WHATCOM COUNTY
CONTRACT INFORMATION SHEET

Whatcom County Contract Number:

Originating Department:	85 Health and Community Services
Division/Program: *(i.e. Dept. Division and Program)*	8540 Environmental Health / 854010 EH Admin
Contract or Grant Administrator:	Anna Mostovetsky / Joshua Leinbach
Contractor's / Agency Name:	Aquatic Insight, LLC

Is this a New Contract?		If not, is this an Amendment or Renewal to an Existing Contract?	Yes ☐	No ☐
Yes ☒	No ☐	If Amendment or Renewal, (per WCC 3.08.100 (a)) Original Contract #:		

Does contract require Council Approval?	Yes ☒	No ☐	If No, include WCC:	
Already approved? Council Approved Date:			(Exclusions see: Whatcom County Codes 3.06.010, 3.08.090 and 3.08.100)	

Is this a grant agreement?					
Yes ☐	No ☒	If yes, grantor agency contract number(s):		ALN#	

Is this contract grant funded?			
Yes ☒	No ☐	If yes, Whatcom County grant contract number(s):	20201016 / 202206016

Is this contract the result of a RFP or Bid process?				Contract Cost Center:	650525 ($16,667) / ECY Grant (in process - $45,833)
Yes ☐	No ☐	If yes, RFP and Bid number(s):			

Is this agreement excluded from E-Verify?	No ☐	Yes ☐	

If YES, indicate exclusion(s) below:

☐ Professional services agreement for certified/licensed professional.	☐ Goods and services provided due to an emergency.
☐ Contract work is for less than $100,000.	☐ Contract for Commercial off the shelf items (COTS).
☐ Contract work is for less than 120 days.	☐ Work related subcontract less than $25,000.
☐ Interlocal Agreement (between Governments).	☐ Public Works - Local Agency/Federally Funded FHWA.

Contract Amount:(sum of original contract amount and any prior amendments):

$ 62,500

This Amendment Amount:

$

Total Amended Amount:

$

Waiting ECY funding ($45,833). FPHS funding is sufficient to cover funding in the interim.

Council approval required for; all property leases, contracts or bid awards **exceeding $40,000**, and professional service contract amendments that have an increase greater than $10,000 or 10% of contract amount, whichever is greater, **except when*:***

1. Exercising an option contained in a contract previously approved by the council.
2. Contract is for design, construction, r-o-w acquisition, prof. services, or other capital costs approved by council in a capital budget appropriation ordinance.
3. Bid or award is for supplies.
4. Equipment is included in Exhibit "B" of the Budget Ordinance
5. Contract is for manufacturer's technical support and hardware maintenance of electronic systems and/or technical support and software maintenance from the developer of proprietary software currently used by Whatcom County.

Summary of Scope: This contract supports consulting services and the development of a Wiser Lake Cyanobacteria Management Plan.

Term of Contract:	9 Months	Expiration Date:	03/31/2025

Contract Routing:				
	1. Prepared by:	JT	Date:	06/21/2024
	2. Health Budget Approval	JS	Date:	07/10/2024
	3. Attorney signoff:	Christopher Quinn	Date:	07/15/2024
	4. AS Finance reviewed:	A Martin	Date:	07/11/2024
	5. IT reviewed (if IT related):		Date:	
	6. Contractor signed:		Date:	
	7. Executive Contract Review:		Date:	
	8. Council approved (if necessary):	AB2024-487	Date:	
	9. Executive signed:		Date:	
	10. Original to Council:		Date:	

Whatcom County Contract Number:

CONTRACT FOR SERVICES
Between Whatcom County and Aquatic Insight

Aquatic Insight, LLC, hereinafter called **Contractor** and Whatcom County, hereinafter referred to as **County,** agree and contract as set forth in this Agreement, including:

General Conditions, pp. 3 to 13,
Exhibit A (Scope of Work), pp. 14 to 18,
Exhibit B (Compensation), pp. 19 to 22,
Exhibit C (Certificate of Insurance), p. 23,
Exhibit D (Wiser Lake QAPP).

Copies of these items are attached hereto and incorporated herein by this reference as if fully set forth herein.

The term of this Agreement shall commence on the 24th day of July, 2024, and shall, unless terminated or renewed as elsewhere provided in the Agreement, terminate on the 31st day of March, 2025.

The general purpose or objective of this Agreement is to provide consulting services and develop a Wiser Lake Cyanobacteria Management Plan, as more fully and definitively described in Exhibit A hereto. The language of Exhibit A controls in case of any conflict between it and that provided here.

The maximum consideration for the initial term of this agreement or for any renewal term authorized herein (if applicable) shall not exceed $62,500. The Contract Number, set forth above, shall be included on all billings or correspondence in connection therewith.

Contractor acknowledges and by signing this contract agrees that the Indemnification provisions set forth in Paragraphs 11.1, 21.1, 30.1, 31.2, 32.1, 34.2, and 34.3, if included, are totally and fully part of this contract and have been mutually negotiated by the parties.

Each person signing this Contract represents and warrants that he or she is duly authorized and has legal capacity to execute and deliver this Contract.

IN WITNESS WHEREOF, the parties have executed this Agreement on:

CONTRACTOR:

Aquatic Insight, LLC
4207 SE Woodstock Blvd #535
Portland, OR 97206

Each signatory below to this Contract warrants that he/she is the authorized agent of the respective party; and that he/she has the authority to enter into the contract and to bind the party thereto.

_____

Mark Rosenkranz, Owner and Manager Date

WHATCOM COUNTY:
Recommended for Approval:

Sue Sullivan, Environmental Health Manager Date

Erika Lautenbach, Health and Community Services Director Date

Approved as to form:

Christopher Quinn, Chief Civil Deputy Prosecutor Date

Approved:
Accepted for Whatcom County:

By: _____
Satpal Singh Sidhu, Whatcom County Executive Date

CONTRACTOR INFORMATION:

Aquatic Insight, LLC
Mark Rosenkranz, Owner and Manager
4207 SE Woodstock Blvd #535
Portland, OR 97206
503-515-7864
mark@aquaticinsight.com

GENERAL CONDITIONS

Series 00-09: Provisions Related to Scope and Nature of Services

0.1 Scope of Services:
The Contractor agrees to provide to the County services and any materials as set forth in the project narrative identified as Exhibit "A", during the agreement period. No material, labor, or facilities will be furnished by the County, unless otherwise provided for in the Agreement.

Series 10-19: Provisions Related to Term and Termination

10.1 Term:
Services provided by Contractor prior to or after the term of this contract shall be performed at the expense of Contractor and are not compensable under this contract unless both parties hereto agree to such provision in writing. The term of this Agreement may be extended by mutual agreement of the parties; provided, however, that the Agreement is in writing and signed by both parties.

10.2 Extension:
The duration, consideration and other terms and conditions of this Agreement may be extended after the initial term of this Agreement by mutual written consent of the parties.

Extensions may be for a period of up to one year per extension, and for a cumulative total of no longer than four years including the original term.

11.1 Termination for Default:
If the Contractor defaults by failing to perform any of the obligations of the contract or becomes insolvent or is declared bankrupt or commits any act of bankruptcy or insolvency or makes an assignment for the benefit of creditors, the County may, by depositing written notice to the Contractor in the U.S. mail, first class postage prepaid, terminate the contract, and at the County's option, obtain performance of the work elsewhere. Termination shall be effective upon Contractor's receipt of the written notice, or within three (3) days of the mailing of the notice, whichever occurs first. If the contract is terminated for default, the Contractor shall not be entitled to receive any further payments under the contract until all work called for has been fully performed. Any extra cost or damage to the County resulting from such default(s) shall be deducted from any money due or coming due to the Contractor. The Contractor shall bear any extra expenses incurred by the County in completing the work, including all increased costs for completing the work, and all damage sustained, or which may be sustained by the County by reason of such default.

11.2 Termination for Reduction in Funding:
In the event that funding from State, Federal or other sources is withdrawn, reduced, or limited in any way after the effective date of this Agreement, and prior to its normal completion, the County may summarily terminate this Agreement as to the funds withdrawn, reduced, or limited, notwithstanding any other termination provisions of this Agreement. If the level of funding withdrawn, reduced or limited is so great that the County deems that the continuation of the programs covered by this Agreement is no longer in the best interest of the County, the County may summarily terminate this Agreement in whole, notwithstanding any other termination provisions of this Agreement. Termination under this section shall be effective upon receipt of written notice as specified herein, or within three days of the mailing of the notice, whichever occurs first.

11.3 Termination for Public Convenience:
The County may terminate the Agreement in whole or in part whenever the County determines, in its sole discretion, that such termination is in the interests of the County. Whenever the Agreement is terminated in accordance with this paragraph, the Contractor shall be entitled to payment for actual work performed at unit contract prices for completed items of work. An equitable adjustment in the contract price for partially completed items of work will be made, but such adjustment shall not include provision for loss of anticipated profit on deleted or uncompleted work. Termination of this Agreement by the County at any time during the term, whether for default or convenience, shall not constitute breach of contract by the County.

Series 20-29: Provisions Related to Consideration and Payments

20.1 Accounting and Payment for Contractor Services:

Payment to the Contractor for services rendered under this Agreement shall be as set forth in Exhibit "B." Where Exhibit "B" requires payments by the County, payment shall be based upon written claims supported, unless otherwise provided in Exhibit "B," by documentation of units of work actually performed and amounts earned, including, where appropriate, the actual number of days worked each month, total number of hours for the month, and the total dollar payment requested, so as to comply with municipal auditing requirements.

Unless specifically stated in Exhibit "B" or approved in writing in advance by the official executing this Agreement for the County or his designee (hereinafter referred to as the "Administrative Officer") the County will not reimburse the Contractor for any costs or expenses incurred by the Contractor in the performance of this contract. Where required, the County shall, upon receipt of appropriate documentation, compensate the Contractor, no more often than monthly, in accordance with the County's customary procedures, pursuant to the fee schedule set forth in Exhibit "B."

21.1 Taxes:

The Contractor understands and acknowledges that the County will not withhold Federal or State income taxes. Where required by State or Federal law, the Contractor authorizes the County to withhold for any taxes other than income taxes (i.e., Medicare). All compensation received by the Contractor will be reported to the Internal Revenue Service at the end of the calendar year in accordance with the applicable IRS regulations. It is the responsibility of the Contractor to make the necessary estimated tax payments throughout the year, if any, and the Contractor is solely liable for any tax obligation arising from the Contractor's performance of this Agreement. The Contractor hereby agrees to indemnify the County against any demand to pay taxes arising from the Contractor's failure to pay taxes on compensation earned pursuant to this Agreement.

The County will pay sales and use taxes imposed on goods or services acquired hereunder as required by law. The Contractor must pay all other taxes, including, but not limited to, Business and Occupation Tax, taxes based on the Contractor's gross or net income, or personal property to which the County does not hold title. The County is exempt from Federal Excise Tax.

22.1 Withholding Payment:

In the event the County's Administrative Officer determines that the Contractor has failed to perform any obligation under this Agreement within the times set forth in this Agreement, then the County may withhold from amounts otherwise due and payable to Contractor the amount determined by the County as necessary to cure the default, until the Administrative Officer determines that such failure to perform has been cured. Withholding under this clause shall not be deemed a breach entitling Contractor to termination or damages, provided that the County promptly gives notice in writing to the Contractor of the nature of the default or failure to perform, and in no case more than 10 days after it determines to withhold amounts otherwise due. A determination of the Administrative Officer set forth in a notice to the Contractor of the action required and/or the amount required to cure any alleged failure to perform shall be deemed conclusive, except to the extent that the Contractor acts within the times and in strict accord with the provisions of the Disputes clause of this Agreement. The County may act in accordance with any determination of the Administrative Officer which has become conclusive under this clause, without prejudice to any other remedy under the Agreement, to take all or any of the following actions: (1) cure any failure or default, (2) to pay any amount so required to be paid and to charge the same to the account of the Contractor, (3) to set off any amount so paid or incurred from amounts due or to become due the Contractor. In the event the Contractor obtains relief upon a claim under the Disputes clause, no penalty or damages shall accrue to Contractor by reason of good faith withholding by the County under this clause.

23.1 Labor Standards:

The Contractor agrees to comply with all applicable state and federal requirements, including but not limited to those pertaining to payment of wages and working conditions, in accordance with RCW 39.12.040, the Prevailing Wage Act; the Americans with Disabilities Act of 1990; the Davis-Bacon Act; and the Contract Work Hours and Safety Standards Act providing for weekly payment of prevailing wages, minimum overtime pay, and providing that no laborer or mechanic shall be required to work in surroundings or under conditions which are unsanitary, hazardous, or dangerous to health and safety as determined by regulations promulgated by the Federal Secretary of Labor and the State of Washington.

Series 30-39: Provisions Related to Administration of Agreement

30.1 Independent Contractor:

The Contractor's services shall be furnished by the Contractor as an independent contractor, and nothing herein contained shall be construed to create a relationship of employer-employee or master-servant, but all payments made hereunder and all services performed shall be made and performed pursuant to this Agreement by the Contractor as an independent contractor.

The Contractor acknowledges that the entire compensation for this Agreement is specified in Exhibit "B" and the Contractor is not entitled to any benefits including, but not limited to: vacation pay, holiday pay, sick leave pay, medical, dental, or other insurance benefits, or any other rights or privileges afforded to employees of the County. The Contractor represents that he/she/it maintains a separate place of business, serves clients other than the County, will report all income and expense accrued under this contract to the Internal Revenue Service, and has a tax account with the State of Washington Department of Revenue for payment of all sales and use and Business and Occupation taxes collected by the State of Washington.

Contractor will defend, indemnify and hold harmless the County, its officers, agents or employees from any loss or expense, including, but not limited to, settlements, judgments, setoffs, attorneys' fees or costs incurred by reason of claims or demands because of breach of the provisions of this paragraph

30.2 Assignment and Subcontracting:
The performance of all activities contemplated by this agreement shall be accomplished by the Contractor. No portion of this contract may be assigned or subcontracted to any other individual, firm or entity without the express and prior written approval of the County.

30.3 No Guarantee of Employment:
The performance of all or part of this contract by the Contractor shall not operate to vest any employment rights whatsoever and shall not be deemed to guarantee any employment of the Contractor or any employee of the Contractor or any subcontractor or any employee of any subcontractor by the County at the present time or in the future.

31.1 Ownership of Items Produced and Public Records Act:
All writings, programs, data, public records or other materials prepared by the Contractor and/or its consultants or subcontractors, in connection with performance of this Agreement, shall be the sole and absolute property of the County. If the Contractor creates any copyrightable materials or invents any patentable property, the Contractor may copyright or patent the same, but the County retains a royalty-free, nonexclusive and irrevocable license to reproduce, publish, recover, or otherwise use the materials or property and to authorize other governments to use the same for state or local governmental purposes. Contractor further agrees to make research, notes, and other work products produced in the performance of this Agreement available to the County upon request.

Ownership. Any and all data, writings, programs, public records, reports, analyses, documents, photographs, pamphlets, plans, specifications, surveys, films or any other materials created, prepared, produced, constructed, assembled, made, performed or otherwise produced by the Contractor or the Contractor's subcontractors or consultants for delivery to the County under this Contract shall be the sole and absolute property of the County. Such property shall constitute "work made for hire" as defined by the U.S. Copyright Act of 1976, 17 U.S.C. § 101, and the ownership of the copyright and any other intellectual property rights in such property shall vest in the County at the time of its creation. Ownership of the intellectual property includes the right to copyright, patent, and register, and the ability to transfer these rights. Material which the Contractor uses to perform this Contract but is not created, prepared, constructed, assembled, made, performed or otherwise produced for or paid for by the County is owned by the Contractor and is not "work made for hire" within the terms of this Agreement.

Public Records Act. This Contract and all records associated with this Contract shall be available for inspection and copying by the public where required by the Public Records Act, Chapter 42.56 RCW (the "Act"). To the extent that public records then in the custody of the Contractor are needed for the County to respond to a request under the Act, as determined by the County, the Contractor agrees to make them promptly available to the County at no cost to the County. If the Contractor considers any portion of any record provided to the County under this Agreement, whether in electronic or hard copy form, to be protected from disclosure under law, the Contractor shall clearly identify any specific information that it claims to be confidential or proprietary. If the County receives a request under the Act to inspect or copy the information so identified by the Contractor and the County determines that release of the information is required by the Act or otherwise appropriate, the County's sole obligations shall be to notify the Contractor (a) of the request and (b) of the date that such information will be released to the requester unless the Contractor obtains a court order to enjoin that

disclosure pursuant to RCW 42.56.540. If the Contractor fails to timely obtain a court order enjoining disclosure, the County will release the requested information on the date specified.

The County has, and by this section assumes, no obligation on behalf of the Contractor to claim any exemption from disclosure under the Act. The County shall not be liable to the Contractor for releasing records not clearly identified by the Contractor as confidential or proprietary. The County shall not be liable to the Contractor for any records that the County releases in compliance with this section or in compliance with an order of a court of competent jurisdiction.

The Contractor shall be liable to the requester for any and all fees, costs, penalties or damages imposed or alleged as a result of the Contractor's failure to provide adequate or timely records.

This provision and the obligations it establishes shall remain in effect after the expiration of this contract.

31.2 Patent/Copyright Infringement:

Contractor will defend and indemnify the County from any claimed action, cause or demand brought against the County, to the extent such action is based on the claim that information supplied by the Contractor infringes any patent or copyright. The Contractor will pay those costs and damages attributable to any such claims that are finally awarded against the County in any action. Such defense and payments are conditioned upon the following:

A. The Contractor shall be notified promptly in writing by the County of any notice of such claim.

B. Contractor shall have the right, hereunder, at its option and expense, to obtain for the County the right to continue using the information, in the event such claim of infringement, is made, provided no reduction in performance or loss results to the County.

32.1 Confidentiality:

The Contractor, its employees, subcontractors, and their employees shall maintain the confidentiality of all information provided by the County or acquired by the Contractor in performance of this Agreement, except upon the prior written consent of the County or an order entered by a court after having acquired jurisdiction over the County. Contractor shall immediately give to the County notice of any judicial proceeding seeking disclosure of such information. Contractor shall indemnify and hold harmless the County, its officials, agents or employees from all loss or expense, including, but not limited to, settlements, judgments, setoffs, attorneys' fees and costs resulting from Contractor's breach of this provision.

33.1 Right to Review:

This contract is subject to review by any Federal, State or County auditor. The County or its designee shall have the right to review and monitor the financial and service components of this program by whatever means are deemed expedient by the Administrative Officer or by the County Auditor's Office. Such review may occur with or without notice and may include, but is not limited to, on-site inspection by County agents or employees, inspection of all records or other materials which the County deems pertinent to the Agreement and its performance, and any and all communications with or evaluations by service recipients under this Agreement. The Contractor shall preserve and maintain all financial records and records relating to the performance of work under this Agreement for three (3) years after contract termination, and shall make them available for such review, within Whatcom County, State of Washington, upon request. Contractor also agrees to notify the Administrative Officer in advance of any inspections, audits, or program review by any individual, agency, or governmental unit whose purpose is to review the services provided within the terms of this Agreement. If no advance notice is given to the Contractor, then the Contractor agrees to notify the Administrative Officer as soon as it is practical.

34.1 Insurance

The Contractor shall, at its own expense, obtain and continuously maintain the following insurance coverage for the duration of this contract, which shall include insurance against claims for injuries to persons or damage to property which may arise from or in connection with the performance of the work hereunder by the Contractor, its agents, representatives, subcontractors or employees. All insurers providing such insurance shall have an A.M. Best Rating of not less that A- (or otherwise be acceptable to the County) and be licensed to do business in the State of Washington and admitted by the Washington State Insurance Commissioner. Coverage limits shall be the minimum limits identified in this Contract or the coverage limits provided or available under the policies maintained by the Contractor without regard to this Contract, whichever are greater.

1. **Commercial General Liability**

Property Damage	$500,000.00, per occurrence

General Liability & bodily injury	$1,000,000.00, per occurrence
Annual Aggregate	$2,000,000.00

At least as broad as ISO form CG 00 01 or the equivalent, which coverage shall include personal injury, bodily injury and property damage for Premises Operations, Products and Completed Operations, Personal/Advertising Injury, Contractual Liability, Independent Contractor Liability, medical payments and Stop Gap/Employer's Liability. Coverage shall not exclude or contain sub-limits less than the minimum limits required, unless approved in writing by the County.

2. Business Automobile Liability

$1,000,000.00 Minimum, per occurrence
$2,000,000.00 Minimum, Annual Aggregate

Contractor shall provide auto liability coverage for owned, non-owned and hired autos using ISO Business Auto Coverage form CA 00 01 or the exact equivalent with a limit of no less than $1,000,000 per accident. If Contractor owns no vehicles this requirement may be met through a non-owned auto Endorsement to the CGL policy.

3. Additional Insurance Requirements and Provisions

a. All insurance policies shall provide coverage on an occurrence basis.

b. Additional Insureds. Whatcom County, its departments, elected and appointed officials, employees, agents and volunteers shall be included as additional insureds on Contractor's and Contractor's subcontractors' insurance policies by way of endorsement for the full available limits of insurance required in this contract or maintained by the Contractor and subcontractor, whichever is greater.

c. Primary and Non-contributory Insurance. Contractor shall provide primary insurance coverage and the County's insurance shall be non-contributory. Any insurance, self-insured retention, deductible, risk retention or insurance pooling maintained or participated in by the County shall be excess and non- contributory to Contractor's insurance.

d. Waiver of Subrogation. The insurance policy shall provide a waiver of subrogation with respect to each insurance policy maintained under this Contract. When required by an insurer, or if a policy condition does not permit Contractor to enter into a pre-loss agreement to waive subrogation without an endorsement, then Contractor agrees to notify the insurer and obtain such endorsement. This requirement shall not apply to any policy which includes a condition expressly prohibiting waiver of subrogation by the insured or which voids coverage should the Contractor enter into such a waiver of subrogation on a pre-loss basis.

e. Review of and Revision of Policy Provisions. Upon request, the Contractor shall provide a full and complete certified copy of all requested insurance policies to the County. The County reserves the right, but not the obligation, to revise any insurance requirement, including but not limited to limits, coverages and endorsements, or to reject any insurance policies which fail to meet the requirements of this Contract. Additionally, the County reserves the right, but not the obligation, to review and reject any proposed insurer providing coverage based upon the insurer's financial condition or licensing status in Washington.

f. Verification of Coverage/Certificates and Endorsements. The Contractor shall furnish the County with a certificate of insurance and endorsements required by this contract. The certificates and endorsements for each policy shall be signed by a person authorized by the insurer to bind coverage on its behalf. The certificate and endorsements for each insurance policy are to be on forms approved by the County prior to commencement of activities associated with the contract. The certificate and endorsements, and renewals thereof, shall be attached hereto as Exhibit "C". If Exhibit C is not attached, the Contractor must submit the certificate and endorsements required in this contract to the County prior to the commencement of any work on the contracted project. A certificate alone is insufficient proof of the required insurance; endorsements must be included with the certificate. The certificate of insurance must reflect the insurance required in this contract, including appropriate limits, insurance coverage dates, per occurrence, and in the description of operations, include the County project, Whatcom County, its departments, officials, employees, agents and volunteers as additional insureds, primary, non-contributory, and waiver of subrogation.

g. The County must be notified immediately in writing of any cancellation of the policy, exhaustion of aggregate limits, notice of intent not to renew insurance coverage, expiration of policy or change in insurer carrier. Contractor shall always provide the County with a current copy of the certificate and endorsements throughout the duration of the contract.

h. No Limitation on Liability. The insurance maintained under this Contract shall not in any manner limit the liability or qualify the liabilities or obligations of the Contractor to the coverage provided by such insurance, or otherwise limit the County's recourse to any remedy available at law or equity.

i. Payment Conditioned on Insurance and Failure to Maintain Insurance. Compensation and/or payments due to the Contractor under this Contract are expressly conditioned upon the Contractor's compliance with all insurance requirements. Failure on the part of the Contractor to maintain the insurance as required shall constitute a material breach of contract. Payment to the Contractor may be suspended in the event of non-compliance, upon which the County may, after giving five business days' notice to the Contractor to correct the breach, immediately terminate the contract or, at its discretion, procure or renew such insurance and pay any and all premiums in connection therewith, with any sums so expended to be repaid to the County on demand or offset against funds due the Contractor. Upon receipt of evidence of Contractor's compliance, payments not otherwise subject to withholding or set-off will be released to the Contractor.

j. Workers' Compensation. The Contractor shall maintain Workers' Compensation coverage as required under the Washington State Industrial Insurance Act, RCW Title 51, for all Contractors' employees, agents and volunteers eligible for such coverage under the Industrial Insurance Act.

k. Failure of the Contractor to take out and/or maintain required insurance shall not relieve the Contractor or subcontractors from any liability under the contract, nor shall the insurance requirements be construed to conflict with or otherwise limit the obligations concerning indemnification. The County does not waive any insurance requirements even in the event the certificate or endorsements provided by the Contractor were insufficient or inadequate proof of coverage but not objected to by the County. The County's failure to confirm adequate proof of insurance requirements does not constitute a waiver of the Contractor's insurance requirements under this Contract.

l. Availability of Contractor Limits. If the Contractor maintains higher insurance limits than the minimums shown above, the County shall be insured for the full available limits, including Excess or Umbrella liability maintained by the Contractor, irrespective of whether such limits maintained by the Contractor are greater than those required by this contract or whether any certificate furnished to the County evidences limits of liability lower than those maintained by the Contractor.

m. Insurance for Subcontractors. If the Contractor subcontracts (if permitted in the contract) any portion of this Contract, the Contractor shall include all subcontractors as insureds under its policies or shall require separate certificates of insurance and policy endorsements from each subcontractor. Insurance coverages by subcontractors must comply with the insurance requirements of the Contractor in this contract and shall be subject to all of the requirements stated herein, including naming the County as additional insured.

n. The Contractor agrees Contractor's insurance obligation shall survive the completion or termination of this Contract for a minimum period of three years.

34.3 Defense & Indemnity Agreement. To the fullest extent permitted by law, the Contractor agrees to indemnify, defend and hold the County and its departments, elected and appointed officials, employees, agents and volunteers, harmless from and against any and all claims, damages, losses and expenses, including but not limited to court costs, attorney's fees, and alternative dispute resolution costs, for any personal injury, for any bodily injury, sickness, disease, or death and for any damage to or destruction of any property (including the loss of use resulting therefrom) which: 1) are caused in whole

or in part by any error, act or omission, negligent or otherwise, of the Contractor, its employees, agents or volunteers or Contractor's subcontractors and their employees, agents or volunteers; or 2) directly or indirectly arise out of or occur in connection with performance of this Contract or 3) are based upon the Contractor's or its subcontractors' use of, presence upon, or proximity to the property of the County. This indemnification obligation of the Contractor shall not apply in the limited circumstance where the claim, damage, loss, or expense is caused by the sole negligence of the County.

Should a court of competent jurisdiction determine that this contract is subject to RCW 4.24.115, then in the event of concurrent negligence of the Contractor, its subcontractors, employees or agents, and the County, its employees or agents, this indemnification obligation of the Contractor shall be valid and enforceable only to the extent of the negligence of the Contractor, its subcontractors, employees, and agents. This indemnification obligation of the Contractor shall not be limited in any way by the Washington State Industrial Insurance Act, RCW Title 51, or by application of any other workmen's compensation act, disability benefit act or other employee benefit act, and the Contractor hereby expressly waives any immunity afforded by such acts.

It is further provided that no liability shall attach to the County by reason of entering into this contract, except as expressly provided herein. The parties specifically agree that this Contract is for the benefit of the parties only and this Contract shall create no rights in any third party. The County reserves the right, but not the obligation, to participate in the defense of any claim, damages, losses, or expenses, and such participation shall not constitute a waiver of Contractor's indemnity obligations under this Agreement.

In the event the Contractor enters into subcontracts to the extent allowed under this Contract, the Contractor's subcontractors shall indemnify the County on a basis equal to or exceeding Contractor's indemnity obligations to the County. The Contractor shall pay all attorney's fees and expenses incurred by the County in establishing and enforcing the County's rights under this indemnification provision, whether or not suit was instituted.

The Contractor agrees all Contractor's indemnity obligations shall survive the completion, expiration or termination of this Agreement The foregoing indemnification obligations of the Contractor are a material inducement to County to enter into this Agreement and are reflected in the Contractor's compensation.

By signing this contract, the Contractor acknowledges that it has freely negotiated and agreed to the indemnification requirements to defend, indemnify and hold harmless the County from all claims and suits including those brought against the County by the Contractor's own employees, arising from this contract.

35.1 Non-Discrimination in Employment:

The County's policy is to provide equal opportunity in all terms, conditions and privileges of employment for all qualified applicants and employees without regard to race, color, creed, religion, national origin, sex, sexual orientation (including gender identity), age, marital status, disability, or veteran status. The Contractor shall comply with all laws prohibiting discrimination against any employee or applicant for employment on the grounds of race, color, creed, religion, national origin, sex, sexual orientation (including gender identity), age, marital status, disability, political affiliation, or veteran status, except where such constitutes a bona fide occupational qualification.

Furthermore, in those cases in which the Contractor is governed by such laws, the Contractor shall take affirmative action to insure that applicants are employed, and treated during employment, without regard to their race, color, creed, religion, national origin, sex, age, marital status, sexual orientation (including gender identity), disability, or veteran status, except where such constitutes a bona fide occupational qualification. Such action shall include, but not be limited to: advertising, hiring, promotions, layoffs or terminations, rate of pay or other forms of compensation benefits, selection for training including apprenticeship, and participation in recreational and educational activities. In all solicitations or advertisements for employees placed by them or on their behalf, the Contractor shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.

The foregoing provisions shall also be binding upon any subcontractor, provided that the foregoing provision shall not apply to contracts or subcontractors for standard commercial supplies or raw materials, or to sole proprietorships with no employees.

35.2 Non-Discrimination in Client Services:
The Contractor shall not discriminate on the grounds of race, color, creed, religion, national origin, sex, age, marital status, sexual orientation (including gender identity), disability, or veteran status; or deny an individual or business any service or benefits under this Agreement unless otherwise allowed by applicable law; or subject an individual or business to segregation or separate treatment in any manner related to his/her/its receipt any service or services or other benefits provided under this Agreement unless otherwise allowed by applicable law; or deny an individual or business an opportunity to participate in any program provided by this Agreement unless otherwise allowed by applicable law.

36.1 Waiver of Noncompetition:
Contractor irrevocably waives any existing rights which it may have, by contract or otherwise, to require another person or corporation to refrain from submitting a proposal to or performing work or providing supplies to the County, and contractor further promises that it will not in the future, directly or indirectly, induce or solicit any person or corporation to refrain from submitting a bid or proposal to or from performing work or providing supplies to the County.

36.2 Conflict of Interest:
If at any time prior to commencement of, or during the term of this Agreement, Contractor or any of its employees involved in the performance of this Agreement shall have or develop an interest in the subject matter of this Agreement that is potentially in conflict with the County's interest, then Contractor shall immediately notify the County of the same. The notification of the County shall be made with sufficient specificity to enable the County to make an informed judgment as to whether or not the County's interest may be compromised in any manner by the existence of the conflict, actual or potential. Thereafter, the County may require the Contractor to take reasonable steps to remove the conflict of interest. The County may also terminate this contract according to the provisions herein for termination.

37.1 Administration of Contract:
This Agreement shall be subject to all laws, rules, and regulations of the United States of America, the State of Washington, and political subdivisions of the State of Washington. The Contractor also agrees to comply with applicable federal, state, county or municipal standards for licensing, certification and operation of facilities and programs, and accreditation and licensing of individuals.

The County hereby appoints, and the Contractor hereby accepts, the Whatcom County Executive, and his or her designee, as the County's representative, hereinafter referred to as the Administrative Officer, for the purposes of administering the provisions of this Agreement, including the County's right to receive and act on all reports and documents, and any auditing performed by the County related to this Agreement. The Administrative Officer for purposes of this agreement is:

Anna Mostovetsky, Environmental Health Specialist
Joshua Leinbach, Environmental Health Supervisor
Whatcom County Health and Community Services

37.2 Notice:
Any notices or communications required or permitted to be given by this Contract must be (i) given in writing and (ii) personally delivered or mailed, by prepaid, certified mail or overnight courier, or transmitted by electronic mail transmission (including PDF), to the party to whom such notice or communication is directed, to the mailing address or regularly-monitored electronic mail address of such party as follows:

Whatcom County Health and Community Services
Anna Mostovetsky, Environmental Health Specialist
Joshua Leinbach, Environmental Health Supervisor
509 Girard Street
Bellingham, WA 98225
AMostove@co.whatcom.wa.us
JLeinbac@co.whatcom.wa.us

Aquatic Insight
Mark Rosenkranz, Owner and Manager
4207 SE Woodstock Blvd #535
Portland, OR 97206
mark@aquaticinsight.com

Any such notice or communication shall be deemed to have been given on (i) the day such notice or communication is personally delivered, (ii) three (3) days after such notice or communication is mailed by prepaid certified or registered mail, (iii) one (1) working day after such notice or communication is sent by overnight courier, or (iv) the day such notice or communication is sent electronically, provided that the sender has received a confirmation of such electronic transmission. A party may, for purposes of this Agreement, change his, her or its address, email address or the person to whom a notice or other communication is marked to the attention of, by giving notice of such change to the other party pursuant to this Section.

37.3 If agreed by the parties, this Contract may be executed by Email transmission and PDF signature and Email transmission and PDF signature shall constitute an original for all purposes.

38.1 Certification of Public Works Contractor's Status under State Law:
If applicable, Contractor certifies that it has fully met the responsibility criteria required of public works contractors under RCW 39.04.350 (1), which include: (a) having a certificate of registration in compliance with RCW 18.27; (b) having a current state unified business identifier number; (c) if applicable, having industrial insurance coverage for its employees working in Washington as required in Title 51 RCW, an employment security department number as required in Title 50 RCW, and a state excise tax registration number as required in Title 82 RCW; and (d) not being disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065 (3).

38.2 Certification Regarding Federal Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions:
If applicable, the Contractor further certifies, by executing this contract, that neither it nor its principles is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or Agency.

The Contractor also agrees that it shall not knowingly enter into any lower tier covered transactions (a transaction between the Contractor and any other person) with a person who is proposed for debarment, debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, and the Contractor agrees to include this clause titled "Certification Regarding Federal Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction" without modification, in all lower tier covered transactions and in all solicitations for lower tier transactions.

The "Excluded Parties List System in the System for Award Management (SAM) website is available to research this information at WWW.SAM.GOV. Contractor shall immediately notify Whatcom County if, during the term of this Contract, Contractor becomes debarred.

38.3 E-Verify:
The E-Verify contractor program for Whatcom County applies to contracts of $100,000 or more and sub contracts for $25,000 or more if the primary contract is for $100,000 or more. If applicable, Contractor represents and warrants that it will, for at least the duration of this contract, register and participate in the status verification system for all newly hired employees. The term "employee" as used herein means any person that is hired to perform work for Whatcom County. As used herein, "status verification system" means the Illegal Immigration Reform and Immigration Responsibility Act of 1996 that is operated by the United States Department of Homeland Security, also known as the E-Verify Program, or any other successor electronic verification system replacing the E-Verify Program. Contractor/Seller agrees to maintain records of such compliance and, upon request of the County, to provide a copy of each such verification to the County. Contractor/Seller further represents and warrants that any person assigned to perform services hereunder meets the employment eligibility requirements of all immigration laws of the State of Washington. Contractor/Seller understands and agrees that any breach of these warranties may subject Contractor/Seller to the following: (a) termination of this Agreement and ineligibility for any Whatcom County contract for up to three (3) years, with notice of such cancellation/termination being made public. In the event of such termination/cancellation, Contractor/Seller would also be

liable for any additional costs incurred by the County due to contract cancellation or loss of license or permit." Contractor will review and enroll in the E-Verify program through this website: www.uscis.gov

Series 40-49: Provisions Related to Interpretation of Agreement and Resolution of Disputes

40.1 Modifications:
Either party may request changes in the Agreement. Any and all agreed modifications, to be valid and binding upon either party, shall be in writing and signed by both of the parties.

40.2 Contractor Commitments, Warranties and Representations:
Any written commitment received from the Contractor concerning this Agreement shall be binding upon the Contractor, unless otherwise specifically provided herein with reference to this paragraph. Failure of the Contractor to fulfill such a commitment shall render the Contractor liable for damages to the County. A commitment includes, but is not limited to, any representation made prior to execution of this Agreement, whether or not incorporated elsewhere herein by reference, as to performance of services or equipment, prices or options for future acquisition to remain in effect for a fixed period, or warranties.

41.1 Severability:
If any term or condition of this contract or the application thereof to any person(s) or circumstances is held invalid, such invalidity shall not affect other terms, conditions or applications which can be given effect without the invalid term, condition or application. To this end, the terms and conditions of this contract are declared severable.

41.2 Waiver:
Waiver of any breach or condition of this contract shall not be deemed a waiver of any prior or subsequent breach. No term or condition of this contract shall be held to be waived, modified or deleted except by an instrument, in writing, signed by the parties hereto. The failure of the County to insist upon strict performance of any of the covenants and agreements of this Agreement, or to exercise any option herein conferred in any one or more instances, shall not be construed to be a waiver or relinquishment of any such, or any other covenants or agreements, but the same shall be and remain in full force and effect.

42.1 Disputes:

a. General:
Differences between the Contractor and the County, arising under and by virtue of the Contract Documents, shall be brought to the attention of the County at the earliest possible time in order that such matters may be settled or other appropriate action promptly taken. Except for such objections as are made of record in the manner hereinafter specified and within the time limits stated, the records, orders, rulings, instructions, and decisions of the Administrative Officer shall be final and conclusive.

b. Notice of Potential Claims:
The Contractor shall not be entitled to additional compensation which otherwise may be payable, or to extension of time for (1) any act or failure to act by the Administrative Officer or the County, or (2) the happening of any event or occurrence, unless the Contractor has given the County a written Notice of Potential Claim within ten (10) days of the commencement of the act, failure, or event giving rise to the claim, and before final payment by the County. The written Notice of Potential Claim shall set forth the reasons for which the Contractor believes additional compensation or extension of time is due, the nature of the cost involved, and insofar as possible, the amount of the potential claim. Contractor shall keep full and complete daily records of the work performed, labor and material used, and all costs and additional time claimed to be additional.

c. Detailed Claim:
The Contractor shall not be entitled to claim any such additional compensation, or extension of time, unless within thirty (30) days of the accomplishment of the portion of the work from which the claim arose, and before final payment by the County, the Contractor has given the County a detailed written statement of each element of cost or other compensation requested and of all elements of additional time required, and copies of any supporting documents evidencing the amount or the extension of time claimed to be due.

d. Arbitration:

Other than claims for injunctive relief, temporary restraining order, or other provisional remedy to preserve the status quo or prevent irreparable harm, brought by a party hereto (which may be brought either in court or pursuant to this arbitration provision), and consistent with the provisions hereinabove, any claim, dispute or controversy between the parties under, arising out of, or related to this Contract or otherwise, including issues of specific performance, shall be determined by arbitration in Bellingham, Washington, under the applicable American Arbitration Association (AAA) rules in effect on the date hereof, as modified by this Agreement. There shall be one arbitrator selected by the parties within ten (10) days of the arbitration demand, or if not, by the AAA or any other group having similar credentials. Any issue about whether a claim is covered by this Contract shall be determined by the arbitrator. The arbitrator shall apply substantive law and may award injunctive relief, equitable relief (including specific performance), or any other remedy available from a judge but shall not have the power to award punitive damages. Each Party shall pay all their own costs, attorney fees and expenses of arbitration and the parties shall share equally in the Arbitrator's fees and costs. The decision of the arbitrator shall be final and binding and an order confirming the award or judgment upon the award may be entered in any court having jurisdiction. The parties agree that the decision of the arbitrator shall be the sole and exclusive remedy between them regarding any dispute presented or pled before the arbitrator. At the request of either party made not later than forty-five (45) days after the arbitration demand, the parties agree to submit the dispute to nonbinding mediation, which shall not delay the arbitration hearing date; provided, that either party may decline to mediate and proceed with arbitration.

Any arbitration proceeding commenced to enforce or interpret this Contract shall be brought within six years after the initial occurrence giving rise to the claim, dispute, or issue for which arbitration is commenced, regardless of the date of discovery or whether the claim, dispute, or issue was continuing in nature. Claims, disputes, or issues arising more than six years prior to a written request or demand for arbitration issued under this Contract are not subject to arbitration.

e. The parties may agree in writing signed by both parties that a claim or dispute may be brought in Whatcom County Superior Court rather than mediation or arbitration.

Unless otherwise specified herein, this Contract shall be governed by the laws of Whatcom County and the State of Washington.

43.1 Venue and Choice of Law:
In the event that any litigation should arise concerning the construction or interpretation of any of the terms of this Agreement, the venue of such action of litigation shall be in the courts of the State of Washington in and for the County of Whatcom. This Agreement shall be governed by the laws of the State of Washington.

44.1 Survival:
The provisions of paragraphs 11.1, 11.2, 11.3, 21.1, 22.1, 30.1, 31.1, 31.2, 32.1, 33.1, 34.2, 34.3, 36.1, 40.2, 41.2, 42.1, and 43.1, if utilized, shall survive, notwithstanding the termination or invalidity of this Agreement for any reason.

45.1 Entire Agreement:
This written Agreement, comprised of the writings signed or otherwise identified and attached hereto, represents the entire Agreement between the parties and supersedes any prior oral statements, discussions or understandings between the parties.

EXHIBIT "A"
(SCOPE OF WORK)

I. Background and Purpose

This contract provides funding for Wiser Lake data analysis and the development of a Wiser Lake Cyanobacteria Management Plan (LCMP) which will include nutrient and water budgets, remediation and management recommendations. Wiser Lake is a 116-acre lake that regularly experiences Harmful Algae Blooms (HABs). Sampling results over the last two decades have shown consistent presence of HAB toxin concentrations above the Washington State Department of Health (DOH) recreational guidance value.

In 2022, Whatcom County Health and Community Services (WCHCS) was awarded a Freshwater Algae Program Grant from the Washington State Department of Ecology (DOE) to study the sources of nutrient enrichment in the lake, which is a presumed principal driver of HABs. The funding was used to develop a Quality Assurance Project Plan (QAPP) and collect field data from May 2023 through April 2024. Field data collection included water quality sampling, waterfowl surveys, sediment core sampling, and stream flow measurements. Consultant services are needed to analyze the data collected by WCHCS and the final product desired is a LCMP which will guide WCHCS and inform the community in making further decisions regarding water quality improvement in Wiser Lake.

II. Statement of Work

Task 1 – Project Management

The Contractor will ensure that the scope of work is completed on schedule and budget and provide regular communications and progress reports to the County. Any issues that arise which impact the project, or which may affect progress or budget, will be communicated as quickly as possible to minimize the negative impacts and arrive at a collaborative adjustment that supports the project's successful completion.

Activities include:

a. Managing the Contractor's team
b. Managing the project timeline and planning process
c. Monitoring and checking in with the County on progress towards goals and priorities.
d. Providing regular progress reports via phone, email and virtual meetings.
e. Communicating and coordinating with the County's Contract Administrators
f. Reviewing documents, data and comprehensive quality control
g. Providing monthly consolidated invoices to the County. Invoices will include a budget summary with budget per task, budget expended and budget remaining in addition to the requirements described in Exhibits B, B.1 and B.2.

Task 2 – Data Analysis, Water and Nutrient Budget Development

The contractor will review available data, analyze and summarize the data to inform the development of the LCMP management strategies.

Activities include:

a. Utilizing the DOE's LCMP guidance document to develop a draft outline of the LCMP for the County to review.
b. Identifying if there is historical data, reports or studies on Wiser Lake quality and acquire this information, where possible.

c. Conducting a data quality review and validation of the field and laboratory data in accordance with data quality objectives and procedures specified in the QAPP.

d. Identifying any data gaps and methods to fill these gaps.

e. Analyzing and summarizing the hydrology, water quality, nutrient, sediment core, waterfowl, phytoplankton, zooplankton, and aquatic vegetation data into a comprehensive understanding of the lake's current conditions.

f. Developing a water budget based on data collected between May 2023 through April 2024, supported by any data from additional sources, with assumptions supported by literature, if needed.

g. Developing nutrient budgets (phosphorous and nitrogen) using data collected by the County between May 2023 through April 2024. The nutrient budgets will include prioritizing internal and external nutrient loading.

h. Developing a Vollenweider and/or Nurnberg phosphorous model to better understand the Lake's trophic status and inform lake management alternatives. These tools will develop the Contractor's understanding of water quality constituent loading to the Lake from internal and external sources and how the local hydrologic flows through the Lake impact the loading and algal bloom conditions.

i. Developing a presentation of a summary of this task's results to be shared with the County first, via a presentation and virtual meeting.

j. Developing the LCMP chapters focused on data review, analysis, water and nutrient budgets, and a phosphorus model.

Deliverables include:

a. A draft and final outline of the LCMP

b. Draft sections of the LCMP focused on the activities from Task 2

c. Draft presentation to the County on results from Task 2 for feedback and comments before presenting to stakeholders (see Task 4, below). Stakeholders include the local Whatcom County community, the Washington State Department of Ecology and the Washington State Department of Fish and Wildlife.

d. List of data gaps that may arise from analysis

Assumptions include:

a. One round of County-consolidated comments and edits on the draft LCMP outline.

b. One round of County-consolidated comments and edits no the draft sections of the LCMP.

Task 3a – Preliminary Draft LCMP

The Contractor will develop a preliminary draft of the LCMP using the LCMP outline and draft LCMP chapters from Task 2 above for County and stakeholder review and feedback. The Contractor will summarize current data and solicit feedback from lake users that may inform the next step. Information from the broader community may be qualitative as well as quantitative, which both provide valuable insight on past and current lake use and conditions.

Activities include:

a. Developing an LCMP outline including the following (and building off Task 2):

    1. Water quality history;
    2. Current water quality conditions including monitoring results;
    3. Summarizing methods used and results from sampling effort;
    4. Water and nutrient budget results;
    5. Preliminary phosphorous model results and implications;

6. Any gaps in current data;
7. Summarizing restoration options; and
8. Listing options for funding restoration project.

b. Based on past experience and other lake management plans in Washington and Oregon, developing a list of potential lake management strategies.

c. Creating a management strategies matrix to evaluate and rank various strategies, prioritizing them based on a variety of factors such as benefits; funding needs; potential community concerns; implementation details, including timeline to implement; effectiveness; operations and maintenance costs, where appropriate; long-term effectiveness; the potential impacts on wildlife, residents and the watershed; and community feedback.

d. Identifying and prioritizing funding opportunities. This involves conducting a preliminary assessment of funding opportunities to develop a prioritized list of opportunities based on the timeline for submitting proposals, available grant amounts, matching requirements, partner agencies, and more. This task will provide the County with options for pursuing funding without missing any opportunities for deadlines or the need to build relationships with partner agencies.

e. Developing a presentation of the preliminary LCMP results to be shared with the County first via a virtual meeting. Key items include:
    1. Recapping the data and analyses which characterize the current conditions and the future goal for nutrient concentrations to improve water quality.
    2. Discussing a preliminary list of lake management strategies, including the matrix on advantages and disadvantages of each strategy.

f. Developing the primary LCMP for the County.

Deliverables include:

a. A preliminary draft of the LCMP for County review.

b. Draft presentation to the county on results from task 3a for feedback and comments before presenting to stakeholders.

Task 3b – Draft LCMP

Based on the results of Task 3a above, including County feedback and comments on the preliminary draft LCMP and stakeholder feedback in the meetings, the Contractor will develop a more complete draft of the LCMP for the County and public review and comment.

Activities include:

a. Incorporating County and stakeholder feedback into the preliminary draft of the LCMP.

b. Developing a process for adaptive management to ensure continual improvement of lake quality;

c. Assessing whether future work should include any of the following:
    1. Measuring progress (e.g., projects on the ground, load reductions, improvements in the water quality of the lakes); and
    2. Deciding when to shift tactics when desired results are not achieved.

d. Developing an ongoing framework for funding options to ensure long-term sustainability of the lake management plan and its actions.

e. Pursuing funding options. The Contractor will assist the County in starting the process to pursue additional funding for up to two funding opportunities. The focus of this task is to utilize the prioritized list of funding opportunities to assist the County and other stakeholders (if appropriate) in applying for grants, assisting

with inter-agency agreements, coordination, and collaboration. This task is key to building lasting relationships, agreements, and funding resources to the County to support the long-term objective of improving lake water quality. This task will take place simultaneously and in coordination with other tasks to submit an initial round of funding applications and a longer-term plan to keep stakeholders and partner agencies engaged and continued funding resources pursued over the years.

f. Completing the following sections of the LCMP, including feedback from the County and stakeholders:
    1. Management strategies and screening evaluation: Watershed (structural and non-structural); In-Stream; and In-Lake.
    2. Management Plan with recommendations and suggested monitoring
    3. Potential funding sources
    4. Conclusions

g. Submitting the completed draft of the LCMP to the County for review and feedback.

h. Revising the draft LCMP based on County feedback and preparing it for public release.

i. In collaboration with the County, compiling public comments on the draft LCMP and preparing a response to comments (RTC) matrix and editing the LCMP to address comments, where appropriate.

Deliverables include:

a. Completed draft of the LCMP for County review

b. Draft LCMP for public release and comment

c. Draft presentation to the County on results from Task 3b for feedback and comments before presenting to stakeholders.

d. Final LCMP and RTC matrix.

Assumptions include:

a. One round of County-consolidated comments and edits on the complete draft LCMP.

b. One round of County-consolidated comments and edits on the final draft LCMP and RTC matrix.

Task 4 – Outreach Assistance

The Contractor will support the County with outreach to stakeholders and provide technical analysis results and lake management strategies for the community to consider. The Contractor will facilitate at least 3 stakeholder meetings, as follows:

a. Virtually present the results of Task 2 to stakeholders so they understand what the data is informing about the current conditions of the lake. Seek feedback on community concerns and their input on solutions and strategies to improve water quality.

b. Once the preliminary draft LCMP is ready, virtually present to the community, a matrix of lake management strategies as described in Task 3a. The Contractor will solicit feedback on these strategies and any concerns.

c. Once the completed (draft) LCMP is developed, present it to the community in-person, along with a list of prioritized strategies and recommendations, sequencing and costs as described in task 3b. The Contractor will solicit public comment at the meeting and for a set timeframe after the meeting (e.g., 30 days).

Activities include:

a. Developing three sets of slide decks for sharing project results with stakeholders.

b. Developing up to three handouts for each meeting.

c. Conducting virtual meetings with stakeholders about the results of Task 2 and preliminary results of Task 3a.

d. Conducting an in-person meeting to discuss the draft LCMP after Task 3 (a and b) is complete.

Deliverables:

a. Draft and final slide decks and handout materials for the three meetings with stakeholders.

Assumptions:

a. Up to one person from the Contractor's team and on person from the subcontractor's team (Annear Water Resources) will attend the two virtual and one in-person stakeholder meetings.

b. One round of County-consolidated comments and edits on the three stakeholder meeting slide decks.

c. One round of County-consolidated comments and edits on the handout materials for the three stakeholder meetings.

d. The County will be responsible for organizing the stakeholder meetings and communicating these meetings with the public.

III. Estimated Timeline

Task	Task Description	Start Date	End Date
1	Project Management	07/24/2024	02/28/2024
2	Data Analysis, Water and Nutrient Budget Development	07/24/2024	09/16/2023
	Present results of Task 2 to County	09/19/2024	
3a	Preliminary Draft of LCMP	09/01/2024	11/29/2024
	Present results of Task 3b to County	12/05/2024	
3b	Draft LCMP	11/01/2024	01/13/2025
	Present results of Task 3b to County	01/16/2025	
4	Outreach Assistance	07/24/2024	01/13/2025
	Present Task 2 results to stakeholders	01/16/2025	
	Present Task 3a results to stakeholders (Preliminary draft LCMP)	12/11/2024	
	Present Task 3b results to stakeholders (Draft LCMP)	01/22/2025	
	Public Comment Period	01/22/2025	02/20/2025
	Respond to Public Comments	01/22/2025	02/28/2025

IV. Additional Obligations

Funding for this contract is provided by grants from the Washington State Department of Ecology and Department of Health. The State of Washington is named as an express third-party beneficiary to this contract, with full rights as such.

EXHIBIT "B"
(COMPENSATION)

I. **Budget and Source of Funding**: The source of funding for this contract, in an amount not to exceed $62,500, is the Washington State Department of Ecology Grant ($45,833) and the Washington State Department of Health's Foundational Public Health Services Grant ($16,667). The budget for this contract is as follows:

Task	*Cost Description	**Documents Required with Each Invoice	***Budget
1	Project Management	• Hours worked by employee name and title or subcontractor per day and a brief description of the activities performed. Time must be billed by quarter hours. • For Tasks 3a and 3b, County approval of completed drafts	$6,300
2	Data Analysis, Water and Nutrient Budget Development		$18,000
3a	Preliminary Draft LCMP		$10,875
3b	Draft LCMP		$16,635
4	Outreach Assistance		$10,650
		TOTAL	**$62,500**

* Other reasonable expenses incurred in the course of performing the duties herein shall be reimbursed per the rates provided in the Rate Schedule, below. Rates are effective from July 24, 2024 through March 31, 2025 and may not be revised during this period. Total funding may not exceed the amounts indicated in the budget table above.

** Expense reimbursement requests must be accompanied by copies of paid invoices or receipts. For mileage and travel reimbursement, submit the documentation required per Exhibit B.1 (6.c and 6.d).

*** Changes to the line item budget that exceed 10% of the total contract amount, must be pre-approved in writing by the County.

Rate Schedule

AQUATIC INSIGHT, LLC

Description	Rate/hr.
Senior Review, QA/QC, PM, Meetings	$190
Study design, client meetings, technical writing, surface water treatment design and evaluation, technical work	$175
Field work (sample collection, herbicide applications, survey's), background research and data management	$130
Travel	$90
Invoicing	$70

ANNEAR WATER RESOURCES, LLC

Description	Rate/hr.
Senior Review, QA/QC, PM, Meetings, Expert Opinion etc.	$200
Technical Work: data analysis, modeling etc.	$175
Project Management Assistant	$125
Travel	$90
Invoicing	$70

Contractor's Invoicing Contact Information:	
Name	
Phone	
Email	

Refer to Exhibits B.1 and B.2 for invoicing information.

EXHIBIT "B.1" – Invoicing – General Requirements

1. When applicable, the contractor may transfer funds among budget line items in an amount not to exceed 10% of the total budget. Line item changes that exceed 10% must be pre-approved by the County Contract Administrator, prior to invoicing.
2. When applicable, indirect costs and fringe benefit cost rates may not exceed the amount indicated in Exhibit B or the Contractor's federally approved indirect cost rate.
3. The Contractor shall submit invoices indicating the County-assigned contract number to: HL-BusinessOffice@co.whatcom.wa.us, AMostove@co.whatcom.wa.us and JLeinbac@co.whatcom.wa.us
4. The Contractor shall submit itemized invoices on a monthly basis in a format approved by the County and by the 15th of the month, following the month of service, except for January and July where the same is due by the 10th of the month.
5. When applicable, the Contractor will utilize grant funding sources in the order of their expiration date as indicated by the County, prior to spending local funding sources, when no funding restrictions prevent doing so.
6. The contractor shall submit the required invoice documentation identified in Exhibit B.
    a. The County reserves the right to request additional documentation in order to determine eligible costs. Additional documentation must be received within 10 business days of the County's request.
    b. When applicable, if GL reports for personnel reimbursement do not specify position titles, additional documentation must be provided that includes staff name and position title.
    c. When applicable, mileage will be reimbursed at the current GSA rate (www.gsa.gov). Reimbursement requests for mileage must include:
        1. Name of staff member
        2. Date of travel
        3. Starting address (including zip code) and ending address (including zip code)
        4. Number of miles traveled
    d. When applicable, travel and/or training expenses will be reimbursed as follows:
        1. Lodging and meal costs for training are not to exceed the current GSA rate (www.gsa.gov), specific to location.
        2. Ground transportation, coach airfare and ferries will be reimbursed at cost when accompanied by receipts.
        3. Reimbursement requests for allowable travel and/or training must include:
            a. Name of staff member
            b. Dates of travel
            c. Starting point and destination
            d. Brief description of purpose
            e. Receipts for registration fees or other documentation of professional training expenses.
            f. Receipts for meals are not required.
7. Payment by the County will be considered timely if it is made within 30 days of the receipt and acceptance of billing information from the Contractor.
8. The County may withhold payment of an invoice if the Contractor submits it or the required invoice documentation, more than 30 days after the month of services performed and/or the expiration of this contract.
9. Invoices must include the following statement, with an authorized signature and date: **I certify that the materials have been furnished, the services rendered, or the labor performed as described on this invoice.**
10. Duplication of billed costs or payments for service: The Contractor shall not bill the County for services performed or provided under this contract, and the County shall not pay the Contractor, if the Contractor has been or will be paid by any other source, including grants, for those costs used to perform or provide the services in this contract. The Contractor is responsible for any audit exceptions or disallowed amounts paid as a result of this contract.

EXHIBIT "B.2" – Invoice Preparation Checklist for Vendors

The County intends to pay you promptly. Below is a checklist to ensure your payment will be processed quickly. Provide this to the best person in your company for ensuring invoice quality control.

☐ Send the invoices to the correct address:

HL-BusinessOffice@co.whatcom.wa.us, AMostove@co.whatcom.wa.us **and** JLeinbac@co.whatcom.wa.us

☐ Submit invoices monthly, or as otherwise indicated in your contract.

Verify that:

☐ the time period for services performed is clearly stated and within the contract term beginning and end dates. Also verify any other dates identified in the contract, such as annual funding allocations;

☐ invoice items have not been previously billed or paid, given the time period for which services were performed;

☐ enough money remains on the contract and any amendments to pay the invoice;

☐ the invoice is organized by task and budget line item as shown in Exhibit B;

☐ the Overhead or Indirect Rate costs match the most current approved rate sheet;

☐ the direct charges on the invoice are allowable by contract. Eliminate unallowable costs.

☐ personnel named are explicitly allowed for within the contract and the Labor Rates match the most current approved rate sheet;

☐ back-up documentation matches what is required as stated in Exhibit B and B.1;

☐ contract number is referenced on the invoice;

☐ any pre-authorizations or relevant communication with the County Contract Administrator is included; and

☐ Check the math.

Whatcom County will not reimburse for:

- Alcohol or tobacco products;
- Traveling Business or First Class; or
- Indirect expenses exceeding 10% except as approved in an indirect or overhead rate agreement.

EXHIBIT "C"
(INSURANCE)

Wiser Lake Quality Assurance Project Plan

April 2023

WHATCOM COUNTY
HEALTH AND
COMMUNITY
SERVICES

Contact Information

Anna Mostovetsky
Whatcom County Health and Community Services (WCHCS)
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Phone: 360-778-6065

COVER PHOTO: *Algae Bloom at Wiser Lake*. PHOTO BY ANNA MOSTOVETSKY.

Wiser Lake Quality Assurance Project Plan

March 2023

Approved by:

Signature:	Date:
Anna Mostovetsky, Environmental Health Specialist, Whatcom County Health and Community Services	
Signature:	Date:
Tom Kunesh, Environmental Health Specialist, Whatcom County Health and Community Services	
Signature:	Date:
Arati Kaza, Quality Assurance Officer, Department of Ecology	

1.0 Table of Contents

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2.0 Abstract

Wiser Lake is a water body in Whatcom County, Washington. This Quality Assurance Project Plan (QAPP) outlines a strategy to address cyanobacteria blooms within Wiser Lake. The lake routinely develops harmful alge blooms with Anatoxin and Microcystin exceeding their respective Washington State Department of Health (WA DOH) recreational criteria. These toxins can be harmful to human and animal health and limit both residential and recreational use.

An understanding of what causes algal blooms at Wiser Lake is needed. There is little historical data available and no formal studies conducted that have assessed the nutrient sources that feed cyanobacteria blooms. Comprehensive data collection will shed light on the environmental factors governing cyanobacterial proliferation and help identify external and internal nutrient sources. The development of water and nutrient budgets for the lake will inform a future action plan for reducing nutrient levels and reducing the severity and duration of cyanobacterial blooms.

The broader goal of this QAPP is to develop a Lake Cyanobacteria Management Plan (LCMP), which will propose corrective steps that will improve water quality in Wiser Lake. This will include management methods, a lake restoration plan as well as future monitoring and adaptive management.

3.0 Background

3.1 Introduction and problem statement

Wiser lake is located in Whatcom County, 3 miles south of Lynden, Washington. It is a 116 acre, shallow lake with a maximum depth of 10 feet. It is found within the Nooksack River watershed (WRIA 1). The region is located on glacial sediments of the Fraser-Whatcom Lowlands. Much of the region has been developed extensively for farming and includes areas of dense residential development. State Route 539/Guide Meridian runs through the lake, creating two connected basins.

The shallow nature and historical use of the watershed makes Wiser Lake prone to eutrophication and excessive nutrient loads. As a result the lake experiences harmful algae blooms (HABs) during most years. Monitoring detected algae blooms producing Anatoxin or Microcystin levels exceeding DOH recreational toxin guidelines in 2014, 2015, 2016, 2018, 2020, 2021 and 2022 (Figures 2 and 3). Excess levels have been detected as early as June (2021) and as late as November (2021). Community members express concern that these blooms will negatively impact human health and recreational use.

Understanding the nutrient inputs into the lake is critical to managing ongoing HABs at Wiser Lake. This QAPP document is the first step to that broader goal. The process outlined in the QAPP will lead to the development of a Washington State Department of Ecology (WA DOE)-approved LCMP, which will include management strategies for reducing HABs.

3.2 Study area and surroundings

The Wiser Lake watershed, as delineated by USGS StreamStats, is shown in Figure 1. The watershed is approximately 3.32 square miles (2,125 acres). It is approximately 0.86 miles long, with a maximum width of approximately 0.33 miles. The only tributary to Wiser Lake is Cougar Creek. Cougar Creek exits Wiser Lake to the west and flows approximately 3.3 miles until it meets the main stem of the Nooksack River. The water level of the lake is maintained at a 50-foot elevation through the use of a weir located at the west end of the lake. Water level is occasionally influenced by beaver activity as well. The Guide Meridian (Hwy 539) divides Wiser Lake into two basins. The maximum depth of the west basin is 4ft and the maximum depth of the east basin is 10ft.

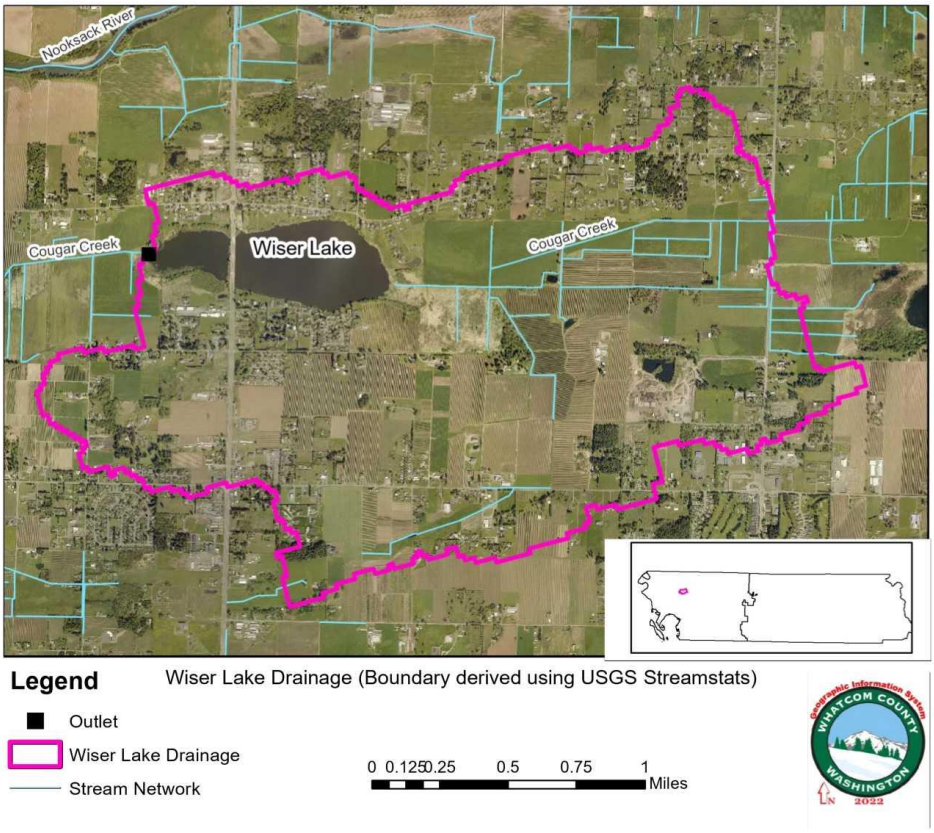


Figure 1: Map of Wiser Lake watershed.

The land immediately adjacent to the shoreline of the lake primarily consists of privately held residential properties, particularly on its north and south shoreline. Much of the land located near the east and west shorelines is zoned agricultural for crops (berries/hay/grains), livestock and grazing. Outside of the immediate land surrounding the lake, land use is mainly agricultural production. Land use within the watershed consists of: agricultural use (68.7%), residential development (20.5%), water (5.4%), forest (3.1%) and wetlands (2.4%) (USGS National Landcover Database, 2019). The combination of agricultural and residential use makes the human footprint surrounding Wiser Lake considerably high.

The soils comprising the watershed consist largely of sandy loam (~61%) and muck (~26%). The rest is a combination of other loams, histosols and water (5.4%) (USDA Web Soil Survey, 2019).

There are 533 onsite sewage systems (OSS) believed to be active in the Wiser Lake Watershed. The majority of these are conventional gravity (90%), followed by pressure distribution (5%). The remaining 5% consist of ATU pressure distribution, glendon biofiler, pressure mound, non-pressurized mound and pump to gravity systems (WCHCS OSS GIS Data, 2022).

3.2.1 History of study area

Historically, the majority of the watershed has been used for agriculture. Development in northern Whatcom County began approximately in the 1880's. Logging opened up land for produce and bulb farms, hops fields, dairy farms and cattle production. New roads, including the Guide Meridian, which divides Wiser Lake into its two basins, was constructed during this time (Oakley, 2005). Currently, agricultural use in the Wiser Lake watershed consists primarily of raspberry fields (42%) and hay/silage (25%) (WSDACropData, 2021).

Recreation is an important use of the lake. The Washington State Department of Fish and Wildlife maintains a public access point with a boat launch on the north shore. Fish species composition is dominated by Brown Bullhead (*Ameiurus nebulosus*), Largemouth Bass (*Micropterus salmoides*), Rainbow Trout (*Oncorhynchus mykiss*) and Pumpkinseed Sunfish (*Lepomis gibbosus*). Other warm water species include resident and migratory waterfowl. A significant number of individuals such as Snow Geese use Wiser Lake as a winter roosting site.

3.2.2 Summary of previous studies and existing data

Whatcom County Health and Community Services has been collecting cyanobacteria samples for Wiser Lake since the early 2000's. This data has been publicly available on the NW Toxic Algae web site (https://www.nwtoxicalgae.org/) since 2014. Sampling was conducted in response to public concerns regarding intermittent algae blooms on the lake. The sampling results show a consistent presense of either Microcystin or Anatoxin-a at concentrations that were above the Washington State Department of Health recreational guidance value (Figures 2 and 3).

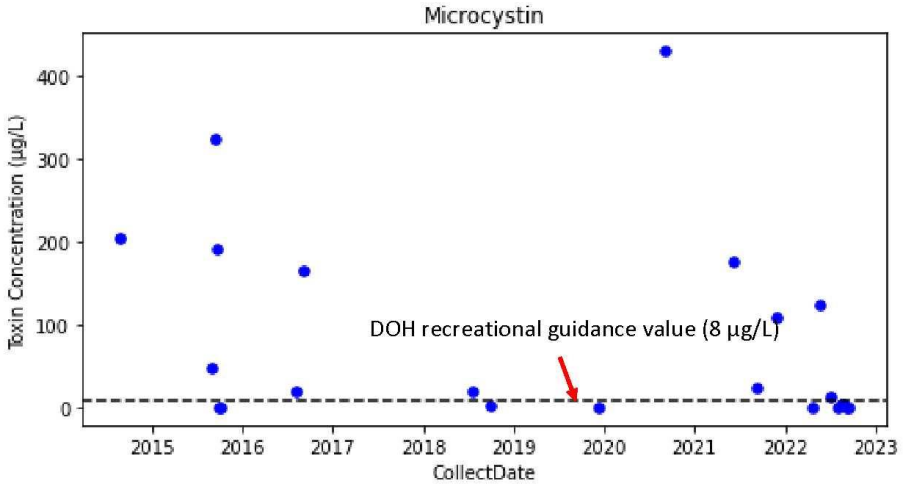


Figure 2: Microcystin samples with levels detected above method detection limit (MDL)

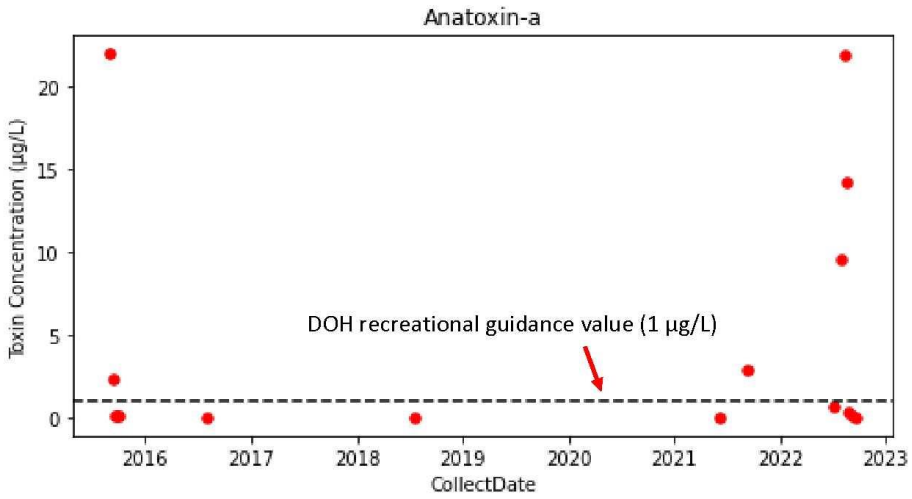


Figure 3: Anatoxin-a samples with levels detected above method detection limit (MDL)

Relevant available data for Wiser Lake is summarized in Table 1.

Table 1: Summary of existing data for Wiser Lake.

Data/Study Type	Years Sampled	Parameters analyzed	Source
Cyanotoxins	2014 - 2016; 2018 - 2022	Microcystin, Anatoxin-a, Saxitoxin, Cylindrospermopsin	NW Toxic Algae
Water Quality (EPA cyanomonitoring project)	2018	microtoxins, chlorophyll, phycocyanin	WWU[1]Institute of Watershed Studies
Water Quality	2006 - 2020	temp, pH, cond, alk, turb, NH3, TN, NO3, TP, SRP	WWU Institute of Watershed Studies
Statewide freshwater macrophyte monitoring	1996, 1997, 2004	aquatic plant distribution index; water transparency	Department of Ecology (EIM[2])
Plant Surveys	2013, 2014, 2018, 2021	Species identification and density	Whatcom County Public Works
Lake Whatcom sediment mercury sources	2002	Cesium-137, lead, lead-210, mercury, solids, total organic carbon	Department of Ecology (EIM)
WA State toxics monitoring	2001	fish age, sex, length, weight, lipids, mercury	Department of Ecology (EIM)
Statewide lake monitoring	1993, 1994, 1997	chl, cond, DO, hardness, pH, Temp, TP, TPN, turb, water transparancy	Department of Ecology (EIM)

[1]Western Washington Universtiy
[2]EIM: Evironmental Information Management database

3.2.3 Parameters of interest and potential sources

This QAPP describes the data collection necessary for the creation of water, phosphorus and nitrogen budgets in Wiser Lake. These budgets will be key to identifying the sources of nutrients that lead to cyanobacterial blooms. A comprehensive overview of field and laboratory activities is described in Section 7. Below is a brief outline of environmental parameters that will be collected in the field:

- Vertical lake profiles in the east and west lake basins
- Stream measurements of temperature (T), specific conductance (SC), dissolved oxygen (DO) and pH.
- Surface water samples in both basins to measure suspended solids; nitrogen and phosphorus compounds; and indicators of algal growth, such as chlorophyll-*a*, cyanotoxins, and phytoplankton and zooplankton communities.
- Sediment core samples that will be analyzed for nutrients, iron, aluminum, calcium, and water content.
- Continuous water level data and manual stream discharge measurements.
- Waterfowl surveys
- Shoreline modification survey

- Existing vegetation survey data from Whatcom County Public Works will be used in the final LCMP analysis.

The sampling plan described in this QAPP is not intended to measure iron, sulfur, or other micronutrients that are important for cyanobacterial and algal growth. Based on extensive algal blooms that have occurred in the lake, this document assumes that macronutrients (i.e., phosphorus and nitrogen) limit cyanobacteria and algae growth, not micronutrients.

Nutrients are suspected to enter the lake primarily via these sources:

1. External loading via Cougar Creek
2. Surface water runoff
3. Groundwater discharge
4. Waterfowl use
5. Internal loading

Groundwater discharge and internal loading will vary spatially.

3.2.4 Regulatory criteria or standards

Wiser Lake's designated uses include agricultural water supply (irrigation); primary contact recreation; wildlife habitat, including indigenous warm water species; boating; and aesthetic values. Algal blooms impair each of these activities. Regulatory criteria (Table 2) apply for conventional pollutants as defined in WAC 173-201A-600 (1)(a)(ii).

Table 2. Wiser Lake Regulatory Criteria

Criterion	Value	Units
Temperature	20[1]	°C
Dissolved Oxygen	6.5[2]	mg/L
pH	6.5 - 8.5[3]	-
Turbidity	10 over background when background <50 20% increase when background >50	NTU

[1]Applies as 7-day average of the daily maximum temperature (7DADMax)

[2]Applies as daily minimum

[3]Human-caused variation must be less than 0.2 units

3.3 Water quality impairment studies

Not applicable. Wiser Lake has not been assessed by the state for water quality impairment.

3.4 Effectiveness monitoring studies

Not applicable.

4.0 Project Description

4.1 Project goals

The goal of this sampling project is to collect data of sufficient quality and quantity to support development of a LCMP for Wiser Lake by following Ecology's Lake Cyanobacteria Management Plan template and guidance. Specifically, the data will be used to:

- Quantify the nutrient loading of different sources into Wiser Lake
- Track changes in the water quality characteristics of Wiser Lake over the course of a year
- Develop hydrologic and nutrient budgets for Wiser Lake

4.2 Project objectives

The project objectives have different components that consist of data collection, nutrient and water budget formulation and planning. These objectives are based on the recommendations outlined in the DOE guidance document *Lake Cyanobacteria Management Plan Template Guide* (Ecology, 2022). Each of these are outlined below.

Data Collection:

- Collect 18 sets of water quality data from Wiser Lake in the east and west lake basins (twice monthly sampling from May – October and monthly from November to April)
- Collect monthly lake profile data for one full year in both basins, with twice monthly measurements during the growing season (approx. May – October)
- Collect at least 18 sets of monthly water quality data from Cougar Creek
- If possible, collect grab samples during periods of storm flows and determine the contribution of nutrients in stormwater
- Collect continuous water level data from the Cougar Creek inlet and outlet
- Take manual flow measurements at various flow levels at the inlet and outlet to establish flow rating curves
- Characterize the labile phosphorus in sediment
- Conduct waterfowl surveys to estimate average monthly waterfowl usage
- Analyze existing vegetation survey data
- Conduct shoreline modification survey using GIS software

Nutrient and Water Budgets:

- Compile field data and evaluate for quality
- Use hydrologic variables to develop a water budget

- Develop nutrient budgets for phosphorous and nitrogen using external and internal nutrient loading data

Planning:

- Develop a list of potential restoration and management actions based on water and nutrient budgets
- Describe future monitoring and potential adaptive management activities
- Describe the funding and human resources required for implementation of the recommended restoration and management actions.

4.3 Information needed and sources

Information and data available from previous studies is summarized in Section 3.2.2 and Table 1. Additional information, such as GIS layers, will be obtained from Whatcom County or other partners.

4.4 Tasks required

This project will be completed in two phases:

Phase 1 will consist of field work to be conducted by WCHCS staff.

- Create a health and safety plan
- Create a sampling schedule
- Gather water sampling and monitoring equipment
- Install stage sensors at the Cougar Creek inlet and outlet locations for continuous stage measurements
- Take manual flow measurements at the Cougar Creek inlet and outlet during different flows to develop hydrologic rating curves (Section 7.2.1)
- Verify surface water sampling locations
- Calibrate instruments
- Collect monthly or bimonthly surface water samples at the deepest parts of the two basins (Section 7.2.3)
- Conduct waterfowl surveys (Section 7.2.4)
- Collect core sediment samples (Section 7.2.7)
- Track storms (Section 7.2.8)
- If conditions allow, collect stormwater samples, spread throughout the rainy season (Section 7.2.8)

Phase 2 will be accomplished with the aid of a consultant or graduate student:

- Analyze results of field work by measuring completed work against Quality Objectives (Section 6)

- Develop and perform QA/QC on hydrologic and nutrient budgets
- Identify management methods for cyanobacteria control and lake restoration planning
- Determine funding strategy and implementation
- Complete LCMP

4.5 Systematic planning process

The preparation of this QAPP is sufficient systematic planning for this project.

5.0 Organization and Schedule

5.1 Key individuals and their responsibilities

Table 3 shows the responsibilities of those who will be involved in this project.

Table 3. Organization of primary project staff and responsibilities.

Staff	Title	Responsibilities
Anna Mostovetsky **Environmental Health Specialist, WCHCC** **Phone: 360-778-6065**	**Project Manager and Principal Investigator**	**Writes the QAPP. Oversees field sampling and transportation of samples to the laboratory. Conducts QA review of data and enters data into EIM.**
Tom Kunesh **Environmental Health Specialist, WCHCC** **Phone: 360-778-6034**	**Supervisor for the Project Manager**	**Provides internal review of the QAPP, approves the budget, and approves the final QAPP.**
Kirsten McDade **Pollution Prevention Specialist, RE Sources** **Phone: 360-220-0556**	**Field Assistant**	**Helps collect samples and records field information.**
Analytical Laboratories (Various – See Table 4)	**-**	**Reviews draft QAPP, coordinates with WCHCS QA Coordinator.**
Lizbeth Seebacher Wetland & Aquatic Ecologist, DOE **Phone: 360-628-7516**	**Project Manager**	**Reviews the draft QAPP and recommends the final QAPP for approval.**
William Hobbs **Environmental Assessment Program, DOE** **Phone: 360-995-3369**	**Reviewer**	**Reviews and approves the draft QAPP and the final QAPP. Assists with sediment core sampling.**

Table 4. List of analytical laboratories

Laboratory	Lab Manager	Phone	Analysis/Sample Type
WWU Institute for Watershed Studies (IWS)	Joan Pickens	360-650-4384	Water samples
King County Environmental Lab	Meghan Elkey	206-477-7154	Cyanotoxins
IEH Analytical Laboratories	Damien Gadomski	206-632-2715	Sediment cores
EcoAnalysts, Inc.	Megan Payne	208-882-2588	Zooplankton
Aquatic Analysts	Jim Sweet	503-869-5032	Phytoplankton

5.2 Special training and certifications

At least one member of the field team for each data collection event will have previous experience with the equipment being used. All field staff/volunteers will read the QAPP and sampling SOP's prior to conducting field activities. A DOE staff member from the Bellingham Field Office will conduct an initial field audit to ensure all field protocols align with standards.

All staff must be familiar with the project's health and safety plan. As water quality and sediment sampling will be conducted by boat, at least one member of each sampling team must have experience operating a boat. All persons on a watercraft must wear a life jacket and possess a sounding device (horn, whistle or bell) in the state of Washington.

Training and assistance with aspects of the field work will be available from state and local agencies denoted in Table 5.

Table 5. List of individuals and agencies that will provide technical assistance on this project

Staff	Title	Agency	Technical Assistance
Gopal Mulukutla	Water and Climate Policy Specialist	WA Department of Health	Stage sensor installation and equipment
Erika Douglas	Senior Water Quality Planner	Whatcom County Public Works	QAPP review; equipment resources
Paul DeBruyn	Wildlife Biologist (retired from WDFW)	Audobon Society	Waterfowl surveys
Jennifer Ayrey	Environmental Health Specialist	WCHCS	Field sampling assistance
Kat deBeauclair	Volunteer	RE Sources	Field sampling assistance
James Kardouni	Natural Resource Scientist	WA DOE (Bellingham Field Office)	Initial field audit

If tenable, volunteer aide will be utilized for rain gauge monitoring. Appropriate training will take place for all volunteers prior to commencing data collection.

5.3 Organization chart

See Tables 3, 4 and 5.

5.4 Proposed project schedule

Table 6 lists key activities, anticipated completion dates, and lead staff for this project. It should be noted that dates are subject to change based on DOE approval, contract approval, weather conditions, and other field conditions that might impact lake accessibility.

Table 6. Schedule for completing field and laboratory work

Work Type	Due date	Lead staff
Field and laboratory work		
Field work	5/2023 – 4/2024	Anna Mostovetsky
Laboratory analyses	4/2024	Analytical Lab(s)
Environmental Information System (EIM) database		
EIM data loaded	5/2024	Anna Mostovetsky
EIM data entry review	6/2024	TBD
EIM complete	7/2024	Anna Mostovetsky
Final Report*		
Draft due to supervisor	8/2024	TBD
Draft due to peer reviewer	9/2024	TBD
Draft due to DOE	10/2024	TBD

*The author of the final report is yet to be determined. It is anticipated that the data analysis and report writing portion of this project will be completed by a consultant or graduate student.

5.5 Budget and funding

The primary funding source for this project is the Department of Ecology Freshwater Algae Control Grant totaling $50,000 USD. The field sampling portion of the QAPP will be done through this grant using the budget from Table 7. Whatcom County Health and Community Services is utilizing additional funding provided by the Washington State Department of Health's Foundational Public Health Services grant totaling $16,667 USD.

Table 7. Project budget and funding

Cost Category	Cost ($)
QAPP Preparation	$5,000
Field and Office Work	$15,000
Equipment	$2,000
Waterfowl surveys	$10,000
Laboratory (See Tables 8 and 9)	$25,974
Data analysis and LCMP development*	$8,693
Total	$66,667

*The data analysis and LCMP development portion of this project will be conducted using left-over funds from this grant cycle. In addition, Whatcom County Health and Community Services plans to apply for subsequent grant funding from WA DOE to cover any additional cost of data analysis and LCMP development.

Table 8. Laboratory budget details for water quality samples

Parameter	# of Samples	# of QA Samples	Total # of Samples	Cost Per Sample ($)	Lab Subtotal ($)
Ammonia	77	8	85	21	1,806
Nitrate + Nitrite	77	8	85	26	2,168
Total N	77	8	85	30	2,529
Total P	77	8	85	30	2,529
SRP	77	8	85	26	2,168
Chlorophyll-*a*	36	4	40	30	1,190
Phycocyanin	34	4	38	30	1,131
IWS Overhead Costs	-	-	-	-	2,153
Phytoplankton Species	16	-	16	160	2,560
Zooplankton Species	16	-	16	295	4,720
Total					$22,623

Table 9. Laboratory budget details for sediment samples

Parameter	Number of Samples*	Number of QA Samples	Total Number of Samples	Cost Per Sample ($)	Lab Subtotal ($)
Phosphorous fractions (all)	12	-	12	200	2,400
Total Solids	12	-	12	20	240
Metals (Fe, Ca, Al)	12	-	12	60	720
Total					$3,360

* One sample consists of a 5cm core section from a 30cm core. Two sediment cores will make for a total of 12 samples.

6.0 Quality Objectives

6.1 Data quality objectives [1]

The main data quality objectives (DQO) for this project are:

- To collect water quality and sediment samples outlined in Section 7, which are representative of Wiser Lake
- To have them analyzed to support development of hydrologic and nutrient budgets.

The analysis will use standard methods to obtain concentration data that meet the measurement quality objectives (MQOs) described below and are comparable to future study results.

6.2 Measurement quality objectives

Measurement quality objectives (MQOs) are to obtain data of sufficient quality to meet the study objectives. MQOs include targets for precision, bias, sensitivity, representativeness, comparability, and completeness.

6.2.1 Targets for precision, bias, and sensitivity

The MQOs for project results, expressed in terms of acceptable precision, bias, and sensitivity, are described in this section and summarized in the tables below.

Table 10: Measurement quality objectives for field measurement equipment

Parameter	Accuracy	Sensitivity
Temperature	± 0.4°C	± 0.2°C
Conductivity	± 2%	± 1 µohm/cm
DO	± 10%	± 0.1 mg/L
pH	± 0.2 S.U.	± 0.1 S.U.

[1] DQO can also refer to ***Decision*** Quality Objectives. The need to identify Decision Quality Objectives during the planning phase of a project is less common. For projects that do lead to important decisions, DQOs are often expressed as tolerable limits on the probability or chance (risk) of the collected data leading to an erroneous decision. And for projects that intend to estimate present or future conditions, DQOs are often expressed in terms of acceptable uncertainty (e.g., width of an uncertainty band or interval) associated with a point estimate at a desired level of statistical confidence.

Table 11. Measurement quality objectives for laboratory analyses of water samples.

Parameter	Lab Duplicate (ug/L)	Field Duplicate (RPD)	High Control Standard (% Recovery)	Spike Blank (% Recovery)	Matrix Spike (% Recovery)	Lowest Concentrations of Interest (Reporting Limit)
Ammonia Nitrogen	37	≤30%	20%	N/A	80-120%	20.0 *µg*-N/L
Chlorophyll-a	1	≤30%	N/A	N/A	N/A	0.1 ug/L
Phycocyanin		≤30%	N/A	N/A	N/A	8.0 ug/L
Nitrate-Nitrite Nitrogen	94	≤30%	7%	N/A	80-120%	20.0 *µg*-N/L
SRP	4	≤30%	5%	N/A	80-120%	5.0 *µg*-P/L
Total Nitrogen	124	≤30%	5%	N/A	80-120%	100.0 *µg*-N/L
Total Phosphorous	15	≤30%	5%	N/A	80-120%	5.0 *µg*-P/L
Cyanotoxin: Microcystin	45%[a]	≤30%	70 - 130%[b]	60 - 140%	50 - 150%	0.15 ug/L
Cyanotoxin: Anatoxin-a	45%[a]	≤30%	75 - 125%[b]	60 - 140%	50 - 150%	0.15 ug/L
Cyanotoxin: Cylindrospermopsin	45%[a]	≤30%	N/A	50 - 150%	50 - 150%	0.025 ug/L
Cyanotoxin: Saxitoxin	45%[a]	≤30%	70 - 130%[b]	60 - 140%	60 - 140%	0.02 ug/L
Phytoplankton Species	N/A	N/A	N/A	N/A	N/A	N/A
Zooplankton Species	N/A	N/A	N/A	N/A	N/A	N/A

[a] Matrix Spike Duplicate used instead of Laboratory Duplicate

[b] Positive Control for ELISA used instead of Laboratory Control Standard

Table 12. Measurement quality objectives for laboratory analyses of sediment samples.

Parameter	Laboratory Duplicate (RPD)	Check Standard (LCS)	Method Blanks	Lowest Concentrations of Interest (Reporting Limit)
Total Phosphorous	±20	±10	<MDL	5 mg/kg
Loosely sorbed (or bound) phosphorous	±20	N/A	N/A	2 mg/kg
Organic Phosphorous	±20	±10	<MDL	2 mg/kg
Fe-P (iron-bound phosphorous)	±20	±10	<MDL	2 mg/kg
Al-P (aluminum-bound phosphorous)	±20	±10	<MDL	2 mg/kg
Ca-P (calcium bound phosphorous)	±20	±10	<MDL	2 mg/kg
Iron	±20	±10	<MDL	2 mg/kg
Aluminum	±20	±10	<MDL	2 mg/kg
Calcium	±20	±10	<MDL	2 mg/kg
% Water	±20	±10	<MDL	1 mg/kg
% Solids	±20	±10	<MDL	1 mg/kg

6.2.1.1 Precision

Precision will be assessed based on the analyses of laboratory and field duplicates. One laboratory duplicate will be assessed for each batch of 20 samples, and one field duplicate will be analyzed at a rate of 1 replicate per 10 samples.

Precision in these samples will be quantified based on their relative percent difference (RPD):

$$RPD = \frac{(X1+X2)}{\left(\frac{X1+X2}{2}\right)} \times 100\%$$

Where: RPD = Relative Percent Difference, %

X1 = Larger of the two values

X2 = Smaller of the two values

Any deviations from standard protocols will be documented.

If either the sample or replicate sample is at or below the reporting limit the MQO cannot be calculated. To calculate the RPD the reported values should be greater than five times the detection limit. RPD values exceeding those identified in Tables 11 and 12 will trigger an

assessment as to whether there are any problems with laboratory methodology, which might warrant remediation.

6.2.1.2 Bias

Bias will be assessed based on analysis of method blanks, laboratory control samples (LCS), and Matrix Spikes. This will be quantified based on percent recovery.

Percent recovery for LCS:

$$Percent\ Recovery\ (\%) = \frac{M}{T} \times 100\%$$

Where: M = Measured value

T = True value of LCS

Percent recovery for MS:

$$Percent\ Recovery\ (\%) = \frac{S - U}{C} \times 100\%$$

Where: S = Measured value of spiked sample

U = Measured value of unspiked sample

C = Concentration of spike added

6.2.1.3 Sensitivity

Sensitivity is a measure of the capability of a method to detect a substance. For the purposes of this QAPP it is described as the Method Detection Limit and Reporting Limit (Tables 11 and 12).

6.2.2 Targets for comparability, representativeness, and completeness

6.2.2.1 Comparability

Comparability will be ensured by following the Standard Operating Procedures (SOPs) specified in Section 8.2 and standard analytical methods specified in Tables 13 and 14. Field staff will be required to review SOPs prior to conducting field sampling to ensure their familiarity with required procedures. Copies of the SOPs will be carried into the field during sampling execution.

6.2.2.2 Representativeness

Representativeness will be ensured by following consistent, documented procedures outlined this QAPP. Measurements will be taken as close as practical to the same locations throughout the project, with sample locations recorded via GPS coordinates. Samples are intended to represent variable flow, seasonality, and weather conditions.

6.2.2.3 Completeness

This study has a goal of 95% completeness as related to collection of specified samples. Safety concerns, access, weather, or other factors may prevent the collection of a full suite of data during a given month. In this case a second attempt will be made to collect the data as near as possible to the date of the original planned sample event.

6.3 Acceptance criteria for quality of existing data

Available data will be assessed based on its data quality level as listed in Ecology's EIM database (Ecology, 2021). Only data with a Level 3 or higher QA Assessment Level designation will be used in the LCMP. Additional data not included in EIM may be used if an associated QAPP is available.

6.4 Model quality objectives

The models created for this project will be simple spreadsheet-based mass balance models. These nutrient and hydrologic budgets will be considered acceptable if calculated inflows and the sum of outflows plus change in storage is within ±20% of each other.

7.0 Study Design

7.1 Study boundaries

The study boundaries for this project consist of the Wiser Lake watershed. This consists of the lake itself (including the east and west basins), the inlet stream (Cougar Creek) and potential stormwater inputs in the vicinity of the lake. Selected sample points, by sample type, are shown in Figure 4 and described in their respective subsections of Section 7.2. Selected sample points are approximate and include two lake sampling points (one for each basin) selected based on lake bathymetry and one creek sampling point on Cougar Creek (inlet). Two points were selected for flow monitoring at the outlet and inlet locations.

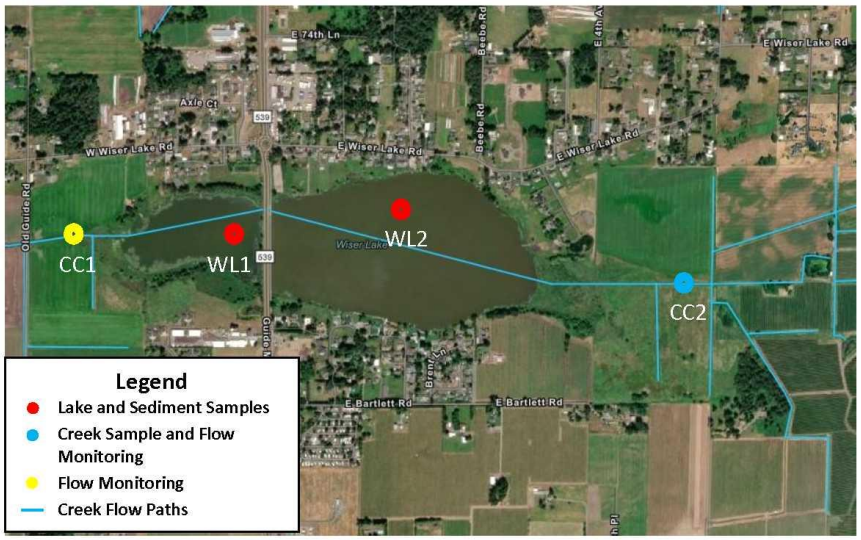


Figure 4. Proposed sampling and flow monitoring locations for Wiser Lake

7.2 Field data collection

7.2.1 Hydrology

7.2.1.1 Flow Monitoring

Flow monitoring will occur for Cougar Creek at the outlet (CC1) and as close as logistically possible to the lake inlet (CC2) (Figure 4). These sites were selected based on physical characteristics and permission to access private property. A stage sensor will be installed at both locations in May 2023 and will collect continuous water level data through April 2024. This data will be downloaded at least monthly. Manual monthly and bi-monthly flow measurements using a current meter will be taken at both locations. A range of flows will be captured to

formulate an accurate rating curve for the inlet and outlet, including high flows during storm events.

7.2.1.2 Meteorological information
Meteorological data will be downloaded from internet archives of measurements at Bellingham International Airport (BLI). Additionally, a rain gauge will be installed near the lake and daily precipitation amounts will be recorded and compared against BLI data. This latter effort is contingent upon the ability to recruit volunteer aide.

7.2.1.3 Groundwater
Groundwater will be calculated as the remaining unknown portion of the water budget.

7.2.2 Evaporation

7.2.2.1 Locations
Lake evaporation will be calculated using local meteorological data, and thus there is no location for a measurement of evaporation.

7.2.2.2 Monitoring Methods

Lake evaporation will be calculated using the U.S. Weather Bureau method presented by Harwell (2012). This requires dewpoint temperature, daily average air temperature, daily average wind speed, and cloud cover from the meteorological data archives.

7.2.3 Surface Water

7.2.3.1 Sampling Locations and Depths

Water quality sampling will occur in the deepest portions of the the two lake basins and Cougar Creek inlet (WL1, WL2, CC2) (Figure 4). The inlet location will be the same location used for flow monitoring.

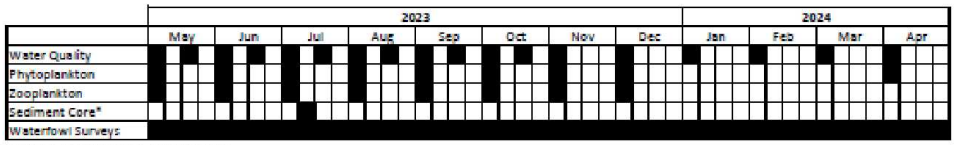
Locations are approximate to allow for minor adjustments based on field conditions when initial sampling occurs. During initial sampling, geographical coordinates will be recorded and future sampling will occur as close as reasonably possible to the established coordinates. If a sampling location must be moved, this will be recorded in field logs and the project team will decide whether the moved location will be maintained into the future or whether future sampling will occur at the original location.

7.2.3.2 Sampling Frequency

Creek and lake water sampling will occur monthly starting in Spring of 2023 and will continue for twelve months. Twice monthly samples will be taken from May to October, when HABs are most common, during the first and third weeks of the month. From November to April, sampling will take place in the first week of the month. The field sampling scheduled is outlined

in Figure 5. Cougar Creek is a perennial stream that flows year-round, therefore stream sampling will occur during all field sampling events. Additional grab sampling may take place during high flow storm events.

Phytoplankton and zooplankton samples will be collected monthly from May through December in both basins. Sampling will be extended into late Fall since elevated Microcystin levels have been observed at Wiser Lake in late November.



* Timing of sampling is tentative

Figure 5. Wiser Lake field sampling schedule

7.2.3.3 Sampling methods: lake samples

Water quality field parameters will be collected continuously by lowering a water quality sonde from the surface to the bottom of the water column while the sonde records measurements at discrete intervals. Readings will be recorded beginning just below the surface, then at one meter intervals down through the entire water column until .5 meters above the substrate. T, SC, pH and DO will be measured (Table 13). Secchi depth will also be measured at every sampling event.

Two lake grab samples will be collected for laboratory analysis at every sampling event in the east basin. They will be taken .5 m below the surface and .5 m from the apparent bottom. During periods of lake stratification (observed as a change of ≥1 °C per meter of depth), an additional sample will be taken from the metalimnion. One sample per sampling event will be sufficient for the west basin since it has a shallow depth of four feet. These samples will be analyzed for: Total P, SRP, Total N, Nitrate + Nitrite, Ammonia, Cholorophyll-*a* and Phycocyanin (Table 13). Due to the shallow nature of the lake, only one Chlorophyll-*a* and Phycocyanin sample from the epilimnion will be necessary in both basins.

Table 13: Field and lab measurement parameters for surface water samples

Parameter	Sample Type		Lab or Field Measurement	Analytical Method
	Lake	Creek		
Temperature	x	x	Field	Multi-parameter sonde
Conductivity	x	x	Field	Multi-parameter sonde
Dissolved Oxygen	x	x	Field	Multi-parameter sonde
pH	x	x	Field	Multi-parameter sonde
Secchi depth	x		Field	Secchi disk
Total Nitrogen	x	x	Lab	APHA (2017) #4500-N C; SOP-IWS-22
Ammonia	x	x	Lab	APHA (2017) #4500-NH3 H; SOP-IWS-19
Nitrate + Nitrite	x	x	Lab	APHA (2017) #4500-NO3 I; SOP-IWS-22
Total Phosphrous	x	x	Lab	APHA (2017) #4500-P J; SOP-IWS-22
Soluble Reactive Phos	x	x	Lab	APHA (2017) #4500-P G; SOP-IWS-22
Chlorophyll-*a*	x		Lab	APHA (2017) #10200 H; SOP-LW-16
Phycocyanin	x		Lab	EPA (2017); Kasinak et al. (2015)
Cyanotoxins	x		Lab	Abraxis; Beacon
Phytoplankton Spp.	x		Lab	APHA, 1992; McNabb, 1960
Zooplankton Spp.	x		Lab	N/A

A 4- to 6-L vertical Kemmerer bottle will be used at depths greater than 0.5 m. Gradations of 0.5 m will be marked on the rope used to suspend the Kemmerer bottle, and this will determine the precision of the depth at which samples are collected. The sampling vessel will be anchored prior to deployment of the Kemmerer bottle. When the Kemmerer bottle has been retrieved, it will be used to fill individual sample bottles. Sample bottles will be handled only with gloved hands, and they will be stored in resealable plastic bags in coolers on ice before and after sampling. Sample bottles will be supplied by the analytical laboratory and thus will not need cleaning by WCHCS; the Kemmerer bottle will be rinsed 3-5 times with distilled water prior to each sampling day.

Cyanotoxin samples will be taken during active algae blooms and sent to the King County Environmental Lab for analysis. These samples will be collected by submerging one sample bottle to within 0.3 m below the water surface, gently scooping up water, and then capping. The sample bottle will be filled with minimal headspace.

Due to the shallow nature of the lake, one phytoplankton sample will be sufficient in each basin. Discrete samples will be collected from multiple depths within the photic zone and composited into one sample.

One vertical zooplankton sample will be collected in each basin. This will be done using an 80 µm Wisconsin net with a collection bucket attached at the cod end. Multiple tows will be required to achieve a cumulative tow length of 5m. In the west basin this will be a minimum of 10 tows and and in the east basin this will be a minimum of 5 tows. The objective is to sample a sufficient volume of water to obtain at least 300 organisms per sample. Once the net is lifted

out of the water it will be rinsed from the outside to free organisms from the side of the net and to concentrate them in the collection bucket. Organisms in the sample will be narcotized with an effervescent sodium bicarbonate tablet (e.g., Alka-Seltzer® tablet). The sample will then be transferred from the collection bucket to a 500 mL sample container and preserved with 95% ethanol.

7.2.3.4 Sampling methods: creek samples

Grab samples will be taken from the center of the stream at wrist depth, as close as possible to the thalweg. These will be analyzed for parameters outlined in Table 13. The following parameters will be collected with a water quality sonde: T, SC, pH and DO. Creek sampling will occur on a dry weather day.

For grab samples, laboratory-provided bottles will be obtained and filled with sample. Samples will be stored on ice in a cooler until delivery to the lab.

7.2.4 Waterfowl

Waterfowl surveys will be conducted weekly from May 2023 through April 2024 (Figure 5). Weekly counts will account for variable waterfowl use, particularly during the Fall/Winter roosting season. The determination for survey timing and frequency is based on feedback from local WDFW waterfowl experts.

Surveys will consist of early morning, land-based counts that will be conducted from multiple visual vantage points on the lake. Surveys will be conducted by a former WDFW Wildlife Biologist, who has previous experience conducting surveys on Wiser Lake and established relationships with landowners for private property access.

The following information will be recorded:

- Date, start and end time
- Weather, including temperature, visibility, approximate cloud cover, approximate wind speed
- Observer name
- Number of waterfowl and species. Identification will be limited to duck, goose and swan.

7.2.5 Aquatic Vegetation Survey

Plant surveys have been conducted on Wiser Lake in 2013, 2014, 2018 and 2021 by the Whatcom County Public Works' Noxious Weed Program. Another survey is scheduled for 2023. The data compiled from these surveys includes speciation of emergent, submersed and shoreline plants, density estimates and invasive/native species designation (Baldwin, 2016). This data is sufficient for LCMP analysis. No additional survey work is necessary.

7.2.6 Shoreline Modification Survey

A shoreline modification survey will be conducted to determine the length or percent of the shoreline that has been modified with bulkheads, fill, or other changes to the natural shoreline. The number of lakeshore residential properties will be noted as part of this analysis. This will be done using GIS Software.

7.2.7 Sediment Sampling

Sediment core samples will be collected from Wiser Lake to characterize P-fractions at incremental depths in each sediment core.

7.2.7.1 Sampling location and frequency

Two sediment cores will be collected at WL01 and WL02 (Figure 4). These are the deepest portions of the two lake basins, which were also identified for surface water sampling. Samples will be collected once during the sampling year, in spring or summer. Sediment sampling will occur such that it does not conflict with surface water sampling.

7.2.7.2 Sample Collection

Sediment samples will be collected using a piston interface corer (Aquatic Research Instruments, 2011). Collection will occur in two locations in order to characterize sediment-bound binding agents for phosphorus. Each core will be at least 30 centimeters deep to ensure that the active zone of the sediment is sampled. All core samples will be kept cool until delivered to the lab. Polycarbonate tubes will be transported from the field in an upright position to the laboratory so that sediment cores remain intact and representative of the sediment matrix.

7.1.7.3 Analysis of Sediment Samples

Sediment samples will be photographed prior to sectioning in 5-cm core sections. Sections will be homogenized. Samples will be analyzed for the parameters summarized in Table 14.

Table 14. Analytical measurement parameters for sediment samples

Parameter	Method
Total Phosphorous	SM4500PF
Loosely sorbed Phosphorous	Rydin & Welch (NH4Cl)
Iron-bound Phosphorous	a) EAP038 (Sectioning sediment cores) b) Rydin & Welch (dithionate) (fractionates Fe-P) c) SM2540B or EPA160.3 (water content in soils) d) EPA 365.1 or SM4500PF (Soil Phosphorus content)

Parameter	Method
Aluminum-bound Phosphorous	a) EAP038 (Sectioning sediment cores) b) Rydin & Welch (NAOH) (fractionates Al-P) c) SM2540B or EPA160.3 (water content in soils) d) EPA 365.1 or SM4500PF (Soil Phosphorus content)
Calcium-bound Phosphorous	a) EAP038 (Sectioning sediment cores) b) Rydin & Welch (HCl) (fractionates Ca-P) c) SM2540B or EPA160.3 (water content in soils) d) EPA365.1 or SM4500PF (Soil Phosphorus content)
Organic Phosphorous	Rydin & Welch (NAOH)
Biogenic Phosphorous	
Total Calcium	EPA 6010
Total Iron	EPA 6010D
Total Aluminum	EPA 6010
% Water	SM2540B or EPA160.3
% Solids	SM2540B or EPA160.3

7.2.8 Overland Flow

No discernible stormwater inputs were identified during initial field reconnaissance. There are no obvious catchbasins, ditches and outflow pipes that connect to Wiser Lake. Additionally, the 2022-2023 rainy season has not been a typical year for rainfall and it has been difficult to determine whether there is active stormwater input.

Stormwater sampling will thus be a phased approach consisting of two phases:

Phase 1: Conduct screening during storm events to identify sampling sites. If sites are identified, the field crew will document the level of rainfall that was needed to see stormwater flow. This will dictate the number of sampling events that take place during the 2023-2024 rainy season.

If sampling is feasable, field parameters will be collected with a water quality sonde and grab samples will be collected for laboratory analysis. All grab samples collected will adhere to Ecology stormwater sampling methods (Ecology, 2015). Grab samples will be analyzed for: Total P, SRP, Total N, Nitrate + Nitrite, Ammonia. The following parameters will be collected with a water quality sonde: T, SC, pH and DO.

Phase 2: If suitable sites are identified for stormwater sampling, develop a stormwater monitoring plan. This will consist of sampling locations, storm criteria and number of sampling events.

7.3 Modeling and analysis design

This section describes the methodology used to develop water and nutrient budgets to address LCMP development.

7.3.1 Hydrologic Budget

The hydrologic budget of Wiser Lake will be defined as described in Equation 1:

$$P + Q_{CC\text{-}I} + Q_{SR} + GW = Q_{CC\text{-}O} + EVAP + \Delta S$$

where:

P	is the volume of precipitation falling directly on the lake
$Q_{CC\text{-}I}$	is inflow via Cougar Creek at the inlet
Q_{SR}	is inflow via surface runoff
GW	is groundwater inflow volume
$Q_{CC\text{-}O}$	is flow at Cougar Creek at the outflow of Wiser Lake
EVAP	is evaporation from the lake surface
ΔS	is the change in lake storage

Of these variables $Q_{CC\text{-}I}$ and $Q_{CC\text{-}O}$ will be directly measured. Q_{SR} and GW will be estimated from drainage area characteristics. P and EVAP will be calculated from meteorological data. GW and S will be unknowns whose values will be checked against estimates from previous studies, and lake level changes, respectively.

7.3.2 Nitrogen Budget

The budgets for total nitrogen in the water column of Wiser Lake will be defined as described in Equation 2:

$$L_{CC\text{-}N} + L_{SR\text{-}N} + GW_N + L_{INT\text{-}W\text{-}N} + L_{ATM\text{-}N} = E_{CC\text{-}N} + \Delta S_N + D$$

where:

$L_{CC\text{-}N}$	is the load of nitrogen entering via Cougar Creek
$L_{SR\text{-}N}$	is the load of nitrogen entering via surface runoff
GW_N	is the load of nitrogen entering via groundwater
$L_{INT\text{-}W\text{-}N}$	is the internal load of nitrogen entering the water column from the sediment bed in Wiser Lake
$L_{ATM\text{-}N}$	is loading via atmospheric deposition
$E_{CC\text{-}N}$	is the export of nitrogen leaving via Cougar Creek
ΔS_N	is the change in nitrogen stored in the lake
D	is the loss of nitrogen to the atmosphere via denitrification

Of these variables, $L_{CC\text{-}N}$ will be calculated from measured flow and measured nitrogen concentrations. $L_{SR\text{-}N}$ will only be incorporated into this equation if stormwater sampling is feasible. $E_{CC\text{-}N}$ will be calculated from measured flows and the nitrogen concentration exiting the lake. $L_{INT\text{-}W\text{-}N}$ will be calculated from measured sediment and sediment flux concentrations. GW_N, $L_{ATM\text{-}N}$, D, and S_N will be unknowns that may be estimated via literature values.

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7.3.2 Phoshorous Budget

The budgets for total phosphorous in the water column of Wiser Lake will be defined as described in Equation 3:

$$L_{CC\text{-}P} + L_{SR\text{-}P} + GW_P + L_{INT\text{-}W\text{-}P} + L_{ATM\text{-}P} = E_{CC\text{-}P} + \Delta S_P + D$$

where:

$L_{CC\text{-}P}$	is the load of phosphorous entering via Cougar Creek
$L_{SR\text{-}P}$	is the load of phosphorous entering via surface runoff
GW_P	is the load of phosphorous entering via groundwater
$L_{INT\text{-}W\text{-}P}$	is the internal load of phosphorous entering the water column from the sediment bed in Wiser Lake
$L_{ATM\text{-}P}$	is loading via atmospheric deposition
$E_{CC\text{-}P}$	is the export of phosphorous leaving via Cougar Creek
ΔS_P	is the change in phosphorous stored in the lake

Of these variables, $L_{CC\text{-}P}$ will be calculated from measured flow and measured phosphorous concentrations. $L_{SR\text{-}P}$ will only be incorporated into this equation if stormwater sampling is feasible. $E_{CC\text{-}P}$ will be calculated from measured flows and the phosphorous concentration exiting the lake. $L_{INT\text{-}W\text{-}P}$ will be calculated from measured sediment and sediment flux concentrations. GW_P, $L_{ATM\text{-}P}$, and S_P will be unknowns that may be estimated via literature values.

7.4 Assumptions of study design

Table 15. Assumptions of underlying study design

Project Component	Assumptions
Hydrology	• Equations presented by Harwell (2012) for the U.S. Weather Bureau method of estimating evaporation render pan evaporation measurements unnecessary. • Private property will continue to be accessible for inlet stream monitoring and water sampling.
Surface Water Sampling	• A set of surface water measurements and samples can be accomplished in 1 workday, allowing preparation and followup activities to occur within one week. • Stratification will be sufficiently stable when it occurs for field measurements to characterize it and anoxic bottom water to be sampled. • Staff will be available to keep to a consistent field sampling schedule and to process samples and organize data in between sampling trips. • Ecology's EIM database will be sufficient for storage of field analytical results and corresponding metadata.
Hydrologic Budget	• Groundwater flows are not significant.
Nutrient Budgets	• Internal loading estimates will be reasonable when based on a limited number of bottom water and sediment samples.

7.5 Possible challenges and contingencies

7.5.1 Logistical problems

Sampling locations have been identified in the field, but will be revisited during trial field sampling runs prior to the collection of data. Logistical and/or health and safety issues encountered during these dry runs will receive careful consideration.

The WDFW boat launch is the only public access point on Wiser Lake. Access to private property will be a continued requirement to conduct monitoring at the inlet location and waterfowl survey work.

Logistical problems for overland flow field reconnaissance could include limited ability to identify stormwater inputs. This will depend on timing of rain, ability to safely reach sampling points during low-light conditions and private property access.

Though stage sensors are intended to be installed on private property, issues of theft or vandalism may arise.

7.5.2 Practical constraints

Most sampling will need to be done by at least two people present for safety reasons. Sampling will require at least 2 days per month for surface water samples, along with an additional half day for equipment preparation and post-sampling equipment maintenance. Back-up staff have been identified to accommodate work absences (e.g., vacation, sick time) so that these events do not lead to missed sampling excursions.

7.5.3 Schedule limitations

Logistical issues may lead to sampling events that are not evenly spaced between months, or even missed sampling events. Sample events are most critical during the likely period of stratification (May through October), so it is essential that the QAPP be reviewed and approved in time for sampling to start, preferably by April 2023, but no later than May 2023, to ensure at least one sampling collection event occurs before the critical time period is reached.

8.0 Field Procedures

8.1 Invasive species evaluation

Equipment will be chosen that can be easily inspected and cleaned. All sampling and weather-related gear will be dedicated for use only in Wiser Lake. Non-felt soles and boot-foot waders will be used during creek sampling, as the spread of New Zealand mud snails and other AIS has been associated with felt-soled wading gear. Since sampling from Wiser Lake will not take place in an area of extreme concern for AIS in Washington, additional decontamination steps for other equipment are not necessary.

It will be important to minimize contact between equipment and potential sources of invasive species, including aquatic plants, sediment, amphibians and fish. Steps to be taken will include:

1) Prioritizesample collection from the least to most impacted areas.
2) Minimize wading and avoid running boats onto sediment.
3) Use a catch pan underneath the sediment coring apparatus when it is retrieved to avoid getting plants, sediment, fish, or other AIS on the boat deck and bilges.
4) Avoid driving and walking through muddy areas with high weed growth.

When boating from site to site (between the two lake basins), field personnel will make sure not to transport water, sediment, organisms, or vegetation on sampling gear and boat props, etc. between basins.

After each day of field work is complete, all equipment will be inspected and cleaned. Visible vertebrates, invertebrates, plants, algae, or sediment on equipment will be removed manually or with a scrub brush. Bilges, samplers, or any other equipment that could hold water from the site will be drained. Areas that are difficult to clean manually will be flushed until the rinse water runs clean.

Smooth surfaced sampling equipment will be fully wiped down until dry. All sampling and field gear will be thoroughly air dried before being used on additional sampling days.

8.2 Measurement and sampling procedures

Prior to sampling, field staff will review relevant SOPs from WA DOE to ensure samples and field measurements are collected properly (Table 16). Staff will also reference the National Lakes Assessment Field Operations Manual for sampling protocols (EPA, 2022).

Table 16. Standard operating procedures

SOP	Title and Link	Pub. #	Date	Activity
EAP070	Minimize the Spread of Invasive Species	18-03-201	3/2018	All field work
EAP057	Conducting Stream Hydrology Site Visits	19-03-209	2/2019	Stream discharge measurements
EAP042	Measuring Gage Height of Streams	18-03-232	2/2018	
EAP056	Measuring and Calculating Stream Discharge	18-03-203	3/2018	
EAP011	Instantaneous Measurements of Temperature in Water	22-03-221	3/2022	Measuring water quality field parameters
EAP011	Collection and Analysis of pH Samples	18-03-240	12/2018	
EAP032	Collection and Analysis of Conductivity Samples	17-03-206	7/2017	
EAP108	Collecting In Situ Water Quality Data	22-03-219	5/2022	
EAP034	Collection, Processing, and Analysis of Stream Samples	17-03-207	7/2017	Water quality sampling
	Collecting Grab Samples from Stormwater Discharges	18-10-023	7/2018	Stormwater sampling
	Calculating Pollutant Loads for Stormwater Discharges	18-10-026	7/2018	

8.3 Containers, preservation methods, holding times

Table 17. Sample containers, preservation, and holding times for water samples.

Parameter	Matrix	Minimum Required	Container: Plastic (P) or Glass (G)	Holding Time	Preservation
Ammonia Nitrogen	Water	250 - 500 mL	P or G	28 days	Filter, cool, 4°C, HCl to pH<2, 28 days
Chlorophyll-a	Water	1 L	Amber P	48 hours	Cool, 4°C, add MgCO3 w/in 6 hours, filter within 48 hrs. Filtered, store dark, -20°C
Phycocyanin	Water	400 mL	500 mL amber polyethylene bottle	60 days after frozen	Cool to 4°C
Nitrate-Nitrite Nitrogen	Water	250 - 500 mL	P or G	28 days	*Filter, freeze, analyze within 60 days
Soluble Reactive Phosphorous	Water	250 - 500 mL	P or G	NA	*Filter, freeze, analyze within 30 days
Total Nitrogen	Water	250 - 500 mL	P or G	28 days	*Freeze, analyze within 28 days, or digest w/in 8 hrs. and hold up to 28 days
Total Phosphorous	Water	250 - 500 mL	P or G	28 days	*Freeze, analyze within 28 days, or digest w/in 8 hrs. and hold up to 28 days
Anatoxin-a; Microcystin; Cylindrospermopsin	Water	250 mL	250 mL WM amber glass	7 days	Freeze at –20°C within 48 hours of collection
Saxitoxin	Water	40 mL	40 mL VOA vial amber glass	7 days	Freeze at –20°C within 48 hours of collection
Phytoplankton	Water	125 mL	Amber PET/HDPE	None	Lugols
Zooplankton	Water	500 mL	PET/HDPE	None	Alka-Seltzer/Ethanol **

* Freezing is in replacement of preservation with H2SO4.
**If preservative can not be acquired, samples will need to be shipped on ice the day of or the next day after collection.

Table 18. Sample containers, preservation, and holding times for sediment samples.

Parameters	Sample Container	Sample Volume	Preservation	Recommended Holding Time	Maximum Holding Time
Total Phosphorus	Polycarbonate, Glass	10 g	Cool, <4° C	28 days	28 days
Loosely Sorbed Phosphorus	Polycarbonate, Glass	10 g	Cool, <4° C	28 days	No regulation
Fe-P (iron-bound phosphorus)	Polycarbonate, Glass	10 g	Cool, <4° C	28 days	No regulation
Organic Phosphorous	Polycarbonate, Glass	10 g	Cool, <4° C	28 days	No regulation
Al-P (Aluminum-bound phosphorus)	Polycarbonate, Glass	10 g	Cool, <4° C	28 days	No regulation
Ca-P (Calcium bound phosphorus)	Polycarbonate, Glass	10 g	Cool, <4° C	28 days	No regulation
Biogenic Phosphorous	Polycarbonate, Glass	10 g	Cool, <4° C	28 days	No regulation
Iron	Polycarbonate, Glass	10 g	Cool, <4° C	28 days	6 months
Aluminum	Polycarbonate, Glass	10 g	Cool, <4° C	28 days	6 months
Calcium	Polycarbonate, Glass	10 g	Cool, <4° C	28 days	6 months
% Water	Polycarbonate, Glass	10 g	Cool, <4° C	6 months	6 months
% Solids	Polycarbonate, Glass	10 g	Cool, <4° C	6 months	6 months

8.4 Equipment decontamination

Field staff may encounter cyanotoxins while sampling. No other exposure of equipment to toxic chemicals is anticipated. Decontamination of equipment will consist of thorough rinsing with native water at sampling locations and then with distilled water at the end of each sampling day. Zooplankton nets will be soaked in a 1% bleach solution and air-dried after each use. Since sampling will be limited to Wiser Lake only, it will not be necessary to decontaminate nets between sampling the two basins.

8.5 Sample ID

A self-adhesive, non-removable label will be affixed to each sample container. Sample information will be written with an indelible marker prior to sample collection. Sample labels will contain the following:

- Site name
- Project number
- A unique sample identification number (see below for correct sample designation nomenclature for quality control samples)
- Initials of sample collector(s)
- Time and date collected
- Analysis required
- Sample preservative (if applicable)

Locations where field quality control (QC) samples are collected will be documented in field records. The following standard abbreviations will be used:

- d.1 – start of the sample depth interval in feet to closest tenth of a foot
- d.2 – end of sample depth interval in feet to closest tenth of a foot
- yymmdd – date of sample collection
- field duplicate samples will use "FD" followed by sequential numbering (i.e., FD1, FD2, etc.) so that the laboratory cannot identify where the sample came from. Field notes will record what sample is represented by each field duplicate.
- Equipment blank sample IDs will use QCEB-#

8.6 Chain of custody

Chain-of-custody forms will be used to trace the possession and handling of samples, from the time of their collection, through analysis, until their final disposition. These forms will document the names of the relinquishing and receiving parties and the time and date of the transfer of custody. Field personnel will complete the following information on each chain of custody form:

- Project number
- Project name
- Project location
- Sample identification number
- Date and time of sample collection

- Sample matrix
- Sample preservative
- Analyses requested
- Sampler's signature
- Signature of person relinquishing sample custody to the laboratory courier or FedEx
- Date and time relinquished
- Sampler remarks

One chain-of-custody form will accompany each set of coolers sent to the laboratory. The chain of custody form will be placed in a sealed plastic bag inside the cooler. A custody seal will be placed on each cooler after packing and prior to shipment. For multiple cooler shipments, the cooler number designation (e.g., cooler 1 of 2, cooler 2 of 2) will be written on the custody seal. Shipping of samples to the laboratory will be accomplished by FedEx or equivalent overnight service. Samples will remain in the custody of the sampling team until custody is relinquished to FedEx or a laboratory courier. Each sample shipment will be tracked via the FedEx tracking number to ensure that prompt delivery of the shipment to the laboratory has occurred. A copy of the chain-of-custody form will then be transmitted to the project manager and uploaded to the project file folder.

8.7 Field log requirements

A bound, waterproof notebook with pre-numbered pages will be used to document field activities. A permanent, waterproof marker will be used for all entries. Any corrections will be made with single line strikethroughs, initialed and dated. Documented field procedures should be detailed enough to allow the data user to easily understand the procedures.

All field log entries will include the following:

- Name and location of project
- Field personnel
- Sequence of events
- Any changes or deviations from the QAPP or SOPs
- Environmental conditions
- Date, time, location, ID, and description of each sample
- Field instrument calibration procedures
- Field measurement results
- Identity of QC samples collected
- Unusual circumstances that might affect interpretation of results

8.8 Other activities

The laboratory will be alerted at least three business days in advance of anticipated lake, surface water, and sediment sampling, so that they are prepared to receive samples. The lab may not be alerted in advance of stormwater sampling due to the uncertain timing inherent to stormwater sampling.

A tailgate safety meeting will occur at the beginning of each field workday. Safety meetings will include a brief review of the health and safety plan, a more detailed discussion of activities being performed for the first time or changes to previously executed activities, and any special considerations, such as expected weather.

Field equipment will be maintained and kept in good working order. This includes proper storage, cleaning and completing maintenance that follows manufacturer recommendations.

9.0 Laboratory Procedures

9.1 Lab procedures table

Samples will be sent to an Ecology-accredited analytical laboratory for analyses of water quality parameters and sediment parameters when feasible. Containers will be provided by analytical laboratories with preservative already in them, so field sampling personnel will not be responsible for adding preservative.

Analytical methods for sediment samples have been summarized in Tables 14. Analytical methods for water samples are outlined in Table 19.

Table 19. Analytical methods for water quality samples.

Analyte	Sample Matrix	# of Samples	Method Detection Limit	Reporting Limit	Analytical Method
Ammonia Nitrogen	Water	80	10.0 µg-N/L	10.0 µg-N/L	APHA (2017) #4500-NH3 H; SOP-IWS-19
Chlorophyll-a	Water	40	0.1 ug/L	0.1 ug/L	APHA (2017) #10200 H; SOP-LW-16
Phycocyanin	Water	40	8 ug/L	20 ug/L	EPA (2017); Kasinak et al. (2015)
Nitrate-Nitrite Nitrogen	Water	80	20.0 µg-N/L	20.0 µg-N/L	APHA (2017) #4500-NO3 I; SOP-IWS-22
Soluble Reactive Phosphorous	Water	80	5.0 µg-P/L	5.0 µg-P/L	APHA (2017) #4500-P G; SOP-IWS-22
Total Nitrogen	Water	80	100.0 µg-N/L	100.0 µg-N/L	APHA (2017) #4500-N C; SOP-IWS-22
Total Phosphorous	Water	80	5.0 µg-P/L	5.0 µg-P/L	APHA (2017) #4500-P J; SOP-IWS-22
Microcystin; Anatoxin-a	Water	TBD	0.15 ug/L	0.15 ug/L	Abraxis
Saxitoxin	Water	TBD	0.02 ug/L	0.02 ug/L	Abraxis
Cylindrospermopsin	Water	TBD	0.025 ug/L	0.025 ug/L	Beacon
Phytoplankton Species	Water	18	NA	NA	APHA Standard Methods, 1992; McNabb, 1960
Zooplankton Species	Water	14	NA	NA	See Section 9.2

9.2 Sample preparation method(s)

Preparatory methods for water and sediment samples are a part of the analytical method summarized in Tables 14 and 19. Sample preparation methods for zooplankton are outlined below:

Preparation methods for Zooplankton ID:

After recording the original sample volume, a 1 mL Hensen-Stempel pipette is inserted into the sample and is used to homogenize the sample, mixing it in a random fashion (not swirling). The sub-sample is captured during the mixing process to avoid bias due to sinking of heavier planktonic organisms.

The subsample taken from the homogenized sample is rinsed into a watch glass with 70% ethanol. Based on the organism density of the first 1 mL of the subsample, more 1-mL aliquots are added until the client/protocol-specific target count is present in the watch glass. If the target count is exceeded in one mL of sample, a secondary dilution is made by transferring aliquots from the sample into a second graduated container and diluting this subsample. After recording the volume of the secondary dilution, aliquots are then taken from this secondary dilution for analysis. Identifications are taken to the lowest practical level (Genus and species for Cladocera, Cyclopoida, Calanoida, Anostraca, and Rotifera, family level for Diptera, Hydracarina, and order level for Harpacticoida).

The entire contents of the watch glass are counted to allow proper abundance calculations. After identification, enumeration, and measurements, the final volume of the sample (and the secondary dilution, if used) is recorded to calculate the total volume analyzed.

After initial analyses are complete, 10% of the samples will be randomly selected for re-identification. The final data will be adjusted according to the recommendations of both taxonomists. A reference collection will be compiled. Taxonomic references used for the taxonomic analysis of samples will be provided.

9.3 Special method requirements

There are no special method requirements.

9.4 Laboratories accredited for methods

Samples collected will be analyzed by Ecology-accredited analytical laboratories when possible. These laboratories are listed in Table 4.

10.0 Quality Control Procedures

Field quality control (QC) will be accomplished through calibration and validation of equipment, as well as the measurement of field duplicates. Laboratory QC will be assessed through the internal laboratory QC performed, including method blanks, laboratory control sample (LCS) recoveries, surrogate recoveries, laboratory duplicates, and matrix spike/matrix spike duplicate recoveries as applicable to the analytical method.

10.1 Field quality control

QC samples will be obtained in the field and analyzed in the lab to allow for assessment of MQOs. The selected analytical laboratory will use its standard, established procedures and the requirements of each method to analyze a sufficient number of blanks, spikes, and surrogates. For field samples, duplicates will be obtained at a minimum rate of 1 in every 10 sample sets for each type of matrix.

10.2 Corrective action processes

Field activities will be reviewed following each sampling event, including calibration frequency, decontamination method, and sample collection locations. If activities are found to be inconsistent with this QAPP, or if some other unforeseen problem arises, the following actions may be taken:

- Collecting new samples using the methods described in this QAPP.
- Reanalyzing lab samples that do not meet QC criteria.

11.0 Data Management Procedures

11.1 Data recording and reporting requirements

Final laboratory data and electronic data deliverables (EDDs) will be stored on Whatcom County Health Community Services' server in the, "Data," folder within the project folder (Wiser Lake study). Field data will be carefully recorded using field template forms or well-kept notes, which will be uploaded to the same folder the first business day after work is completed. For work completed by external staff/volunteers, they will email the project manager all field data and notes within three business days of returning from the field. The project manager will then save this data to the same folder.

Hand-recorded data will be manually digitized as necessary, with all digitized data undergoing peer review for accuracy.

11.2 Laboratory data package requirements

Water and Sediment Samples: The laboratory will be required to submit results that are supported by sufficient backup data and quality assurance results to enable reviewers to determine conclusively the quality of the data. Data reports include results of blanks, check standards, analytical duplicates and matrix spike results. All quality control data are from the analytical run and samples for this project.

Zooplankton: Data is to be delivered in an excel spreadsheet containing sample IDs, taxa, abundance, and phylogeny.

Phytoplankton: Deliverables include individual sample reports, data summaries, and database files. Individual sample reports include sample identification, a trophic state index, total sample density, total sample biovolume, and a list of algae species with their absolute and relative densities and biovolumes. All data are reported in Excel format.

11.3 Electronic transfer requirements

All laboratory results, including QC sample results, will also be provided as an EDD in excel format.

11.4 Data upload procedures

Compiled data will be input into Ecology's Environmental Information Management (EIM) data system following completion of the Lake Cyanobacterial Management Plan. A project named, "Wiser Lake 2024," or similar, will be created in EIM to hold the data. Inputs will be peer reviewed and corrected if necessary.

11.5 Model information management

Not applicable.

12.0 Audits and Reports

12.1 Audits

When feasible, this work will use WA DOE-accredited laboratories, which undergo audits from Ecology's Laboratory Accreditation Unit (LAU) every 3 years. If an Ecology-certified laboratory that accepts outside samples is not available for a specific parameter, or if DOE- certified laboratories have prohibitive turnaround times or costs, laboratories with other certifications will be considered. In these cases, associated certification information will be documented in the LCMP.

A field audit will take place at the start of the sampling season in Spring of 2023 to ensure field methods are consistent with standards. This will be done by a DOE staff member based out of the Bellingham field office.

12.2 Responsible personnel

Ecology's LAU is responsible for auditing analytical laboratories. Laboratory audits include an examination of documents and procedures, examination of equipment, review of quality assurance procedures, and discussion with laboratory staff.

See Section 12.1 for field audit information.

12.3 Frequency and distribution of reports

The data collected as part of QAPP execution will result in a LCMP report. The final report will be conveyed to Ecology via email, and will follow Ecology's Freshwater Algae Control Program Lake Cyanobacteria Management Plan template (Ecology, 2022).

12.4 Responsibility for reports

The author(s) of the final report are yet to be determined. WCHCS will seek out either consulting services or a graduate student to complete the LCMP.

13.0 Data Verification

13.1 Field data verification, requirements, and responsibilities

Replicate field measurements will be collected at a rate of 1 in 10 sampling events.

13.2 Laboratory data verification

The Ecology-certified analytical laboratory will perform internal data verification before releasing data to the project manager. The lab will report to the project manager if holding times are exceeded or if preservation temperatures exceed method requirements. In these cases, the project manager will decide whether samples should be analyzed. If the samples are analyzed, a data flag will be applied.

13.3 Validation requirements, if necessary

Not applicable.

13.4 Model quality assessment

The models created for this project will be simple spreadsheet-based mass balance models. If the budget is accounted for within the range specified by the Model Quality Objectives (Section 6.4), the model will be considered of sufficient quality. If the difference does not meet the objectives, data may be reexamined, or additional data may need to be collected.

14.0 Data Quality (Usability) Assessment

14.1 Process for determining project objectives were met

Usability determination will entail evaluation of field and laboratory results and relative standard deviation between field replicates. Adherence to established protocols should eliminate most sources of bias. Field replicates should indicate overall variability (environmental, sampling, and laboratory). The Project Manager will verify that all measurement and data quality objectives have been met for each sampling event. If the objectives have not been met then consideration will be taken to qualify the data, how to use it in analysis, or whether it should be rejected. Decisions for data quality and usability will be documented.

14.2 Treatment of non-detects

The treatment of non-detect data will vary based on frequency of occurrence:

- If all samples for a parameter are non-detect, that parameter will be assumed to be absent at the sample location.
- If less than ten percent of samples for a given parameter at a given location are non-detect, if data is not determined to be critical to understanding lake chemistry, or if the data set is too small to implement regression on order statics (ROS), statistical analyses will use half of the detection limit in place of results.
- If greater than ten percent of samples for a given parameter at a given location are nondetect, or if the parameter in question is of critical importance for lake management, ROS statistics will be used to fill in non-detect values where possible.

14.3 Data analysis and presentation methods

Data analysis will result in the creation of quantitative nutrient and water budgets for Wiser Lake. The equations presented in Section 7.3 will be used to achieve this. The results will be summarized in a narrative form in the LCMP.

14.4 Sampling design evaluation

This sampling plan is expected to yield enough statistical power to develop a useful spreadsheet-based model of lake nutrients.

14.5 Documentation of assessment

The final report will include a detailed summary of the data quality assessment along with the full analysis and findings of the surveys.

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16.0 Appendices

Appendix A. Glossaries, Acronyms, and Abbreviations

Glossary of General Terms

Conductivity: A measure of water's ability to conduct an electrical current. Conductivity is related to the concentration and charge of dissolved ions in water.

Designated uses: Those uses specified in Chapter 173-201A WAC (Water Quality Standards for Surface Waters of the State of Washington https://app.leg.wa.gov/WAC/default.aspx?cite=173-201A&full=true) for each water body or segment, regardless of whether or not the uses are currently attained.

Dissolved oxygen (DO): A measure of the amount of oxygen dissolved in water.

Eutrophic: Nutrient rich and high in productivity resulting from human activities such as fertilizer runoff and leaky septic systems.

Nutrient: Substance such as carbon, nitrogen, and phosphorus used by organisms to live and grow. Too many nutrients in the water can promote algal blooms and rob the water of oxygen vital to aquatic organisms.

pH: A measure of the acidity or alkalinity of water. A low pH value (0 to 7) indicates that an acidic condition is present, while a high pH (7 to 14) indicates a basic or alkaline condition. A pH of 7 is considered to be neutral. Since the pH scale is logarithmic, a water sample with a pH of 8 is ten times more basic than one with a pH of 7.

Primary contact recreation: Activities where a person would have direct contact with water to the point of complete submergence including, but not limited to, skin diving, swimming, and water skiing.

Sediment: Soil and organic matter that is covered with water (for example, river or lake bottom).

Stormwater: The portion of precipitation that does not naturally percolate into the ground or evaporate but instead runs off roads, pavement, and roofs during rainfall or snow melt. Stormwater can also come from hard or saturated grass surfaces such as lawns, pastures, playfields, and from gravel roads and parking lots.

Streamflow: Discharge of water in a surface stream (river or creek).

Thalweg: The deepest and fastest moving portion of a stream.

Watershed: A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

Acronyms and Abbreviations

AIS	Aquatic invasive species
Al-P	Aluminum-bound phosphorous
Ca-P	Calcium-bound phosphrous
DO	Dissolved oxygen
e.g.	For example
DOE	Washington State Department of Ecology
EIM	Environmental Information Management database
EPA	U.S. Environmental Protection Agency
Fe-P	Iron-bound phosphorous
HAB	Harmful algal bloom
et al.	And others
GIS	Geographic Information System software
GPS	Global Positioning System
i.e.	In other words
IWS	Institute of Watershed Studies (Western Washington University)
LCMP	Lake Cyanobacteria Management Plan
MQO	Measurement quality objective
NLCS	National Landcover Database
OSS	Onsite Sewage System
QA	Quality assurance
QC	Quality control
RPD	Relative percent difference
RSD	Relative standard deviation
SC	Specific conductance
SOP	Standard operating procedures
SRP	Soluble reactive phosphorous
T	Temperature
TN	Total nitrogen
TP	Total phosphorous
USDA	United States Department of Agriculture

USFS	United States Forest Service
USGS	United States Geological Survey
WAC	Washington Administrative Code
WCHCS	Whatcom County Health and Community Services
WDFW	Washington Department of Fish and Wildlife
WQA	Water Quality Assessment
WRIA	Water Resource Inventory Area
WWU	Western Washington University

Units of Measurement

°C	degrees centigrade
cfs	cubic feet per second
cfu	colony forming units
cms	cubic meters per second, a unit of flow
dw	dry weight
ft	feet
g	gram, a unit of mass
kg	kilograms, a unit of mass equal to 1,000 grams
km	kilometer, a unit of length equal to 1,000 meters
L/s	liters per second (0.03531 cubic foot per second)
m	meter
mm	millimeter
mg	milligram
mgd	million gallons per day
mg/d	milligrams per day
mg/kg	milligrams per kilogram (parts per million)
mg/L	milligrams per liter (parts per million)
mg/L/hr	milligrams per liter per hour
mL	milliliter
ng/g	nanograms per gram (parts per billion)
ng/kg	nanograms per kilogram (parts per trillion)
ng/L	nanograms per liter (parts per trillion)

NTU	nephelometric turbidity units
pg/g	picograms per gram (parts per trillion)
pg/L	picograms per liter (parts per quadrillion)
psu	practical salinity units
s.u.	standard units
µg/g	micrograms per gram (parts per million)
µg/kg	micrograms per kilogram (parts per billion)
µg/L	micrograms per liter (parts per billion)
µm	micrometer
ww	wet weight

Quality Assurance Glossary

Accreditation: A certification process for laboratories, designed to evaluate and document a lab's ability to perform analytical methods and produce acceptable data (Kammin, 2010). For Ecology, it is defined according to WAC 173-50-040: "Formal recognition by [Ecology] that an environmental laboratory is capable of producing accurate and defensible analytical data."

Accuracy: The degree to which a measured value agrees with the true value of the measured property. USEPA recommends that this term not be used, and that the terms *precision* and *bias* be used to convey the information associated with the term *accuracy* (USEPA, 2014).

Analyte: An element, ion, compound, or chemical moiety (pH, alkalinity) which is to be determined. The definition can be expanded to include organisms, e.g., fecal coliform, Klebsiella (Kammin, 2010).

Bias: Discrepancy between the expected value of an estimator and the population parameter being estimated (Gilbert, 1987; USEPA, 2014).

Blank: A synthetic sample, free of the analyte(s) of interest. For example, in water analysis, pure water is used for the blank. In chemical analysis, a blank is used to estimate the analytical response to all factors other than the analyte in the sample. In general, blanks are used to assess possible contamination or inadvertent introduction of analyte during various stages of the sampling and analytical process (USGS, 1998).

Calibration: The process of establishing the relationship between the response of a measurement system and the concentration of the parameter being measured (Ecology, 2004).

Check standard: A substance or reference material obtained from a source independent from the source of the calibration standard; used to assess bias for an analytical method. This is an obsolete term, and its use is highly discouraged. See Calibration Verification Standards, Lab Control Samples (LCS), Certified Reference Materials (CRM), and/or spiked blanks. These are all

check standards but should be referred to by their actual designator, e.g., CRM, LCS (Kammin, 2010; Ecology, 2004).

Comparability: The degree to which different methods, data sets and/or decisions agree or can be represented as similar; a data quality indicator (USEPA, 2014; USEPA, 2020).

Completeness: The amount of valid data obtained from a project compared to the planned amount. Usually expressed as a percentage. A data quality indicator (USEPA, 2014; USEPA 2020).

Continuing Calibration Verification Standard (CCV): A quality control (QC) sample analyzed with samples to check for acceptable bias in the measurement system. The CCV is usually a midpoint calibration standard that is re-run at an established frequency during the course of an analytical run (Kammin, 2010).

Control chart: A graphical representation of quality control results demonstrating the performance of an aspect of a measurement system (Kammin, 2010; Ecology 2004).

Control limits: Statistical warning and action limits calculated based on control charts. Warning limits are generally set at +/- 2 standard deviations from the mean, action limits at +/- 3 standard deviations from the mean (Kammin, 2010).

Data integrity: A qualitative DQI that evaluates the extent to which a data set contains data that is misrepresented, falsified, or deliberately misleading (Kammin, 2010).

Data quality indicators (DQI): Commonly used measures of acceptability for environmental data. The principal DQIs are precision, bias, representativeness, comparability, completeness, sensitivity, and integrity (USEPA, 2006).

Data quality objectives (DQO): Qualitative and quantitative statements derived from systematic planning processes that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions (USEPA, 2006).

Data set: A grouping of samples organized by date, time, analyte, etc. (Kammin, 2010).

Data validation: The process of determining that the data satisfy the requirements as defined by the data user (USEPA, 2020). There are various levels of data validation (USEPA, 2009).

Data verification: Examination of a data set for errors or omissions, and assessment of the Data Quality Indicators related to that data set for compliance with acceptance criteria (MQOs). Verification is a detailed quality review of a data set (Ecology, 2004).

Detection limit (limit of detection)**:** The concentration or amount of an analyte which can be determined to a specified level of certainty to be greater than zero (Ecology, 2004).

Duplicate samples: Two samples taken from and representative of the same population, and carried through and steps of the sampling and analytical procedures in an identical manner.

Duplicate samples are used to assess variability of all method activities including sampling and analysis (USEPA, 2014).

Field blank: A blank used to obtain information on contamination introduced during sample collection, storage, and transport (Ecology, 2004).

Initial Calibration Verification Standard (ICV): A QC sample prepared independently of calibration standards and analyzed along with the samples to check for acceptable bias in the measurement system. The ICV is analyzed prior to the analysis of any samples (Kammin, 2010).

Laboratory Control Sample (LCS)/LCS duplicate: A sample of known composition prepared using contaminant-free water or an inert solid that is spiked with analytes of interest at the midpoint of the calibration curve or at the level of concern. It is prepared and analyzed in the same batch of regular samples using the same sample preparation method, reagents, and analytical methods employed for regular samples. Monitors a lab's performance for bias and precision (USEPA, 2014).

Matrix spike/Matrix spike duplicate: A QC sample prepared by adding a known amount of the target analyte(s) to an aliquot of a sample to check for bias and precision errors due to interference or matrix effects (Ecology, 2004).

Measurement Quality Objectives (MQOs)**:** Performance or acceptance criteria for individual data quality indicators, usually including precision, bias, sensitivity, completeness, comparability, and representativeness (USEPA, 2006).

Measurement result: A value obtained by performing the procedure described in a method (Ecology, 2004).

Method: A formalized group of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, data analysis), systematically presented in the order in which they are to be executed (USEPA, 2001).

Method blank: A blank prepared to represent the sample matrix, prepared and analyzed with a batch of samples. A method blank will contain all reagents used in the preparation of a sample, and the same preparation process is used for the method blank and samples (Ecology, 2004; Kammin, 2010).

Method Detection Limit (MDL): The minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results (USEPA, 2016). MDL is a measure of the capability of an analytical method of distinguished samples that do not contain a specific analyte from a sample that contains a low concentration of the analyte (USEPA, 2020).

Minimum level: Either the sample concentration equivalent to the lowest calibration point in a method or a multiple of the method detection limit (MDL), whichever is higher. For the purposes of NPDES compliance monitoring, EPA considers the following terms to be synonymous: "quantitation limit," "reporting limit," and "minimum level" (40 CFR 136).

NLCD (National Land Cover Database): This GIS layer displays a time series of land cover for the United States at various intervals from 2001 to present. It groups land cover into 20 classes based on a modified Anderson Level II classification system. Classes include vegetation type, development density, and agricultural use. Areas of water, ice and snow and barren lands are also identified.

Parameter: A specified characteristic of a population or sample. Also, an analyte or grouping of analytes. Benzene and nitrate + nitrite are all parameters (Kammin, 2010; Ecology, 2004).

Population: The hypothetical set of all possible observations of the type being investigated (Ecology, 2004).

Precision: The extent of random variability among replicate measurements of the same property; a data quality indicator (USGS, 1998).

Quality assurance (QA): A set of activities designed to establish and document the reliability and usability of measurement data (Kammin, 2010).

Quality Assurance Project Plan (QAPP): A document that describes the objectives of a project, and the processes and activities necessary to develop data that will support those objectives (Kammin, 2010; Ecology, 2004).

Quality control (QC): The routine application of measurement and statistical procedures to assess the accuracy of measurement data (Ecology, 2004).

Relative Percent Difference (RPD): RPD is commonly used to evaluate precision. The following formula is used:

$$RPD = [Abs(a-b)/((a + b)/2)] * 100\%$$

where "Abs()" is absolute value and a and b are results for the two replicate samples. RPD can be used only with 2 values. Percent Relative Standard Deviation is (%RSD) is used if there are results for more than 2 replicate samples (Ecology, 2004).

Relative Standard Deviation (RSD): A statistic used to evaluate precision in environmental analysis. It is determined in the following manner:

$$RSD = (100\% * s)/x$$

where s is the sample standard deviation and x is the mean of results from more than two replicate samples (Kammin, 2010).

Replicate samples: Two or more samples taken from the environment at the same time and place, using the same protocols. Replicates are used to estimate the random variability of the material sampled (USGS, 1998).

Reporting level: Unless specified otherwise by a regulatory authority or in a discharge permit, results for analytes that meet the identification criteria (i.e., rules for determining qualitative presence/absence of an analyte) are reported down to the concentration of the minimum level

established by the laboratory through calibration of the instrument. EPA considers the terms "reporting limit," "quantitation limit," and "minimum level" to be synonymous (40 CFR 136).

Representativeness: The degree to which a sample reflects the population from which it is taken; a data quality indicator (USGS, 1998).

Sample (field): A portion of a population (environmental entity) that is measured and assumed to represent the entire population (USGS, 1998).

Sample (statistical): A finite part or subset of a statistical population (USEPA, 1992).

Sensitivity: In general, denotes the rate at which the analytical response (e.g., absorbance, volume, meter reading) varies with the concentration of the parameter being determined. In a specialized sense, it has the same meaning as the detection limit (Ecology, 2004).

Spiked blank: A specified amount of reagent blank fortified with a known mass of the target analyte(s); usually used to assess the recovery efficiency of the method (USEPA, 2014).

Spiked sample: A sample prepared by adding a known mass of target analyte(s) to a specified amount of matrix sample for which an independent estimate of target analyte(s) concentration is available. Spiked samples can be used to determine the effect of the matrix on a method's recovery efficiency (USEPA, 2014).

Split sample: A discrete sample subdivided into portions, usually duplicates (Kammin, 2010).

Standard Operating Procedure (SOP): A document which describes in detail a reproducible and repeatable organized activity (Kammin, 2010).

Surrogate: For environmental chemistry, a surrogate is a substance with properties similar to those of the target analyte(s). Surrogates are unlikely to be native to environmental samples. They are added to environmental samples for quality control purposes, to track extraction efficiency and/or measure analyte recovery. Deuterated organic compounds are examples of surrogates commonly used in organic compound analysis (Kammin, 2010).

Systematic planning: A step-wise process which develops a clear description of the goals and objectives of a project, and produces decisions on the type, quantity, and quality of data that will be needed to meet those goals and objectives. The DQO process is a specialized type of systematic planning (USEPA, 2006).

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