendor/Service Center				
Address				Phone
Fax	Web Site		E-mail	

MECHANICAL NAMEPLATE DATA

Equip.			Serial No.	
Make			Model No.	
ID No.	Frame No.	HP	RPM	Cap.
Size	TDH	Imp. Sz.	CFM	PSI
Other:				

ELECTRICAL NAMEPLATE DATA

Equip.				Serial No.				
Make				Model No.				
ID No.	Frame No.	HP	V.	Amp.	HZ	PH	RPM	SF
Duty	Code	Ins. Cl.	Type	NEMA	C Amb.	Temp. Rise	Rating	
Other:								

SPARE PARTS PROVIDED PER CONTRACT

Part No.	Part Name	Quantity

RECOMMENDED SPARE PARTS

Part No.	Part Name	Quantity

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EXHIBIT B2

Equipment Record

Recommended Maintenance Summary

Equipment Description	Project Equip. Tag No(s).	

RECOMMENDED BREAK-IN MAINTENANCE (FIRST OIL CHANGES, ETC.)	INITIAL COMPLETION * FOLLOWING START-UP							
	D	W	M	Q	S	A	RT	Hours

RECOMMENDED PREVENTIVE MAINTENANCE	PM TASK INTERVAL *							
	D	W	M	Q	S	A	RT	Hours

* D = Daily W = Weekly M = Monthly Q = Quarterly S = Semiannual A = Annual Hours = Run Time I

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HDR

EXHIBIT B3

Equipment Record

Lubrication Summary

Equipment Description	Project Equip. Tag No(s).

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

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SECTION 46 66 11

OPEN CHANNEL ULTRAVIOLET (UV) DISINFECTION SYSTEM EQUIPMENT - HORIZONTAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Trojan Technologies low pressure, high intensity, horizontal, open channel, gravity flow, automatic wiping UV disinfection system equipment, with all controls and power equipment.

B. Related Specification Sections include but are not necessarily limited to:
   1. Section 01 33 00 – Submittals.
   2. Section 01 33 04 – Operations and Maintenance Manuals.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF):
      a. Standard Methods for the Examination of Water and Wastewater, latest edition.
   2. United States Environmental Protection Agency (USEPA):
      a. EPA/625/1-86/021, Municipal Wastewater Disinfection Design Manual.
   3. Underwriters Laboratory (UL):
      a. 508, UL Standards for Safety Industrial Control Equipment.

B. Testing and Analysis:
   1. Testing and analysis information shall be submitted, as follows:
      a. Detailed plan for Functional Testing and Performance Testing that shall satisfy the requirements specified herein, including harmonics.
      b. Preliminary documentation shall be provided at least two (2) weeks prior to the Functional Testing. Final documentation of the UV System as installed shall be provided within two (2) weeks after successful completion of the Performance Testing.
      c. The Functional Testing and Performance Testing reports and UV system supplier (UVSS) certifications, as specified herein.

C. Test Reports:
   1. Submit written test reports upon completion of each test and inspection (Functional Testing and Performance Testing) as required in Part 3. At a minimum, the reports should include the following:
      a. The Functional Test report shall include:
         1) Wiring continuity tests.
         2) Control system loop tests.
         3) Lamp status reports.
         4) Ballast status report.
         5) UV intensity sensor tests to determine sensor-to-sensor variability and impact of sensor position in window well on sensor accuracy. Both on-line sensors and reference sensors shall be tested.
         6) Wiping system tests.
         7) Valve and operator function tests.
         8) Instrument calibration tests.
         9) Control and alarm tests for overall UV System.
         10) Harmonics.
         11) Water level under various flow conditions.

b. Dates and times of tests, sampling, or inspection.
c. Flow condition during testing.
d. Date and time of water sampling or inspection and record of conditions at the plant noting any unusual circumstances.
e. Plans and description of locations of samples taken or testing performed.
f. Testing laboratory name, address, telephone number, and signature of person performing tests. Standard method or analytical method for conducting test. Date of tests and chain of custody sheets.
g. Interpretation of results.
h. Recommended corrective actions to bring materials and equipment into compliance, if required.
i. Harmonic field test report.

1.3 SYSTEM DESCRIPTION

A. Provide low pressure, high intensity, horizontal, open channel, gravity flow, automatic wiping UV disinfection system equipment including:
1. UV lamp modules:
a. Each UV bank consists of ten (10) UV modules.
b. UV banks in channel placed in series.
c. Two (2) banks, per each channel.
2. UV lamps.
a. Powered by electronic ballasts.
b. Eight (8) UV lamps per UV module.
3. Power Distribution and Air Compressor (as required).
4. Existing Control Center panel to be reprogramed to also control the third channel.
5. In-channel automatic wiping system.
6. UV detection equipment: UV intensity sensors (one (1) for each bank).
7. Channel 3 level transmitter and low level switch.
8. Automatic level control by downward acting motorized weir gate.
9. Enclosures with NEMA 4X rating for outdoor electrical equipment.
10. Enclosures with NEMA 12 rating for indoor electrical equipment in a building.
11. Spare items.
12. Other ancillary equipment required to make a complete UV disinfection system not specified elsewhere.
13. Third channel harmonic frequency mitigation to meet IEEE 519.

1.4 SUBMITTALS

A. Shop Drawings:
1. See Section 01 33 00.
2. A copy of this specification section, with addenda updates included, and all referenced and applicable section with addendum updates included, with each paragraph marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. If deviations from the specifications are indicated and, therefore requested by the Seller, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph no underlined will signify compliance on the part of the Seller with specifications. The submittals shall be accompanied by a detailed written justification for each deviation.
3. A copy of the contract drawings relating to the submitted equipment, with addendum updates that apply to the equipment in this Section, marked to show specific changes necessary for the equipment proposed in the submittal. If no changes are required, the drawing or drawings shall be marked "no changes required".
4. A recommended method for the determination of lamp life using lamp output in the calculation.

5. Complete descriptive information and shop drawings for all equipment, material, and devices furnished showing installation requirements, critical drawings shall indicate matching the existing dimensions for the UV chambers and the locations of all equipment, including electrical and instrumentation enclosures.
6. All interconnections and interface requirements, dimensions and locations of all major elements of the UV disinfection system.
7. Product technical data including:
   a. Manufacturer's installation instructions.
   b. Manufacturer's storage and handling instructions.
8. Dimensional drawings and critical clearance requirements.
9. Electrical schematics and layouts.
10. System control strategies.
11. Hydraulic calculations indicating the new capacity based on hydraulic characteristics as well as disinfection capacity.
12. Disinfection performance guarantee.

B. Certification and Test Reports:
   1. Factory Performance Tests (include experience of independent and certified laboratory):
      a. Hydraulic Testing Reports indicating compliance with 2.3.C.6. below.
      b. Assembled UV disinfection system equipment:
         1) Electronic ballast data indicating compliance with 2.4.A.
         2) UV lamp data indicating compliance with 2.4.B.
   2. Field Performance Test:
      a. Manufacturers Field Service Report.
   3. Manufacturers Qualifications indicating compliance with 1.2.B.

C. Operation and Maintenance Manuals:
   1. See Section 01 33 04.

D. Cost information including, but not limited to:
   1. Replacement electronic ballast.
   2. Replacement UV lamp.
   3. Replacement UV lamp quartz sleeve.
   4. Replacement UV lamp sleeve wiper.

E. Electrical Power:
   1. Updated total connected wattage of ballast and lamps measured at the main power feed to each power module.
   2. Updated normal operating wattage of ballasts and lamps measured at main power feed to each power module.

F. Contact information for UV lamp and ballast Manufacturers other than UV system Manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
   1. Factory ship all major UV disinfection system equipment simultaneously.
   2. Provide written notice to Engineer a minimum three (3) calendar days prior to anticipated date of delivery to afford an opportunity for Engineer and OWNER to be present and inspect unloading of UV disinfection system equipment.
   3. Manufacturer's authorized representative shall be present during unloading.

B. Damaged and/or missing UV disinfection system equipment shall be replaced with new equipment at no additional cost to OWNER:
   1. Replenish any spare parts used to specified quantity.

1.6 GUARANTEE

A. The equipment furnished under this section shall be free of defects in material and workmanship, including damages that may be incurred during shipping for a period of 12 months from the date of startup or 18 months after shipment, whichever comes first.

B. Performance:
   1. Guarantee UV disinfection system equipment shall at all times produce an effluent quality that conforms to Performance Requirements specified herein for a continuous period of one (1) year from date of Final Acceptance:
      a. Provide services of competent and experienced factory trained authorized representative during 1-year period to inspect and correct all UV disinfection system equipment deficiencies within three (3) calendar days of written notification indicating Performance Requirements of UV disinfection system equipment have not been met.

D. The UV system shall deliver a minimum UV dose of 30,000 uW –s/cm2 at peak flow, in effluent with a UV transmittance of 65 percent at end of lamp life after reduction of quartz sleeve fouling:
   1. End-of-lamp life factor (EOLL): lamp output at the end of lamp life of 9,000 hours. The design UV dose shall be based on the EOLL factor of 0.5 unless the UV manufacturer has a technology-specific EOLL factor certified by independent third party. EOLL factor higher than 0.98 will not be considered.
   2. Fouling factor: sleeve fouling causing attenuation of the minimum dose during operation. The design UV dose shall be based on the fouling factor of 0.8 unless the UV manufacturer has technology-specific fouling factor certified by independent third party. Fouling factor higher than 0.95 will not be considered.

C. In case of premature lamp failure, the OWNER will send the lamp back to UV manufacturer together with the information of the UV unit serial number, hours run and on/off cycles. The UV manufacturer shall then offer the following:
   1. Lamp failure before 12,000 hours: Manufacturer will send a replacement lamp free of charge before 9000 hours and pro-rated cost from 9,000-12,000 hrs.

D. The UV manufacturer shall ensure disposal of returned lamps (old/used) at no cost to the OWNER upon receipt of the returned lamps at the manufacturing headquarters.

E. Ballasts to be warranted for 5 years, prorated after 1 year.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. UV Equipment.
      a. Trojan Technologies.
   2. Flow Measurement Device
      a. HACH FL1500.
   3. Ultrasonic
      a. Flo-Station, RS-232.
   4. Water Control Gates
      a. Whipps
   5. Gate Actuator
      a. Auma, A101526
   6. Depth Meter
      a. Milltronics, MultiRanger 100.

2.2 MATERIALS

A. General:
1. All metal contacted by liquid:
   a. Type 316 stainless steel, except the material as noted in below.
      1) Type 316L stainless steel.
         a) Junction boxes.
      2) Type 304 stainless steel.
         a) Baffle plate and module support:
         b) Level control weir.
2. All material exposed to UV radiation:
   a. Type 316 stainless steel, or:
   b. Type 214 clear fused quartz, or:
      1) 99.9 percent silicon dioxide quartz.
      2) Circular tubing; minimum 1/16 IN wall thickness.
   c. Teflon coated, or:
   d. PVDF.
3. All other material not covered above:
   a. Type 304 or 316 stainless steel or anodized aluminum for pneumatic or hydraulic cylinder.
   b. Painted steel if located indoors in a climate-controlled building.

2.3 PERFORMANCE REQUIREMENTS

1. Seller shall provide equipment that is an exact match of existing equipment in Channels 1 & 2.
2. Existing channel 3 is designed for installation of equipment matching that in channels 1 & 2. Manufacturer shall fit their equipment into existing channel at no additional cost to Owner.
3. Channel 3 level transmitter and level switch.
4. The equipment specified herein is intended to be identical to existing equipment currently in operation at the Billings Water Reclamation Facility (WRF). All components of the new equipment shall be identical to existing equipment unless specifically noted by the supplier and approved by the engineer during the Shop Drawing phase prior to equipment fabrication and delivery. Owner reserves the right to install existing spare part inventory on new equipment to verify compatibility at their discretion. In the event existing spare part components are not compatible with new equipment, supplier will provide new, matching equipment, at no additional cost to the Owner.

B. Qualifications:
1. Match UV equipment and accessories currently in operation at the Billings WRF, prototype units not permitted.

C. UV Influent Characteristics:
1. Anticipated UV transmittance measured at 253.7 nanometers, using de-ionized water, through a 1 cm path (at indicated corresponding flow rate):
   a. Minimum of 65 percent at Peak Flow.
2. Anticipated total suspended solids concentration:
   a. Maximum 30mg/L at Peak Flow.
3. Maximum Flow Rate:
   a. 20 MGD.

D. UV Effluent Limits:

Monthly geometric mean; April 1- October 31	E. coli less than 126 cfu/ 100mL
Weekly geometric mean; April 1- October 31	E. Coli less than 252 cfu/ 100mL
Monthly geometric mean; November 1- March 31	E. coli less than 630 cfu/ 100mL

Weekly geometric mean; November 1- March 31	E. coli less than 1,260 cfu/ 100mL
E. coli Monitoring	5 grabs per week

E. UV Disinfection System:
1. Sizing of UV equipment shall be based on matching existing system.
2. Utilize existing third UV Channels.
   a. Channel dimensions:
      1) Length of 30 FT, approximately.
      2) Width of each channel, 40 IN, approximately
      3) Depth (top of concrete slab to bottom of channel), 60 IN
      4) Nominal water depth, 30.6"
      5) See Contract Drawings for additional channel dimensions and tolerances.
3. Bioassay Testing:
   a. On equipment of identical design being proposed.
   b. Verifying theoretical process calculations.
   c. Performed by third party and certified laboratory.

2.4 FABRICATION

A. Electronic Ballast:
1. The ballasts should be electronic microprocessor controlled.
2. Maximum rated voltage of 208 volts.
3. Operating frequency of 20,000 – 70,000 hertz.
4. Minimum power factor of 98 percent
5. The Ballast shall be capable of varying the lamp output proportional to 4-20 mA control signal.
6. Operates at current crest factor between 1.4 and 1.7.
7. Each ballast drives two (2) lamps.

B. UV Lamps:
1. Minimum lamp output of 100 watts UV-C (253.7 nanometers) measured after 9,000 HR operation
   a. Performed by independent certified laboratory.
2. Minimum lamp live of 9,000 HR.
3. Variable UV lamp output proportional to the variable power setting from the electronic ballast.
4. Maximum operation skin temperature of 130 DegC.
5. Electrical connection shall have a minimum of two (2) pins located on either side.
6. Two sources of supply shall be available for replacement lamps.
7. Lamp filaments shall be clamped design, rugged to withstand shock and vibration.
8. Lamp base shall be constructed of material resistant to UV and ozone and shall incorporate dielectric barrier of pin insulator
   a. Pin insulator shall consist of a non-conductive divider placed between the lamp pins to prevent direct arcing across the pins in moist conditions.
   b. Barrier shall be dielectrically tested for 25,000 V.

C. Lamp end Seal and Lamp Holder:
1. The open end of the lamp sleeve shall be sealed by means of a sleeve nut which threads onto a sleeve cup and compresses the sleeve O-ring.
2. The sleeve nut will have a knurled surface to allow a handgrip for tightening. The sleeve nut shall not require any tools for removal.
3. The lamp will be held in place by means of a molded lampholder that will incorporate tow seals. The lampholder will incorporate a double seal against the inside of the quartz sleeve to act in series with the external O-ring.

4. The second seal on the lampholder will isolate and seal the lamp from the module frame and all other lamps in the module.
5. In the event of a quartz sleeve fracture the two seals of the lamp holder will prevent moisture from entering the lamp module frame and the electrical connections to the other lamps in the module.
6. The lampholder will also incorporate a UV resistant PVC molded stop that will prevent the lamp sleeve from touching the steel sleeve cup.

D. UV Modules:
1. Ends of the UV lamp sleeves shall not protrude beyond the frame.
2. Provide reflector shield to prevent UV light from exiting the channel.
3. Design such that UV lamps and UV lamp sleeves can be changed without requiring special tools.
4. Equipped with interlock switch, if required, which will automatically disconnect power to its associated bank if the module is raised from channel or the quick disconnect plug is removed.
5. The module support rack shall be Type 304 or 316 stainless steel and be suspended above the effluent in the channel by means of slotted angles allowing adjustment to the precise height of the channel and requiring no fastening of the individual UV lamp modules.
6. The module support rack will be designed to that no ultraviolet light will radiate above the channel when the UV lamp modules are energized and fully immersed in the effluent.

E. UV Lamp Sleeve:
1. Material: See 2.2
2. The nominal wall thickness shall be 1.5 mm.
3. When clean, minimum UV transmittance of 90 percent at 253.7 nanometers.
4. When fouled, minimum UV transmittance of 70 percent at 253.7 nanometers.
5. Lamp sleeves will be domed at one end.
6. Not subject to solarization or degradation over life.

F. Automatic Cleaning System:
1. Cleaning system shall have mechanical and chemical cleaning abilities, complete with an automatically initiated and controlled cleaning cycle.
2. The cleaning system, including both mechanical and/or chemical components, shall be fully operation *without* requiring either lamps or modules to be placed out of service.
3. Cleaning cycle intervals to be field adjustable within the range of once every 24 hours to once every 500 hours. Remote Manual and Remote Auto Cleaning control to be available through the operator interface.
4. The system shall be provided with the required cleaning solutions necessary for initial equipment testing and for equipment start-up.

G. Automatic Level Controllers:
1. Provide Motorized Weir Gate per section 40 50 58 requirements.
2. All gates required per section 40 50 58 shall be provided by UV manufacturer for system responsibility.
3. Provide level transmitter in each channel to control position of automatic level controller.

H. Hydraulic System Center (HSC):
1. Integrate existing HSC with new channel.

I. Module Lifting Device:
1. Not Required since bridge crane provided

J. UV Intensity Sensor:
1. Provide UV intensity sensor:
   a. One (1) for each bank.
   b. To continuously sense UV intensity produced with indication corresponding to 0 - 100 percent UV intensity of new UV lamp.
   c. Shall measure only the germicidal portion of UV light at 253.7 nanometers.

d. Shall not degrade after prolonged exposure to UV light.
e. Automatically cleaned at the same frequency as the UV lamps.

K. Low Water Level Sensor:
1. One (1) per channel.
2. Extinguish UV lamps automatically if water level in the channel drops below low level.

L. Channel Level Transmitter:
1. Output signal: 4-20ma DC.

2.5 ELECTRICAL

A. General:
1. Power each module from receptacle on Power Distribution Center.
2. Drive two lamps with each ballast.
3. Power factor: more than 98 percent leading or lagging.
4. System Control Center Electrical Supply: 120 V/60 Hz
5. Power Distribution Center electrical Supply: 277/ 480 V/60 Hz, 3 phase, 4 wire.
6. Air compressor electrical supply: 480 V/60 Hz. (WEDECO)
7. Air compressor or pneumatic HSC automatic drain and filter: 120v/60Hz. (WEDECO)
8. Hydraulic system center electrical supply: 480 volts, 3 phase plus ground. (Trojan)
9. Online UV transmission monitor: 120 V/60 Hz.
10. UV manufacturer shall perform all terminations between lamps and ballasts.
11. UV manufacturer shall supply all cabling between lamps and ballasts.

B. Power Distribution Centers (PDC's):
1. NEMA 4X, stainless steel.
2. Power distribution via wire connection to be environmentally sealed to allow for local connection of UV modules.
3. Data concentration via integrated circuit boards located inside the PDC.
4. Comply with UL safety requirements.
5. Seal all internal components from the environment.
6. One separate sealed PDC per bank of lamps.
7. For "cabinet mounted" style ballast system, UV manufacturer shall provide one complete cabinet for each bank of lamps.

2.6 CONTROL AND INSTRUMENTATION

A. Existing UV System Control Panel:
1. Existing control panel (CP-UV) and associated Operator Interface Terminal (OIT) shall be reprogrammed by UV manufacturer as required to allow third (new) UV channel to operate seamlessly with existing channels.
a. Mode of operation, alarms, and all functions shall match existing.

2.7 SPARE PARTS

A. General:
1. Provide spare parts:
a. In the shipment along with the equipment to site.
b. In the amount as indicated in 2.7 B. after all damaged or failed items have been replaced and the UV disinfection system equipment has achieved Final Acceptance.
c. Identical with original installed parts.
d. In clearly identified and labeled containers with quantity, item description, and part number.

B. Spare Parts:
1. Provide the following spare parts:
a. Two (2) UV intensity sensors.
b. Ten (10) percent of total installed UV lamp seal rings.
c. 10 (ten) percent of total installed wiper system components.

d. One full change of cleaning solution (Trojan) for one year after start up and acceptance.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION

A. General:
1. Provide services of competent and experienced factory trained authorized representative to provide technical direction during installation, adjusting, and testing UV disinfection system and ancillary equipment.
2. Provide written certification by UV manufacturer stating UV disinfection system and ancillary equipment have been factory tested to comply with the specifications herein and have been properly assembled prior to shipment.
3. Provide Manufacturer's Field Service Report stating UV disinfection system and ancillary equipment has been started up and ready and ready for operation, and is:
   a. Properly installed and tested.
   b. Free from any induced stress imposed by attached work.
   c. Properly operational under full load conditions.
   d. Properly operational under all control modes.

B. Install all items as shown on drawings.

3.2 FIELD QUALITY CONTROL

A. Delivery and Storage:
1. A complete set of manufacturer's instructions covering storage, installation, operation, lubrication, and maintenance shall be furnished to the OWNER no later than the date the equipment is shipped. Storage, installation, lubrication, and startup of the equipment and motors shall be in strict conformance with the manufacturer's instructions.
2. All equipment shall be delivered by the Manufacturer to the site ready for installation according to the schedule provided in the General Requirements.
3. Deliver materials dry and undamaged, and store out of contact with ground. Cover materials with weather tight coverings and keep dry.

B. Installation:
1. The UV Equipment Manufacturer shall provide technical support during the installation.
2. The Installation Contractor will install the UV equipment and all components including conduit and wiring.

C. Inspection, Startup and Field Adjustment:
1. The INSTALLATION CONTRACTOR shall furnish labor to assist Manufacturer for startup.
2. Factory inspections:
   a. The manufacturer shall inspect control panels and equipment for required construction, electrical connection, and intended function.
   b. The manufacturer shall supervise any factory adjustments and installation checks.
3. Manufacturer shall establish, verify, and demonstrate proper operation of the UV system during startup. Manufacturer shall be present full time for a minimum of three (3) days but as many days as necessary for successful UV system startup.
   a. Furnish all necessary supplies needed for the initial startup and testing of the equipment.
   b. Check proper installation of the equipment.
   c. Proper inspection, checking, and adjustment of the equipment.
   d. Startup and field-testing for proper operation.
   e. Perform functional testing on equipment.

D. Testing:
1. General:

a. Manufacturer and INSTALLATION CONTRACTOR shall be responsible for operation and maintenance of the UV system equipment until compliance with all disinfection requirements has been demonstrated. Manufacturer shall be present full time for a minimum of three (3) days during performance testing but as many days as necessary so that a knowledgeable representative either from the manufacturer or INSTALLATION CONTRACTOR operates and maintains UV system equipment during testing.

b. With the exception of UV system equipment operation and maintenance, OWNER will perform all other operation and maintenance services for peak flow rate performance test, 30-day performance test. OWNER will operate the UV system; however, the INSTALLATION CONTRACTOR or manufacturer shall be on call in case equipment operation or maintenance problems arise.

c. The following field tests shall be performed by or under the direct supervision of the OWNER with assistance from the manufacturer's representative:
   1) Functional testing (including Electrical Harmonic Field Testing).
   2) Performance Testing.
      a) Peak flow rate performance test.
      b) 30-day performance test.
      c) Field Commissioning test.

2. Functional Testing:
   a. Prior to Startup, the manufacturer's representative shall inspect the installed UV System for proper alignment, correct operation, proper connections, and satisfactory function of all components. The manufacturer's representative shall approve the installation and provide certification that the system components have been installed correctly and are ready for operation. If the UV System needs corrective action prior to beginning the Functional Testing, the INSTALLATION CONTRACTOR shall make all necessary modifications to meet these specified requirements. The proposed Functional Testing procedure shall be submitted to and approved by the Engineer before scheduling and performing the Functional Test.
   b. The SELLER shall prepare a report summarizing the results of the Functional Testing. The report shall be transmitted to the Engineer within two (2) weeks of the Functional Test for review and acceptance. Review and acceptance of the summary report will not be necessary in order to proceed from the Functional Testing to the Performance Testing.
   c. WRF secondary effluent shall be used for test fluid.
   d. Functional Testing shall be witnessed by the Engineer and shall demonstrate that the UV System and related control system operates in accordance with the specifications, including all operating, monitoring, and control functions.
   e. The INSTALLATION CONTRACTOR, with assistance from the manufacturer's representative, shall conduct Functional Tests until each individual component item or system has achieved one (1) continuous hour of satisfactory operation. All operational features and controls shall be demonstrated during this period while in automatic modes. Each UV train shall be tested to demonstrate proper performance, as specified herein.
   f. The Functional Test shall include confirming the operability of the serial interface between the UV control panels, PLC, and the plant data control system. The manufacturer shall require the presence of the INSTALLATION CONTRACTOR during the interface test.
   g. The Functional Test shall include field testing of the harmonics. Harmonic testing of the installed UV System shall be used to verify compliance with the harmonic criteria.
3. Performance Testing:
   a. The INSTALLATION CONTRACTOR and Manufacturer shall provide testing services on WRF secondary effluent.
   b. The peak flow rate and 30-day performance tests will be run by the OWNER as part of plant operations and will be used to demonstrate the UV system's ability to meet the OWNER effluent quality requirements given in paragraph 2.3 B. OWNER will perform all sampling and testing.

c. In addition to the effluent quality requirements given in 2.3 B., the performance of the UV system shall be greater than or equal to the disinfection performance of the UV equipment.
d. Written summaries, with results of all tests completed, tests in progress, and equipment modifications, shall be submitted to Engineer within two (2) days and shall include:
1) Operating mode of UV disinfection system equipment.
2) Sampling plan and schedule of UV disinfection system influent and effluent grab samples.
3) Data to be collected with each sampling.
a) Inlet/outlet velocity distribution (if hydraulic profiling is performed).
b) Flow rate and flows split between reactor trains.
c) Water level.
d) UV transmittance and turbidity.
e) Operational UV dose.
f) UV lamp intensity.
g) E. coli counts in cfu/100mL.

4. If the UV system fails to meet any test requirements, OWNER will notify manufacturer, and manufacturer shall investigate the problem and develop a corrective plan within two (2) weeks of notification. Manufacturer shall be solely responsible for costs for modifications to the UV system and for retesting required to demonstrate compliance with all test requirements.
5. Additional testing period beyond initial periods will not be basis for extension of contract time or claim for additional compensation from OWNER.

E. Training:
1. Manufacturer shall be present full time for a minimum of one (1) day to provide complete training of OWNER Operations and Maintenance Staff on UV system operation and maintenance.
2. Instruction shall be specific to the models of equipment provided and shall include both classroom and field sessions.
3. Training shall be completed prior to commencement of startup.
4. All training materials and visual aids to be provided by UV manufacturer and shall be based on the O&M Manual.

F. Effluent quality determined by results shall meet or exceed characteristics indicated in Performance Requirements specified herein.

G. Performance Requirements not met during Performance Testing Period:
1. Modifications to equipment or operational changes shall be made within two (2) weeks of written notification indicating Performance Requirements of UV disinfection system equipment have not been met.
2. Perform additional Performance Testing after deficiencies above have been remedied:
a. Additional Performance Testing period shall have the same requirements and duration as initial Performance Testing period specified.

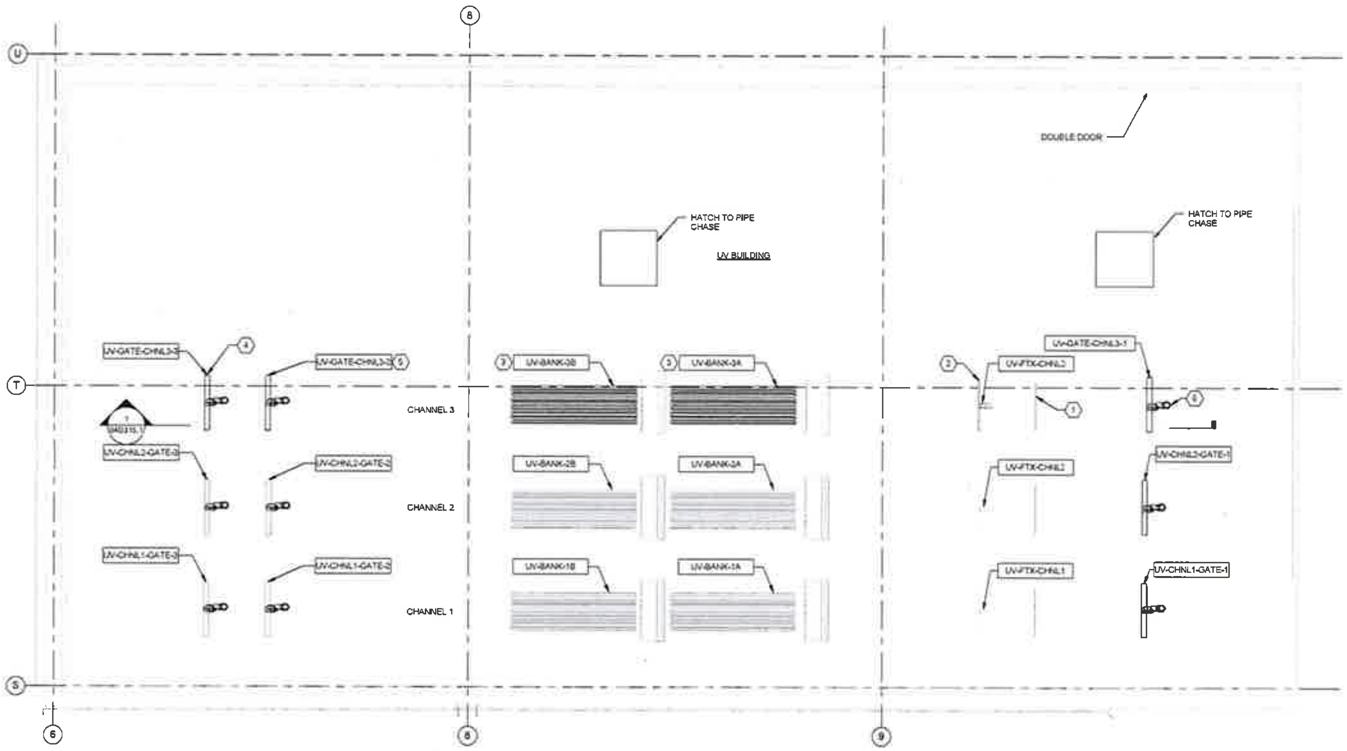
H. UV disinfection system and ancillary equipment failing to meet Performance Requirements specified herein, after first additional Performance Testing Period, and after several attempts of implementing the correcting measures by UV supplier, may be required to be removed at OWNERS option:
1. Within thirty (30) days after rejection.
2. Replaced with UV disinfection system equipment able to meet Performance Requirements specified in this Section at no additional cost to the OWNER.

I. All payments made by the OWNER associated with UV disinfection system equipment shall be returned to OWNER if UV disinfection system cannot perform in accordance with the Specification.

J. Additional Performance Testing Period beyond initial periods will not be basis for extension of contract time or claim for additional compensation from OWNER.

1 **END OF SECTION**

Exhibit A 36/37



KEY NOTES.

1. UV MANUFACTURER TO PROVIDE PERFORATED BAFFLE PLATE MATCHING EXISTING IN CHANNELS 1 & 2.
2. PROVIDE FLOW METER MATCHING EXISTING IN CHANNELS 1 & 2.
3. UV MODULE AND POWER DISTRIBUTION CENTER FURNISHED BY UV MANUFACTURER.
4. WEIR GATE BY UV MANUFACTURER. MOTORIZED ACTUATOR TO MATCH EXISTING ACTUATORS.
5. GATE TO BE RELOCATED BY INSTALLATION CONTRACTOR. UV MANUFACTURER TO PROVIDE NEW MOTORIZED ACTUATOR TO MATCH EXISTING.
6. UV MANUFACTURER TO PROVIDE NEW MOTORIZED ACTUATOR FOR EXISTING GATE. ACTUATOR TO MATCH EXISTING ACTUATORS.

HDR

ISSUE	DATE	DESCRIPTION

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STRUCTURAL	T. HAMLIN
ARCHITECTURAL	J. RICKERT
PROCESS	C. REVIS
MECHANICAL	L. WORTH
ELECTRICAL	D. BESINGER
INSTRUMENTATION	D. BEST
PROJECT NUMBER	233305

Water Reclamation Facility
City of Billings MT
W.O. 19-31

UV Equipment Procurement

BASIN COMPLEX
UV DISINFECTION FLOOR PLAN

FILENAME: BLGS WWP_04_Process - Bioreactor Complex.rvt
SCALE: 1/4" = 1'-0"

SHEET
04D115.1

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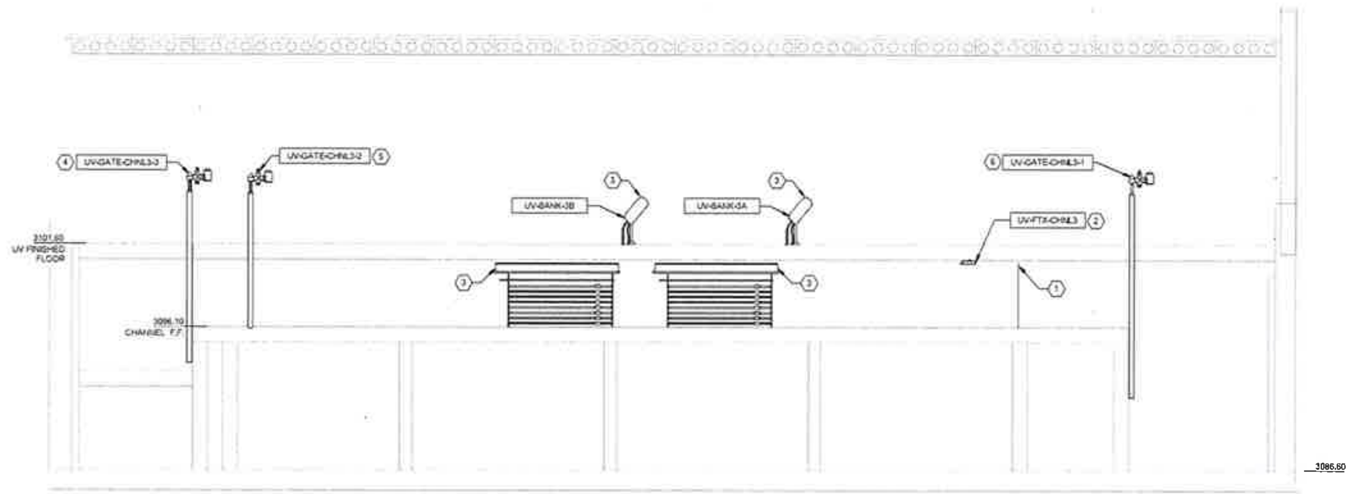

UV PROCUREMENT - UV SECTION
1/4" = 1'-0"

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Exhibit A 37/37

HDR

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Water Reclamation Facility
City of Billings, MT
W.O. 19-31

UV Equipment Procurement

BASIN COMPLEX
UV DISINFECTION SECTION

FILENAME: BLGS WWP_04_Process - Bioreactor Complex.rvt
SCALE: 1/4" = 1'-0"

SHEET 04D315.1

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