LAKEWOOD CITY COUNCIL AGENDA
Monday, March 17, 2025
6:00 P.M.
City of Lakewood
6000 Main Street SW
Lakewood, WA 98499

Residents can virtually attend City Council meetings by watching them live on the city's YouTube channel: https://www.youtube.com/user/cityoflakewoodwa

Those who do not have access to YouTube can participate via Zoom by either visiting https://us02web.zoom.us/j/86872632373 or calling by telephone: Dial +1(253) 215- 8782 and enter participant ID: 868 7263 2373.

Virtual Comments: If you would like to provide virtual Public Comments or Testimony on Public Hearings during the meeting, you will need to join the Zoom meeting as an attendee by calling by telephone Dial +1(253) 215- 8782 and enter participant ID: 868 7263 2373 or visiting https://us02web.zoom.us/j/86872632373.

By Phone: For those participating by calling in by telephone (+1(253) 215- 8782 and enter participant ID: 868 7263 2373), to use the "Raise Hand" feature press *9 on your phone, to be called upon by the Mayor during the Public Comments or Public Hearings portion of the agenda. Your name or the last three digits of your phone number will be called out when it is your turn to speak. When using your phone to call in you may need to press *6 to unmute yourself. When you are unmuted please provide your name and city of residence. Each speaker will be allowed (3) three minutes to speak during the Public Comment and at each Public Hearing.

By ZOOM: For those using the ZOOM link (https://us02web.zoom.us/j/86872632373), upon entering the meeting, please enter your name or other chosen identifier. Use the "Raise Hand" feature to be called upon by the Mayor during the Public Comments or Public Hearings portion of the agenda. When you are unmuted please provide your name and city of residence. Each speaker will be allowed (3) three minutes to speak.

Outside of Public Comments and Public Hearings, all attendees on ZOOM will continue to have the ability to virtually raise your hand for the duration of the meeting. You will not be acknowledged and your microphone will remain muted except for when you are called upon.

Persons requesting special accommodations or language interpreters should contact the City Clerk, 253-983-7705, as soon as possible in advance of the Council meeting so that an attempt to provide the special accommodations can be made.

CALL TO ORDER

ROLL CALL

PLEDGE OF ALLEGIANCE

PROCLAMATIONS AND PRESENTATIONS

(4) 1. Proclamation recognizing March 24, 2025 through March 28, 2025 as First Responder Wellness Week.
– Chief Patrick Smith and Officer Matt Leitgeb, Lakewood Police Department

PUBLIC COMMENTS

C O N S E N T A G E N D A

(6) A. Approval of the minutes of the City Council meeting of March 3, 2025.

(11) B. Motion No. 2025-16

Authorizing the execution of the Pierce County Force Investigation Memorandum of Understanding.

(27) C. Resolution No. 2025-05

Authorizing the retirement, conversion to, and sale of Lakewood Police Canine Officer Kona as surplus property of the City of Lakewood.

(31) D. Items filed in the Office of the City Clerk:
1. Arts Commission meeting minutes of January 6, 2025.
2. American Lake – Lake Management District No. 1 Advisory Committee meeting minutes of December 5, 2024.

R E G U L A R A G E N D A

UNFINISHED BUSINESS

NEW BUSINESS

ITEMS FOR DISCUSSION

(35) Five-Year (2025-2029) Consolidated CDBG Plan Update.

(257) Review of amendments to Lakewood Municipal Code Chapter 1.44 entitled General Penalties.

(264) Waughop Lake Update.

REPORTS BY THE CITY MANAGER

CITY COUNCIL COMMENTS

ADJOURNMENT

Persons requesting special accommodations or language interpreters should contact the City Clerk, 253-983-7705, as soon as possible in advance of the Council meeting so that an attempt to provide the special accommodations can be made.

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CITY OF LAKEWOOD

PROCLAMATION

WHEREAS, first responders including law enforcement officers, firefighters, emergency medical services (EMS) personnel, 911 dispatchers, correctional officers, and members of other organizations in the public safety sector, come together to protect and aid our community in the event of an emergency; and

WHEREAS, first responders risk their life and safety every day in the performance of their duties to protect our residents; and

WHEREAS, first responders are tasked with handling dangerous and complicated situations; and

WHEREAS, nationwide, law enforcement officers will go through an average of 188 critical incidents throughout the course of their career; and

WHEREAS, first responders often experience stress that has real physical impacts including cardiac issues, diabetes, obesity, and sleep issues; and

WHEREAS, first responders are up to 25.6 times higher risk for developing post-traumatic stress disorder when compared to individuals without such experiences; and

WHEREAS, first responder wellness includes management of issues including, but not limited to sleep, fitness, nutrition, fatigue, anger management, posttraumatic stress and loss; and

WHEREAS, we recognize the integral role first responders play in our community and the benefits derived from their hard work, commitment, sacrifice, and unhesitating dedication; and

WHEREAS, research shows that fostering a strong wellness culture inside first responder agencies enhances relations within the communities they serve.

NOW, THEREFORE, the Lakewood City Council, do hereby recognize March 24, 2025 through March 28, 2025 as

FIRST RESPONDER WELLNESS WEEK

in the City of Lakewood and encourages all residents to recognize and to actively support our local first responders.

PROCLAIMED this 17th day of March, 2025.

Jason Whalen, Mayor

Mary Moss, Deputy Mayor

Ryan Pearson, Councilmember

Michael D. Brandstetter, Councilmember

Patti Belle, Councilmember

J. Trestin Lauricella, Councilmember

Paul Bocchi, Councilmember

LAKEWOOD CITY COUNCIL MINUTES
Monday, March 3, 2025
City of Lakewood
6000 Main Street SW
Lakewood, WA 98499
https://www.youtube.com/user/cityoflakewoodwa
Telephone via Zoom: +1(253) 215-8782
Participant ID: 868 7263 2373

CALL TO ORDER

Mayor Whalen called the meeting to order at 7:00 p.m.

ROLL CALL

Councilmembers Present: 7 – Mayor Jason Whalen, Deputy Mayor Mary Moss, Councilmembers Michael Brandstetter, Ryan Pearson, Patti Belle, J. Trestin Lauricella and Paul Bocchi.

PLEDGE OF ALLEGIANCE

Mayor Whalen paused for a moment of silence and led the Pledge of Allegiance.

PROCLAMATIONS AND PRESENTATIONS

Proclamation recognizing March 2025 as Red Cross Month.

MAYOR WHALEN PRESENTED A PROCLAMATION RECOGNIZING MARCH 2025 AS RED CROSS MONTH TO RANDY GILBERT, SR., BOARD OF DIRECTORS, AMERICAN RED CROSS SOUTH PUGET SOUND AND OLYMPICS.

Youth Council Report.

Mayor Whalen recognized Alexandra Corona Hernandez for receiving the University of Washington Presidential Scholarship and shared that she will be receiving a $750 scholarship from City Council and Lakewood Lions.

Youth Councilmember Alexandra Corona Hernandez spoke about being awarded the UW Presidential Scholarship and thanked the City Council for their support.

Zoe Clifford shared that on February 22nd she participated in the Beloved Community Workshop and Alexandra Corona Hernandez shared that students are planning the April 12th Youth Summit. Discussion ensued.

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PUBLIC COMMENTS

The City Council received written comments in advance from Rob & Jill Jensen.

Fred Feller, Lakewood resident, shared that the Family Search Center is hosting an African American Family History Event on March 22, 2025 from 9:00 a.m. to 2:00 p.m. in Tacoma.

Dennis Haugen, Sioux Falls resident, spoke about sanctuary states, illegal immigration and rezoning.

Christina Manetti, Garry Oak Coalition, requested that the City make 2025 the year of ivy irradiation.

Christina Manetti, Lakewood resident, spoke about the former QFC shopping center and demolition of building for a future park in the area.

James Dunlop, Lakewood resident, spoke about positive thinking preventing the solving of problems that exist and recognizing that the city is declining.

C O N S E N T A G E N D A

A. Approval of the minutes of the City Council study session of February 10, 2025.

B. Approval of the minutes of the City Council meeting of February 18, 2025.

C. Approval of claims vouchers, in the amount of $4,514,027.24, for the period of January 16, 2025 through February 14, 2025.

D. Approval of payroll checks, in the amount of $3,253,612.39, for the period of January 16, 2025 through February 15, 2025.

E. Motion No. 2025-13

Authorizing the execution of an agreement with KBH Construction, in the amount of $286,370, for the installation of new park signs.

F. Motion No. 2025-14

Authorizing the execution of an interlocal agreement with Lakewood Water District for construction of a water main along Interlaaken Drive between Washington Boulevard and 112th Street.

COUNCILMEMBER BRANDSTETTER MOVED TO ADOPT THE CONSENT AGENDA . SECONDED BY COUNCILMEMBER LAURICELLA. VOICE VOTE WAS TAKEN AND CARRIED UNANIMOUSLY.

R E G U L A R A G E N D A

UNFINISHED BUSINESS

None.

NEW BUSINESS

Motion No. 2025-15 Authorizing the execution of a professional services agreement with GMP Consultants for City Manager recruitment services.

COUNCILMEMBER BOCCHI MOVED TO ADOPT MOTION NO. 2025-15. SECONDED BY COUNCILMEMBER PEARSON. VOICE VOTE WAS TAKEN AND CARRIED UNANIMOUSLY.

REPORTS BY THE CITY MANAGER

City Manager Caulfield shared that a contract will come forward for City Council consideration for new reader board, the Puget Sound Regional Council approved the City's Comprehensive Plan, the City received the Association of Washington Cities Well City Award, Human Resources Direct Mary McDougal retired on February 28th and the Tenzler Log has been secured in its final location at Fort Steilacoom Park.

He then shared that Chief Smith will provide the 2024 Police Report and public safety statistics at the March 10th Council meeting.

He then announced the following upcoming meetings and events:

- March 4, Noon, Habitat for Humanity 2025 Changing Lives Luncheon, Hotel Murano, Bicentennial Pavilion
- March 7, 9:00 A.M., Pierce County Unified Approach to Homelessness, Pierce County Environmental Services Building
- March 8, Dr. Claudia Thomas Award Gala, McGavick Conference Center
- March 26, 11:30 A.M., Community Healthcare Lunch and Laughter, 12:00 P.M. Hotel Murano

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- March 26, 6:00 P.M., Mayors Coffeehouse, Fort Steilacoom Park Pavilion

- April 12, 11:00 A.M., Youth Summit, Harrison Preparatory School

CITY COUNCIL COMMENTS

Councilmember Bocchi shared that he attended the Economic Development Board Annual meeting and this week he will attend Planning Commission and South Sound Housing Affordability Partnership (SSHA^{3}P) meetings.

Councilmember Brandstetter shared that he will attend the Pierce County Unified Approach to Homelessness kick off event this week and he spoke about the Well City Award and the City changing.

Councilmember Lauricella shared that he attended the Chief Leschi Honor Walk, viewed the Tenzler Log at Fort Steilacoom Park and attended the Groundbreaking Ceremony with Congresswoman Strickland. He congratulated Alexandra Corona Hernandez and shared that he will attend the Dr. Claudia Thomas Service Award Gala.

Councilmember Pearson shared that he attended the Puget Sound Regional Council meeting.

Councilmember Belle congratulated Alexandra Corona Hernandez for her scholarship. She shared that she attended the Groundbreaking Ceremony with Congresswoman Strickland and she will attend the Dr. Claudia Thomas Service Award Gala.

Deputy Mayor Moss congratulated Alexandra Corona Hernandez for her scholarship. She shared that she attended the Economic Development Board Annual Meeting, the Groundbreaking Ceremony with Congresswoman Strickland and the Chief Leschi Honor Walk. She shared that she will attend the African American Family History Event on March 22. Moss shared that there is a concert at PLU on March 9.

Mayor Whalen shared that he attended the Chief Leschi Honor Walk, Groundbreaking with Congresswoman Strickland and this week he will attend an Alumni Connection event at the UW of Washington and the Dr. Claudia Thomas Award Service Gala.

ADJOURNMENT

There being no further business, the meeting adjourned at 8:33 p.m.

_____
JASON WHALEN, MAYOR

ATTEST:

_____
BRIANA SCHUMACHER
CITY CLERK

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REQUEST FOR COUNCIL ACTION

DATE ACTION IS REQUESTED:	TITLE:	TYPE OF ACTION:
March 17, 2025	Motion authorizing the execution of the Pierce County Force Investigation Memorandum of Understanding	___ ORDINANCE
		___ RESOLUTION NO.
REVIEW:	ATTACHMENTS: Memorandum of Understanding	___X MOTION NO. 2025-16
		___ OTHER

SUBMITTED BY: Chief Patrick D. Smith, Lakewood Police Department

RECOMMENDATION: It is recommended that the City Council authorize the execution of the Pierce County Force Investigation (PCFIT) Memorandum of Understanding (MOU). The original MOU for PCFIT was authorized by the City Council on June 15, 2020.

DISCUSSION: In order to comply with the Washington Administrative Code Chapter 139-12, Law Enforcement Training and Community Safety Act – Independent Investigation Criteria Pierce County and municipalities throughout the County have entered into a Memorandum of Understanding which creates the Pierce County Force Investigation Team. This agreement addresses roles and responsibilities relative to the investigation of police use of force. Among other things, it ensures departments do not investigate themselves, there is regular communication to the public and representatives of the public are involved to an appropriate degree.

Because the agreement is between jurisdictions, the agreement falls under the Interlocal Cooperation Act and thus requires ratification by the governing body.

ALTERNATIVE(S): Without the agreement, it is highly unlikely that the City will be able to comply with the WAC given the extensive recommendations and the requirement to have other jurisdictions involved.

FISCAL IMPACT: There is no fiscal impact associated with execution of this Memorandum of Understanding.

Chief Patrick Smith	
Prepared by	City Manager Review

PIERCE COUNTY FORCE INVESTIGATION TEAM
MEMORANDUM OF UNDERSTANDING

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SECTION 1. STATEMENT OF PURPOSE

The Mission and Purpose of the Pierce County Force Investigation Team (PCFIT) is to conduct independent, thorough, accurate, appropriate, open, and unbiased investigations, in compliance with the Law Enforcement Training and Community Safety Act (LETCSA), RCW 10.114.011, and Chapter 139-12 WAC, for all officer-involved use of deadly force incidents that result in death, substantial bodily harm, or great bodily harm occurring within Pierce County.

The PCFIT will conduct criminal investigations to develop relevant information to allow a determination of the presence or absence of criminal culpability on the part of those involved in the incident. The purpose of investigations shall be to inform any determination of whether the use of deadly force met the "good faith" standard of RCW 9A.16.040 and satisfied other applicable laws and policies.

Once a PCFIT investigation has been completed and submitted to the prosecutor for final review, it shall be made available to the involved agency for their internal use and disclosure.

Investigations shall follow the rules of law established by the state and federal constitutions, statutory and case law which apply to criminal investigations. The investigation shall be performed in a manner that provides both the appearance and the reality of an independent, thorough, fair, complete and professional investigation.

> Our Goals: To conduct professional multi-jurisdictional investigations of incidents of deadly force by law enforcement while promoting public trust through transparency and consistency.

SECTION 2. MEMBER AGENCIES

Bonney Lake Police Department	Orting Police Department
Buckley Police Department	Pacific Police Department
Dupont Police Department	Pierce County Sheriff's Department
Eatonville Police Department	Puyallup Police Department
Fife Police Department	Roy Police Department
Fircrest Police Department	Ruston Police Department
Gig Harbor Police Department	Steilacoom Department of Public Safety
Lakewood Police Department	Sumner Police Department
Milton Police Department	Tacoma Police Department
Washington State Patrol	

SECTION 3. DEFINITIONS

Good faith: An objective standard under RCW 9A.16.040, which shall consider all the facts, circumstances, and information known to the officer at the time to determine whether a similarly situated reasonable officer would have believed that the use of deadly force was necessary to prevent death or serious physical harm to the officer or another individual.

Involved Agency: The agency which employed or supervised the officer(s) who used deadly force.

Venue Agency: The agency having geographic jurisdiction of the incident. (This may or may not be the involved agency.)

Member Agency: Signatories to this agreement.

Involved Officer(s): Officer who used deadly force and is the subject of the investigation.

Non-law Enforcement Community Representatives: Civilians chosen by Member Agencies to carry out the duties assigned by WAC 139-12-030(2),(4).

Witness Officer(s): Officer involved in the incident who did not use deadly force.

SECTION 4. EXECUTIVE BOARD

The Executive Board of the PCFIT shall consist of the Sheriff and Chief, or their designee, of each agency with personnel assigned to the Team. Representatives of the Prosecutor's Office and the Medical Examiner's Office will be invited to all Board meetings and their input may be solicited. For voting purposes and for decision making in administering this agreement, it will be the majority rule of the Executive Board.

The Chairperson of the Executive Board will be designated by the Pierce County Police Chiefs Association for a term of two years. The Chairperson of the Executive Board shall schedule a meeting of the Executive Board in January of each year. The purpose of the meeting will be to receive a comprehensive report from the PCFIT Commander(s) concerning activities of the Team over the past year, address issues pertaining to the operation and support of the Team, and address changes to the PCFIT protocol. Special meetings may be called at any time by a member of the Executive Board. Special meetings may also be requested by the PCFIT Commander(s).

SECTION 5. PCFIT COMMANDERS

There will be at least two PCFIT Commanders. They will be the rank of lieutenant or higher and from different departments. The PCFIT Commanders shall have the responsibility to develop Standard Operating Procedure/Guidelines (SOP/G) and manage and coordinate the readiness and training of the Unit. Candidates for the PCFIT Commander position will be nominated by a member agency and selected by the Executive Board and will report directly to the Executive Board. The PCFIT Commanders will serve two years, but the term may be extended or terminated at the discretion of the Executive Board. A Commander must have strong interpersonal and leadership skills, with experience in complex criminal investigations and strong working knowledge of case law relevant to police use of force. A Commander shall not oversee, consult, or participate in any manner on any investigation where the Commander's employer is the involved agency.

SECTION 6. LEAD INVESTIGATORS

There will be at least two Lead Investigators from different departments. The Lead Investigators will be qualified senior investigators with experience in criminal investigations. The Lead Investigators will be nominated by a member agency and selected by the PCFIT Executive Board. The Lead Investigators must have strong leadership and organizational skills and should have a working knowledge of the Incident Command System (ICS) and be prepared to assume command in the absence of the PCFIT Commander. The Lead Investigators will assist the PCFIT in the development of the SOP/G, oversee investigations and assign PCFIT resources as needed.

Lead investigators shall not participate in, oversee, or assign resources to investigations involving officers from their employer agencies.

SECTION 7. INVESTIGATORS

Investigators will be experienced officers with a background in criminal investigations. Investigators shall meet state law requirements for officers investigating use of deadly force. They must be adept at working with multiple agencies. The Investigators will be selected by the PCFIT Commanders with input from the non-law enforcement community representatives and the permission of the investigators agency's chief executive or designee.

SECTION 8. NON-LAW ENFORCEMENT COMMUNITY REPRESENTATIVES

Each Member Agency shall appoint at least one civilian to fulfill the duties assigned by WAC 139-12-030, provided that Member Agencies may use Non-Law Enforcement Community Representatives appointed by other Member Agencies upon mutual agreement. The Executive Board shall create a transparent process for soliciting names and creating a roster of individuals willing to serve in this capacity.

SECTION 9. TRAINING

The Member Agencies will ensure that personnel assigned to PCFIT either have completed or will complete classes in the following core areas:

Criminal Investigations Crime Scene Investigations

Basic Homicide Investigations Interview and Interrogation

Officer Involved Shooting Investigations

LETCSA Violence De-escalation and Mental Health training

Assigned personnel are expected to complete all the core classes within two years of being assigned. In addition, member agencies are encouraged to provide their investigators with advanced training courses. These courses may include advanced homicide investigation, blood stain pattern analysis, crime scene photography/videography, and other classes relevant to their assignment with the PCFIT.

SECTION 10. ACTIVATION

Upon request of the involved agency to investigate an officer-involved use of force resulting in substantial bodily harm, great bodily harm or death, the following Protocol shall automatically and immediately take effect:

- A Chief of Police, Sheriff, WSP Commander, or their designee, shall make the request for the PCFIT to South Sound 911 (SS911).
- SS911 shall contact the PCFIT Commander through standard call-out procedures identified on the PCFIT phone tree or contact list.

- The PCFIT Commander shall assign the Lead Investigator. The Lead Investigator shall be responsible for determining how many investigators will be needed during the initial response.
- The Lead Investigator, other investigators and crime scene processors called out shall not be from the involved agency.

SECTION 11. RESPONSIBILITIES

The involved agency shall make the initial request to activate the PCFIT.

The involved agency will immediately secure the crime scene(s). This responsibility includes preservation of the integrity of the scene(s) and its/their contents, controlling access to the scene(s), and the identification and separation of witnesses. Use of allied agency resources may be necessary to accomplish this task.

The venue agency, if not also the involved agency, shall make facilities and equipment available as needed by the PCFIT. No specialized equipment belonging to the involved agency may be used by the investigative team unless no reasonable alternative exists, the equipment is critical to carrying out the independent investigation, and the use is approved by the PFIT commander. If the equipment is used, the nonlaw enforcement community representatives on the PCFIT must be notified about why it needs to be used and steps taken to strictly limit the role of any involved agency personnel in facilitating the use of that equipment.

The involved agency shall provide a command-level liaison and make appropriate department personnel available to provide information as needed for the investigation.

SECTION 12. AUTHORITY

Once the PCFIT has agreed to investigate an incident as requested by the involved agency's chief executive, the PCFIT shall have sole and exclusive authority concerning the investigation of the incident. The PCFIT Commander(s) or designee will provide limited briefings about the progress of the investigation to the involved agency's designated command level liaison throughout the course of the investigation.

SECTION 13. INVESTIGATIVE PRIORITY

The criminal investigation has investigative priority over the administrative investigation and shall begin immediately after an incident has occurred. Provided, however, that the criminal investigation shall be conducted in a manner that does not inhibit the Involved Agency from conducting a timely administrative investigation.

SECTION 14. INVESTIGATIVE GOALS – SHARING OF INFORMATION

The goal of the investigation is to develop all available relevant information about the incident. When the investigation is completed, including all forensic testing, toxicology report and autopsy reports, the case will be submitted to the County Prosecutor, unless the County Prosecutor determines that the case can be submitted prior to the completion of certain non-critical forensic testing. The County Prosecutor will make a final determination as to whether the use of

deadly force satisfies the statutory "good faith" standard, and on the presence or absence of criminal culpability on the part of the officers involved in the incident.

No information about the ongoing independent investigation will be shared with any member of the involved agency.

If the chief or sheriff of the involved agency requests that the PCFIT release the body cam video or other investigation information of urgent public interest, the PCFIT commander should honor the request with the agreement of the prosecutor.

SECTION 15. INVESTIGATIVE REQUIREMENTS

The investigation is required to follow the rules of law, which apply to all criminal proceedings; these include constitutional, statutory, and case law. Investigators will maintain the integrity of the investigation by following the rules of evidence throughout the investigation.

The investigation will be performed in a manner that provides a thorough, fair, complete, and professional investigation, free of conflicts of interest.

SECTION 16. COSTS

Each member agency shall be responsible for their employees' wages and associated personnel costs. The involved agency shall be responsible for reasonable or extraordinary investigative expenditures (to include, but not limited to, hospital security). The involved agency shall be advised of all extraordinary costs associated with the investigation but shall not have the power to veto or prohibit the expenditure of any necessary expenditures.

SECTION 17. EVIDENCE

- Evidence Storage: All evidence shall be stored at a non-involved agency property room as designated by the PCFIT Commander. The PCFIT Commander shall coordinate with the member agency's chief executive or designee to ensure compliance with that agency's policies and procedures. The involved agency shall be responsible for storage and handling costs of extraordinary items such as vehicles, HAZMAT, etc.
- Evidence Retention: Evidence shall remain in the custody of the designated, non-involved agency property room until the Pierce County Prosecutor has reviewed the case and made a charging determination or has authorized the release of evidence.
    - If no charges are filed, all evidence will be transferred to the involved agency's property room.
    - If charges are filed, all evidence will remain in the custody of the designated, non-involved agency property room until the completion of the criminal prosecution. Once the criminal prosecution is completed all evidence will be transferred to the involved agency's property room.

SECTION 18. CASE FILES

All original reports, statements and other documentation related to the investigation will be electronically filed with SS911.

While the investigation is in process and not yet forwarded to the prosecutor, access to the electronic case files will be restricted to personnel conducting the investigation. Under no circumstances will reports or other case material be disseminated without the written consent of the Commander.

The complete investigation will be sent to the Pierce County Prosecuting Attorney's Office for review.

Once the investigation is complete, the involved agency will be granted access to the case files to conduct their administrative investigation. The non-law enforcement PCFIT representatives shall also have access to the completed case file. Public dissemination of the case files shall be consistent with state law.

SECTION 19. VEHICLE INCIDENTS

When requested, the PCFIT will investigate incidents in which the use of a vehicle is an intentional use of force that causes substantial bodily harm, great bodily harm or death. In these investigations, the PCFIT may utilize experienced Collision Reconstructionist and other appropriate resources.

This section is not to imply that the PCFIT will be activated in a police involved collision causing great bodily harm or death where the collision was not a result of an intentional use of force.

SECTION 20. COMMAND STAFF BRIEFING

This briefing occurs once the case is complete and presented to the County Prosecutor. The purpose of this briefing is to present the results of the investigation to the Command Staff from the involved agency. In addition to the Command Staff from the involved agency, the attendees to this meeting typically will consist of the PCFIT Commander, Lead Investigator and Community Representatives.

SECTION 21. PHYSICAL EVIDENCE COLLECTION, PRESERVATION, AND ANALYSIS

Member agencies having the capability to assist PCFIT Investigators in the documentation of the scene(s) and to assist in the collection, preservation, and analysis of physical evidence may do so providing they possess the requisite training and experience, provided that agencies involved in the use of force shall not assist with the collection, preservation, or analysis of physical evidence.

Prior to final relinquishment of the scene, the Lead Investigator, crime scene Investigators/ professionals, and PCFIT Commander will confer to determine if the collection of evidence is complete.

SECTION 22. EMPLOYEE RIGHTS

Law enforcement employees have the same rights and privileges regarding criminal investigative interviews that any other citizen would have, including the right to remain silent, the right to consult with an attorney prior to an interview, and the right to have an attorney present during the interview.

SECTION 23. OFFICER INTERVIEWS

Witness officers

- Witness officers will provide a written report and/ or recorded interview as deemed appropriate by the Lead Investigator.

Involved officers

- Statements from the officers using force must be completely voluntary. Under no circumstances are investigators to take a compelled statement from the involved officer(s). Any compelled statements obtained in Administrative Investigations shall not be shared with the PCFIT investigative team.

SECTION 24. PUBLIC SAFETY STATEMENT

Public Safety Statements should be taken with consideration of the Involved Agency's policies, procedures and documents. Public Safety Statements should only be taken when deemed absolutely necessary and only when the involved officer(s) refuse to provide this information voluntarily. The public safety statement may include:

- Any outstanding suspects
- Location of evidence
- Location of potentially injured people
- Any general public safety concerns

SECTION 25. REPORT WRITING

All investigators participating in the criminal investigation will write reports documenting their participation.

The Investigators within each investigative team will allocate and divide among themselves the responsibility for documenting interviews and observations.

Prompt completion of reports is essential. All involved agencies and investigators will strive for report completion within 7 days of any investigative activity. The Medical Examiner's report may be delayed beyond 30 days pending results of some scientific tests.

SECTION 26. PUBLIC TRANSPARENCY AND MEDIA RELATIONS

The PCFIT Commander shall provide public updates about the investigation a minimum of once per week, even if there is no new progress to report. When an investigation is complete, the information will be made available to the public in a manner consistent with applicable state law.

The PCFIT Executive Board shall ensure that all the following is made available to the public:

- The names of the members, supervisors, commanders, and non-law enforcement community representatives on the PCFIT.
- The PCFIT policies and procedures

During investigations, the PCFIT commander shall insure that all state law requirements for notification of family members and Tribes are followed.

- PCFIT: Once the PCFIT has initiated an investigation, all media releases related to the investigation shall be made by the PCFIT Public Information Officer (designated by the PCFIT Commander) after consultation with the involved agency's chief executive or designee, and after review by the PCFIT's non-law-enforcement community representatives. The PCFIT may release information typically on the day of the incident, an intermediate news release, and then a release when the complete investigation is sent to the Prosecutor.
- THE INVOLVED AGENCY: The involved agency's Public Information Officer ("PIO"), or other official designee, will release information in coordination with PCFIT supervisors. It shall be the responsibility of the involved agency to determine when the involved officer's name will be released to the public, pursuant to their policies and procedures and consistent with the requirements of state laws including the Public Records Act.

SECTION 27. FAMILY AND TRIBAL LIAISONS

The Lead Investigator will assign a liaison to the family of the person against whom deadly force has been used. The liaison will make every effort to keep the family informed of the status of the investigation and provide details that do not compromise the integrity of the investigation. A Tribal liaison shall be assigned if the person against whom deadly force was used is a member of a recognized Indian Tribe.

SECTION 28. PROSECUTOR PROTOCOL

The Lead Investigator will ensure adherence to the Pierce County Prosecutor's Officer Involved Fatal Incident Protocol. Questions regarding the Prosecutor's protocol or legal questions related to the investigation should be referred to the Pierce County Prosecuting Attorney's Office.

SECTION 29. SANCTIONS/REMOVAL OF MEMBER AGENCY

Willful violations of the protocol agreement will be brought to the attention of the Executive Board by the PCFIT Commander or Lead Investigator. The Executive Board, by majority vote, may elect to immediately stop the investigation and turn the investigation over to the involved agency for another independent agency to investigate. A member agency failing to abide by this agreement may also be removed from the PCFIT by a majority vote of the Executive Board.

SECTION 30. TERM OF AGREEMENT

This Agreement shall become effective on the date it is executed by all signing parties and shall remain in full force and effect and is intended to be indefinite.

SECTION 31. TERMINATION

A party may terminate this Agreement or, alternatively, withdraw its participation in the PCFIT by providing written notice to the chief law enforcement officer for each member agency of its intent to terminate or withdraw from this agreement. A notice of termination or withdrawal shall

become effective upon the latter of: a) 30 days after service of the notice on the chief law enforcement officers for all member agencies; or b) at the conclusion of any PCFIT investigation that is pending on the date of the written notice of intent to terminate or withdraw from this Agreement.

SECTION 32. STATUS OF OFFICERS ASSIGNED TO PCFIT

- Pursuant to RCW 10.93.050, each officer assigned to the PCFIT remains the employee of the party who hired the officer, and is not an employee of any other member agency.
- Member agencies shall not allow officers who have been disciplined for dishonesty, bias or improper use of force to be assigned to the PCFIT.

SECTION 33. LIABILITY, HOLD HARMLESS AND INDEMNIFICATION

Pursuant to RCW 10.93.040, it is understood and agreed that each member agency, its agents, employees, and insureds do not, by virtue of these Protocols, assume any responsibility or liability for the actions of another agency's officers.

Each party hereto shall be responsible and assume liability for its own wrongful or negligent acts or omissions, or those of its officers to the fullest extent required by law, and shall save, indemnify, defend and hold harmless all other parties from such liability. In the case of negligence of more than one party to this Agreement, any damages shall be in proportion to the percentage of negligence attributed to each party, and each party shall have the right to contribution from the other party in proportion to the percentage of negligence attributed to the other party. Nothing contained in this section of this Agreement shall be construed to create a liability or a right of indemnification in any third party. The provisions of this section shall survive the termination or expiration of this Agreement.

SECTION 34. DISPUTE RESOLUTION

For the purpose of this Agreement, time is of the essence. Should any dispute arise concerning the enforcement, breach or interpretation of this Agreement, the parties shall first meet in a good faith attempt to resolve the dispute.

SECTION 35. SEVERABILITY

If any provision of this Agreement or any provision of any document incorporated by reference to this Agreement shall be held invalid, such invalidity shall not affect the other provisions of this Agreement which can be given effect without the invalid provision, if such remainder conforms to the requirements of applicable law and the fundamental purpose of this Agreement. To this end, the provisions of this Agreement are declared to be severable.

SECTION 36. MISCELLANEOUS

Any provision of this Agreement that imposes an obligation that continues after termination or expiration of this Agreement shall survive the term or expiration of the Agreement and shall be binding on the parties to this Agreement. This Agreement shall be governed by and construed in accordance with the laws of the State of Washington.

SECTION 37. EXECUTION OF AGREEMENT

This Agreement may be signed in counterparts by the parties. If the Agreement is signed by the parties in counterparts, it will be considered a fully executed Agreement.

Mark Berry	Chief of Police	Devon Gabreluk	Chief of Police
Print Name	Title	Print Name	Title
Signed by: Mark Berry 90AA66106E224E2...	2/5/2025	DocuSigned by: E9B09B1CCF2C4A7...	2/4/2025
Signature	Date	Signature	Date
Bonney Lake Police Department		Orting Police Department	
Kurt Alfano	Chief of Police	Robert Hendrickson	Chief of Police
Print Name	Title	Print Name	Title
DocuSigned by: Kurt Alfano 95703ADEB55F437...	2/4/2025	Signed by: Robert Hendrickson 0B4CFB754A874D2...	2/18/2025
Signature	Date	Signature	Date
Buckley Police Department		Pacific Police Department	
Bryan Moore	Chief of Police	Keith Swank	Sheriff
Print Name	Title	Print Name	Title
Signed by: Bryan Moore 6D9140D6B84943E...	2/5/2025	Signed by: Keith Swank 3E2B716C7745475...	2/5/2025
Signature	Date	Signature	Date
DuPont Police Department		Pierce County Sheriff's Department	
Chief LaLiberte	Chief	Scott Engle	Chief of Police
Print Name	Title	Print Name	Title
DocuSigned by: Chief LaLiberte BBA331284BE3401...	2/5/2025	Signed by: Scott Engle 029BB10883D0480...	2/4/2025
Signature	Date	Signature	Date
Eatonville Police Department		Puyallup Police Department	

Pete Fisher	Chief of Police
Print Name	Title
Signed by: Pete Fisher 058F630DEEC64D5...	2/4/2025
Signature	Date
Fife Police Department	
Dawn Masko	City Manager
Print Name	Title
Signed by: Dawn Masko F8A7750F35C7482...	2/11/2025
Signature	Date
Fircrest Police Department	

Paul Antista	Chief of Police
Print Name	Title
Signed by: Paul Antista 1D02AC4234D74B5...	2/5/2025
Signature	Date
Roy Police Department	
Nestor Bautista	Chief of Police
Print Name	Title
DocuSigned by: Nestor Bautista FB00308FD4804D6...	2/4/2025
Signature	Date
Ruston Police Department	

Mary Barber	Mayor
Print Name	Title
Signed by: Mary Barber E4478DC311FC48A...	2/6/2025
Signature	Date
Gig Harbor Police Department	
Patrick Smith	
Print Name	Title
Signature	Date
Lakewood Police Department	
Print Name	Title
Signature	Date
Milton Police Department	

Dick Muri	Mayor
Print Name	Title
Signed by: Dick Muri 3E7DE61122A54C8...	2/5/2025
Signature	Date
Steilacoom Dept of Public Safety	
Brad Moericke	Chief
Print Name	Title
Signed by: Brad Moericke 9F37010FB15843E...	2/4/2025
Signature	Date
Sumner Police Department	
Paul Junger	Acting Chief of Police
Print Name	Title
Signed by: Paul Junger DE7CC5DB5C8C4C2...	2/4/2025
Signature	Date
Tacoma Police Department	

Kristene OShannon	Captain	
Print Name	Title	
Signed by: 94E5505CA3C54B8...	2/4/2025	
Signature	Date	

Washington State Patrol

Return to Agenda

REQUEST FOR COUNCIL ACTION

DATE ACTION IS REQUESTED:	TITLE: Authorizing the retirement, conversion to, and sale of Lakewood Police Canine Officer Kona as surplus property of the City of Lakewood.	TYPE OF ACTION:
March 17, 2025		_ ORDINANCE
REVIEW:		X RESOLUTION NO. 2025-05
		__ MOTION
	ATTACHMENTS: Resolution	__ OTHER

SUBMITTED BY: Heidi Ann Wachter, City Attorney

RECOMMENDATION: It is recommended that the City Council authorize conversion of the Police Canine Service Dog Kona to surplus property and sell the same to his handler, Lakewood Police Officer Anthony Bucat. Canine Service Dog Kona is not suitable for continued training and use as a police dog. It is further recommended that the City sell Kona for the sum of One Dollar and 00/100 to Anthony Bucat.

DISCUSSION: Anthony Bucat has been assigned as Canine Handler for Police Service Dog Kona since Kona's purchase in January, 2019 by the City of Lakewood to the present. Canine Police Service Dog Kona is 7 years old; he has acted for a reasonable period of time in the capacity of a Police Service Dog but is no longer suitable for police work.

ALTERNATIVE(S): To convert the animal to surplus property and sell or donate him to some other person or entity.

FISCAL IMPACT: De minimums. The animal is not suitable for canine police service work.

Heidi Ann Wachter
Prepared by

City Manager Review

RESOLUTION NO. 2025-05

A RESOLUTION of the City Council of the City of Lakewood, Washington, authorizing the retirement, conversion to, and sale of Lakewood Police Canine Officer Kona as surplus property of the City of Lakewood.

WHEREAS, Canine Police Service Dog Kona has acted for a reasonable period of time in the capacity of a Police Service Dog; and

WHEREAS, the City of Lakewood Canine Police Service Dog Kona is no longer serviceable as a Police Service Dog; and

WHEREAS, Lakewood Police Department K-9 Officer Anthony Bucat has expressed the desire to acquire sole and exclusive ownership of Kona; and

WHEREAS, there is an understanding between Officer Anthony Bucat and the City of Lakewood that, at the conclusion of Kona's usefulness as a Police Service Dog, the City will sell Kona to Officer Anthony Bucat for the sum of one dollar and no/100 ($1.00).

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF LAKEWOOD, WASHINGTON HEREBY RESOLVES as follows:

Section 1. The City of Lakewood has determined Canine Kona has reached the end of a reasonable service period and therefore determined that the property status of said canine should be converted to surplus and should be sold in a manner that is consistent with the understanding between the City and Canine Handlers to Lakewood Police Officer Anthony Bucat for the amount of one dollar and no/100 ($1.00) upon execution of the sale and waiver agreement as described in Exhibit A attached hereto and incorporated herein by this reference.

Section 2. The City Manager or designee is authorized to implement such administrative procedures as may be necessary to carry out the directives of this legislation.

Section 3. This Resolution shall be in full force and effect upon passage and signatures hereon.

PASSED by the City Council this 17th day of March, 2025.

CITY OF LAKEWOOD

Attest:

_____
Jason Whalen, Mayor

_____
Briana Schumacher, City Clerk

Approved as to form:

_____
Heidi Ann Wachter City Attorney

EXHIBIT A

AGREEMENT BETWEEN THE CITY OF LAKEWOOD AND LAKEWOOD POLICE OFFICER ANTHONY BUCAT FOR SALE OF SURPLUS PROPERTY

THIS AGREEMENT is made is made and entered into the 17th day of March, 2025, as follows:

Anthony Bucat shall pay to the City of Lakewood one dollar and no/100 ($1.00) for and in consideration of the agreement of the parties for ownership of the Police Service Dog named Kona.

The City of Lakewood shall, upon receipt of said one dollar and no/100 ($1.00) conveys to all and transfer full ownership of Police Service Dog Kona to Anthony Bucat.

Anthony Bucat understands that he is receiving full ownership of this Police Service Dog, that the City of Lakewood is relinquishing all claims to this Police Service Dog, and that from the time of execution of this agreement forward, Anthony Bucat assumes total responsibility for the care, maintenance and action of this Police Service Dog.

Anthony Bucat further acknowledges that he is a Lakewood Police Officer and therefore has special knowledge regarding the level of Police Service training and behavioral attributes of this canine.

Anthony Bucat, for and in consideration of being sold the above named Police Service Dog by the City of Lakewood, with the City of Lakewood relinquishing all claims to this Police Service Dog for himself, his heirs, successors and assigns, does agree to defend, indemnify and hold the City of Lakewood harmless from and against any and all claims, injuries, damages, losses or suits of any nature whatsoever, including but not limited to attorney's fees arising out of or in any connection with his use of this Police Service Dog for the duration of the canine's life.

The City of Lakewood agrees to defend, indemnify and hold Anthony Bucat harmless from and against any and all claims, injuries, damages, losses or suits of any nature whatsoever, including but not limited to attorney's fees resulting solely from service provided by Police Service Dog Kona as a working Police Service Dog for the City of Lakewood.

By signing this agreement, Anthony Bucat acknowledges that Police Service Dog Kona is hereby retired and is not to be released back into police service.

_____	_____
Patrick Smith, Chief of Police	Anthony Bucat, Purchaser
_____	_____
Date	Date
Attest:	Approved by:
_____	_____
Briana Schumacher, City Clerk	John Caulfield, City Manager

Approved as to form:

_____
Heidi Ann Wachter, City Attorney

American Lake – Lake Management District No. 1 Advisory Board Meeting Minutes
Thursday, December 5th, 2024, 4:00 PM
Lakewood City Hall, American Lake Room
6000 Main Street SW Lakewood, WA 98499

CALL TO ORDER

The meeting was called to order at 4:07 p.m.

ATTENDANCE:

American Lake – Lake Management District No. 1 Members Present:
Six board members present, a quorum was reached.

Kate Read (Chair)
Richard Martinez (Vice Chair) -Zoom
Jeff Cox (Property Owner) – Zoom
Thomas Blume (Camp Murray) – Proxy: Amanda Pole attended via Zoom
Todd Zuchowski (JBLM)
Mary Dodsworth (City of Lakewood)

Staff: Weston Ott: Engineering Services Division Manager
Katie Foster: Engineering Technician

PUBLIC COMMENT: None, no citizens in attendance.

UNFINISHED BUSINESS: Approval of draft meeting minutes from September 3, 2024. A motion was made by Mary Dodsworth to accept the draft meeting minutes with corrections. This motion was seconded by Jeff Cox.

NEW BUSINESS

Lake Fall Survey

The board reviewed the fall survey produced by AquaTechnex and discussed the quality of the aerial treatment maps provided in the survey, the effectiveness of the ProcellaCOR treatment, and how well ProcellaCOR works in deeper waters. Depending on the outcome of the grant application submitted by the City, the board could potentially explore available combinations of ProcellaCOR and other herbicides or analyze liquid vs. granular applications. Additionally, there was interest in sending a sample of milfoil out for DNA testing to determine if it is a hybridized type of milfoil. Amanda Pool indicated she would investigate a potential contact for DNA testing.

How Do Residents Communicate Concerns
The board discussed several ideas on how to improve the ALMD website and communication with residents, including a payment option for people to pay their fee online and an integrated form to report milfoil issues. Also, it was suggested that sending a notice of the upcoming meeting to the people that have signed up for email updated would be beneficial. The board would like the fall survey and bio-base maps uploaded to the website and wanted a verification of how many people have signed up for email notifications.

Workplan
Kate Read requested more information on the lake levels, and suggested Lakewood Water District might have pertinent information. Also, the board inquired if AquaTechnex could extend the treatment window.

Budget

Yearly Assessment as of 7/1/2024, $29,438.75, Loan Repayment - $2,795.00. The yearly expenses in 2023 were $25,280+ $2,869 = $28,149.

Liens

There are currently four liens: Thornewood Beach Club (8 Thronewood Ln SW), Christa Carlson (15406 Rose Rd SW), David Hanshaw (15108 Silcox Dr SW), and Wilbert & Lucille Damrau-Trust (8816 Frances Folsom ST SW).

NEXT MEETING
Next meeting date March 4, 2025.

ADJOURNMENT

The meeting ended at 4:58 p.m.

Kate Read (Mar 6, 2025 13:16 PST)

Kate Read, Chair

Weston Ott

Weston Ott, City Staff Liaison

Arts Commission Meeting Minutes
Monday, January 6, 2025, 5:00p.m.
City of Lakewood – American Lake Conference Room
6000 Main Street SW Lakewood, WA 98499
https://www.youtube.com/user/cityoflakewoodwa
Telephone via Zoom: 253.215.8782 Participant ID: 996 7750 5460

CALL TO ORDER

The meeting was called to order at 5:04 p.m.

ROLL CALL

Arts Commission Members Present: Emily Feleen-Chair, Shauna Alexander, Nancy Camirand, Don Doman, Sylvi Estrella, Laura Martinez, Lani Neil, Darryl Owens, Phil Raschke, Adriana Serrianne, Susan Warner

Arts Commission Members Excused: Earl Borgert-Vice Chair, Adie Kleckner, Lua Pritchard

Staff Present: Sally Martinez- Recreation Coordinator, Nikki York- Office Assistant

Youth Council Liaison: Bentley Webster-absent, Nevaeh Tutt-absent, Valeria Becerra-present

City Council Liaison: Patti Belle

PUBLIC COMMENT

APPROVAL OF MINUTES

LANI NEIL MOVED TO ADOPT THE ARTS COMMISSION MEETING MINUTES OF DECEMBER 2, 2024. SECONDED BY SHAUNA ALEXANDER. VOICE VOTE WAS TAKEN AND MPU.

UNFINISHED BUSINESS

Officer Elections: Lani Neil motioned for Emily Feleen to continue as Chair. Phil Raschke seconded. MPU. Phil Raschke motioned for Earl Borgert to continue as Vice Chair. Darryl Owens seconded. MPU.

Subcommittees: The subcommittees are Fiesta de la Familia (Laura Martinez, Sylvi Estrella, Darryl Owens), Plinths (Earl Borgert & Phil Raschke), Community Education/Art in the Park (Sylvi Estrella, Laura Martinez, Nancy Camirand and Shuana Alexander), Collection Policy (Emily Feleen & Susan Warner)

Save the Date for Beloved Community Walk: Saturday January 11, 2025 from Noon to 3 p.m.

Save the Date for the Rodney King Artist Reception: Monday January 13, 2025 from 5 p.m.-7 p.m.

Rotating Artist Selection for 2025: The commission reviewed art from artists Kelly Loney, Carlos Lagos, Dr. Johnny Wow, Stephanie Broussard, Ron Pulliam and Hwa Sil Art Studio. Hwa Sil Art Studio had the majority vote for 2nd quarter (8-3). Sally Martinez will ask the Asia Pacific Cultural Center for food and music recommendations. The Hwa Sil 2nd quarter Art Reception will be on Monday, April 7, 2025.

Diane Aoki was selected as the 3rd quarter artist and her reception is on September 15th from 5:00-7:00 pm. The Pierce College Student show is confirmed for 4th quarter and the reception is on Oct. 20th, 2025 from 5:00-7:00pm

Mural Update: Periko the Artist will try to begin the Mural in March when the weather is warmer and dry.

NEXT MEETING

No meeting in February. The next regular meeting of the Arts Commission is scheduled for Monday, March 3, 2025, at 5:00 p.m. in the American Lake Room at Lakewood City Hall, 6000 Main St SW, Lakewood, WA 98499

ADJOURNMENT

There being no further business, the meeting adjourned at 6:04 p.m.

Emily Feleen
Emily Feleen (Mar 4, 2025 09:25 PST)

Emily Feleen, Chair

Sally Martinez

Sally Martinez, Recreation Coordinator

Return to Agenda

TO: Mayor and City Council

FROM: Jeff Gumm, Housing Division Manager

THROUGH: John J. Caulfield, City Manager
Jeff Rimack, PPW Director

DATE: March 17, 2025

SUBJECT: PROPOSED 5-YR CONSOLIDATED PLAN (JULY 1, 2025 – JUNE 30, 2029); FY 2025 ANNUAL ACTION PLAN (AAP); AND ANALYSIS OF IMPEDIMENTS TO FAIR HOUSING CHOICE

ATTACHMENTS: Draft 5-YR 2025-2029 Consolidated Plan; FY 2025 Annual Action Plan; and Public Comments Received to Date

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Background: This memorandum serves multiple purposes:

1) Provides as a brief review of the 5-YR Consolidated Planning process, including the Annual Action Plan and Analysis of Impediments (AI);
2) Reviews CDBG & HOME programs and how these programs are administered between Lakewood and Tacoma as part of the Tacoma-Lakewood Consortium;
3) Reviews expenditures by funding category since the City began receiving funding in 2000;
4) Reviews goals and outcomes associated with the Proposed 5-YR 2025-2029 Consolidated Plan;
5) Introduces Council to the proposed use of CDBG and HOME funds as part of the FY 2025 Annual Action Plan, public participation, and timeline for submittal of the Plan; and
6) Discusses potential uses of CDBG and HOME funds for the remainder of the 5-YR 2025-2029 Consolidated Plan.

Joint Consolidated Plan: Every five years, HUD requires state and local governments to produce a 5-YR Consolidated Plan, an Annual Action Plan, and Analysis of Impediments to Fair Housing Choice to receive federal funding from the Community Development Block Grant (CDBG) and HOME Investment Partnerships Program (HOME).

As a member of the Tacoma-Lakewood HOME Consortium, the FY 2025-29 Consolidated Plan is required to be submitted to HUD as a joint plan between Lakewood and the City of Tacoma. As a joint plan, the document evaluates

shared housing and community development needs and resources across both communities and looks to develop strategies that meet the needs of low- and moderate-income households on a regional Lakewood-Tacoma basis. The Plan is typically developed with broad strokes, allowing flexibility of action to both Tacoma and Lakewood over the five-year period which the plan covers.

Lakewood and Tacoma have contracted with JQUAD Planning Group to assist with the completion of the 5-YR 2025-2029 Consolidated Plan. JQUAD is a Texas-based limited liability company with extensive background in urban planning, the funding and development of affordable housing opportunities, and in the creation of affordable housing and community development strategic plans.

What exactly is the Consolidated Plan and what does it do? The consolidated planning process serves as a framework for identifying a City's long-term housing, homeless, and community development needs and provides a strategic plan for how a community intends to expend CDBG and HOME dollars to meet those needs. The purpose of the Plan is to create a consistent long-term (5-year) vision to carry out activities consistent with HUD's national objectives, which are to: 1) Provide decent housing, 2) Provide a suitable living environment, and 3) Expand economic opportunities. The Plan establishes the framework from which a jurisdiction then focuses its annual expenditure on a specific set of needs and goals identified in the broader 5-YR Plan.

Components of the 5-YR Consolidated Plan include:

- Consultation and Citizen Participation;
- Housing and Homeless Needs Assessment;
- Housing Market Analysis;
- Assessment of Economic and Employment Conditions;
- Assessment of Available Resources;
- Five Year Strategic Plan; and
- Annual Action Plan.

Annual Action Plan: Activities identified as a part of the 5-YR Consolidated Plan are carried out on an annual basis through Annual Action Plans (July 1 – June 30). Annual Action Plans provide specific activities and funding actions to be carried out to meet goals and objectives identified in the 5-YR Plan. Both Lakewood and Tacoma create Annual Action Plans designed to address specific needs as identified in the Consolidated Plan for each community.

For FY 2025, staff is recommending the Annual Action Plan for FY 2025 (July 1, 2025 – June 30, 2026) continue to focus on the preservation of existing affordable housing through the preservation of owner-occupied housing (Major Home Repair program), the development of new affordable rental housing opportunities (ongoing development of LASA's 26-units of affordable rental housing), and support of housing stability and the prevention of homelessness (Emergency Assistance for Displaced Residents and CDBG

Emergency Payments Program). These recommendations in funding continue to build upon successful and effective programs and seek to bridge a funding transition in the second and third year of the Consolidated Plan when the City will begin to transition funding in support of various infrastructure projects serving low-income neighborhoods.

What is an analysis of impediments to fair housing choice? An Analysis of Impediments to Fair Housing Choice (AI) identifies specific impediments or obstacles faced by a jurisdiction's population, especially those faced by low- and moderate-income households. Once identified, the AI then identifies specific goals to ameliorate those impediments, thus ensuring fair housing choice for all of its citizenry.

Examples of Impediments to Fair Housing Choice include:

- Discrimination based upon race, religion, sex, age, etc.;
- Lack of accessible housing stock for persons with disabilities;
- Discriminatory lending policies or practices;
- Lack of infrastructure or access to transportation;
- Zoning or planning policies unfairly restricting the development of affordable housing; and/or
- Access to fair housing information for persons who do not speak English or with limited English-speaking abilities.

As a requirement of funding, each jurisdiction is required to conduct an assessment of impediments to fair housing choice and submit it to HUD along with its 5-YR Consolidated Plan. For 2025, Lakewood and Tacoma will be conducting an update of our existing AI's to reflect current market conditions. This information is not available as part of the report.

CDBG & HOME programs: The 5-YR Consolidated Plan provides broad direction for funding both the CDBG and HOME programs. The City's CDBG programs are administered by City staff as a direct entitlement community; the HOME program is jointly administered with Tacoma serving as the "lead entity." As part of the consortium agreement with Tacoma, the Tacoma Community Redevelopment Authority (TCRA), in consultation with Lakewood, is authorized to review Lakewood's (HOME) housing loans and proposals for housing development projects and make funding decisions based on projects which meet the lending criteria of the TCRA; however, TCRA generally defers to Lakewood on which housing projects it wishes to fund. The TCRA funds Lakewood projects out of Lakewood's portion of the grant.

CDBG funds must be used to meet specific HUD national objectives and may be used to fund activities benefiting low- and moderate-income individuals. Eligible funding categories include:

- Housing;
- Public Services;
- Physical/Infrastructure Improvements; and
- Economic Development.

CDBG funds carry various programmatic regulations which can be found at 24 CFR 570. CDBG carries two specific funding caps: 1) administrative expenses may not exceed 20% of the current entitlement allocation and program income; and 2) public service activities may not exceed 15% of the current entitlement allocation, plus 15% of the preceding year's program income. Additionally, 70% of CDBG funding must be used to benefit low- and moderate- income individuals over a one-, two- or three-year period. CDBG funding faces an annual timeliness test (May 1st) to ensure funds in the jurisdiction's federal line-of-credit do not exceed 1.5 times the annual grant for its current program year.

HOME funds must be used to create safe, decent, affordable housing opportunities for low- and moderate-income individuals. Eligible activities include:

- Single family housing construction or rehabilitation;
- Multifamily construction and rehabilitation;
- Homebuyer activities (down payment assistance); and
- Tenant-based rental assistance.

HOME funds carry various programmatic regulations which can be found at 24 CFR Part 92. Funds received must be committed to an eligible activity within two years and must be expended within four years. Lakewood qualifies for HOME funding through the consortium process as a member of the Tacoma-Lakewood HOME consortium.

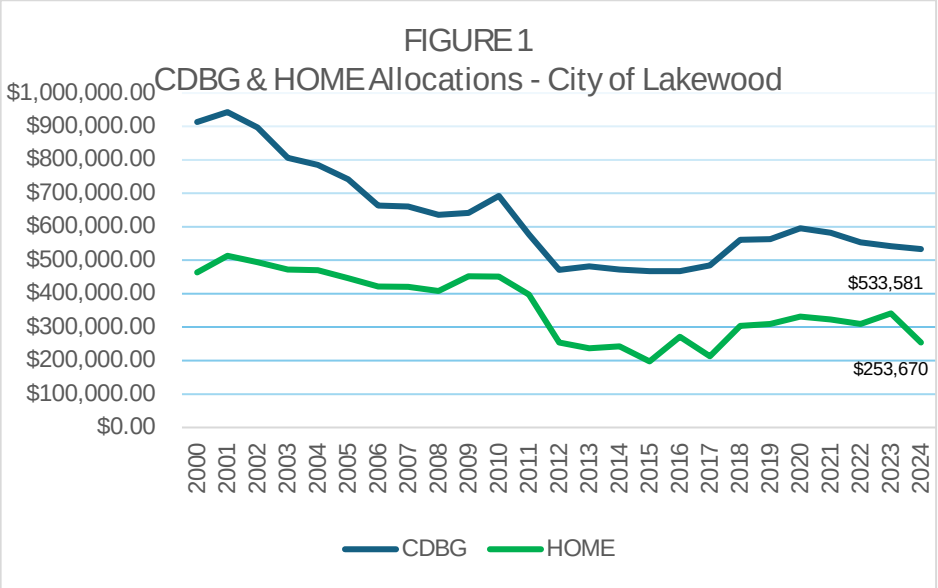
Lakewood's historical CDBG expenditures. Table 1 outlines Lakewood CDBG expenditures from 2000 to date.

TABLE 1
CDBG Expenditure by Funding Priority (including Program Income*)

Year	Physical/ Infrastructure	Housing	Public Service	Economic Development	Administration	Section 108 Loan Payment	CDBG-CV 1, 2 & 3
2000	$537,860.10	$102,275.13	$34,030.65	$0.00	$103,618.22	$0.00	N/A
2001	$250,286.87	$126,611.96	$60,022.92	$0.00	$153,428.50	$0.00	N/A
2002	$451,438.00	$357,309.63	$78,145.68	$0.00	$144,068.86	$0.00	N/A
2003	$399,609.05	$350,528.50	$76,294.76	$0.00	$161,200.00	$0.00	N/A
2004	$294,974.47	$407,591.69	$80,490.00	$0.00	$136,552.91	$0.00	N/A
2005	$86,156.39	$359,033.03	$68,336.00	$0.00	$130,879.53	$0.00	N/A
2006	$164,000.00	$486,607.03	$70,645.37	$0.00	$99,091.68	$0.00	N/A
2007	$0.00	$427,346.00	$66,380.17	$0.00	$96,940.46	$0.00	N/A
2008	$9,871.81	$412,526.83	$66,818.21	$0.00	$108,065.99	$0.00	N/A
2009	$20,000.00	$433,021.09	$64,920.04	$0.00	$127,986.46	$0.00	N/A
2010	$522,544.00	$133,536.78	$84,394.14	$31,947.85	$131,686.11	$0.00	N/A
2011	$185,481.69	$268,584.51	$86,187.73	$0.00	$123,853.80	$0.00	N/A
2012	$0.00	$280,854.87	$34,701.05	$0.00	$100,871.31	$0.00	N/A
2013	$284,851.80	$301,829.41	$3,545.40	$13,229.84	$98,881.36	$0.00	N/A
2014	$160,000.00	$188,138.86	$48,065.71	$0.00	$108,853.98	$0.00	N/A

TABLE 1 CDBG Expenditure by Funding Priority (including Program Income*)							
2015	$320,000.00	$94,747.21	$0.00	$0.00	$98,363.40	$0.00	N/A
2016	$321,937.57	$164,351.72	$0.00	$0.00	$106,967.67	$0.00	N/A
2017	$270,492.80	$101,003.36	$0.00	$0.00	$96,106.18	$49,311.26	N/A
2018	$300,000.00	$220,546.92	$0.00	$0.00	$102,580.28	$49,812.66	N/A
2019	$0.00	$362,134.88	$0.00	$0.00	$122,805.49	$48,224.75	$807,337.00
2020	$0.00	$725,297.27	$0.00	$0.00	$106,919.53	$0.00	N/A
2021	$306,759.20	$391,037.05	$3,000.00	$0.00	$136,745.24	$0.00	$136,706.00
2022	$0.00	$436,203.91	$94,250.00	$0.00	$118,210.50	$0.00	N/A
2023	$0.00	$161,180.23	$75,213.01	$0.00	$100,849.02	$0.00	N/A
2024	$0.00	$44,223.80	$23,296.69	$0.00	$66,471.71	$0.00	N/A
2025 proposed	$0.00	$446,093.45	$45,000.00	$0.00	$105,000.00	$0.00	N/A
TOTAL TO DATE	$4,886,263.75	$7,336,612.23	$1,118,737.53	$45,177.69	$2,881,998.19	$147,348.67	$944.043.00
*Program Income Included in Total	*0.00*	*$996,539.09*	*$5,621.45*	*$10,179.52*	*$272,622.24*	*$0.00*	*$0.00*

CDBG & HOME Allocations 2000 to 2024: CDBG and HOME funding allocations have seen a consistent decline since 2001 when the City received a peak of $943,000 in CDBG and $513,009 in HOME funding. See Figure 1 below for historical funding trends:



What are the five-year goals and objectives identified in the 5-YR 2025-2029 Consolidated Plan? The 5-YR Plan identified five goals to address over the next five years, each a high priority:

- Advance economic development and equity;
- Prevent/reduce homelessness and housing instability;
- Support diverse rental and homeowner opportunities;

- Support public infrastructure improvements; and
- Stabilize existing residents and neighborhoods.

The goals established in the Plan were set broadly to accommodate a wide variety of activities over the coming 5-year period. Additionally, the goals must account for the differing funding goals and activities the City of Tacoma and the City of Lakewood intend to fund moving forward as part of the HOME Consortium.

Table 2 provides a brief description of the goals and outcomes proposed under the 5-YR 2025-2029 Consolidated Plan.

TABLE 2
GOALS AND OUTCOMES ESTABLISHED FOR 5-YR 2020-24 PLAN

GOALS	Measure	# Proposed	Activities
Advance economic development and equity	Businesses Assisted/Jobs Created	0	Tacoma Goal
Prevent/reduce homelessness & housing instability	Homeowner Housing Units Rehabilitated	20	Major Home Repair; SHB-1406 Repair
	Public Service Activities- Persons	60	CDBG Emergency Assistance Payments
	Homelessness Prevention- Persons	90	Emergency Assistance for Displaced Residents
	Tenant-Based Rental Assistance- Persons	150	HOME Tenant -Based Rental Assistance- Security/Rental Deposit Program
Support diverse rental & homeowner opportunities	Homeowner Housing Units Added- Households	8	Homeownership Center NW- 9006 Washington Blvd. SW; Habitat for Humanity- future project(s)
	Rental Units Constructed- Households	5	LASA Gravelly Lk. Commons- HOME & HOME-ARP units only
Support public infrastructure improvements	Public Infrastructure- Persons	20,910	2026- Foster Rd. Improvements; 2027-28- Seminole Rd. Improvements; 2029- Pine St. S. Improvements
Stabilize existing residents and neighborhoods	Buildings Demolished	15	NSP1 Abatement Activities

Projected funding allocations for FY 2025 CDBG and HOME programs:
Staff is projecting funding allocations for the CDBG and HOME programs as the budget for HUD as not yet been announced. Typically, this process takes about 30-60 days after budget approval for HUD to run its programmatic formulas and to notify jurisdictions of program funding allocations. The City is estimating CDBG and HOME funding based on historical trends of decreasing funding (with the state of the current budget, staff would not be

surprised if we were to see more significant cuts). Estimated funding allocations are as follows:

1) CDBG: **$525,000** (1.6% decrease from FY 2024 allocation of $533,581)
2) HOME: **$250,000** (1.4% decrease from FY 2024 allocation of $253,670)

Funding priority recommendation for CDBG for FY 2025 Annual Action Plan (first year of 5-YR Plan): Staff is recommending a stay of course for the initial year of the new 5-YR 2025-2029 Plan as Public Works is unable to pivot from its existing construction schedule to accommodate any potential CDBG projects, and Parks is in the process of developing plans to improve multiple parks, including the development of the downtown park and Edgewater Park. Staff has discussed CDBG funding with Public Works and Parks to identify potential partnerships with CDBG and have concluded the first project, Foster Rd. SW improvements (Edgewater Park roadway improvements) could potentially be funded in 2026-2027, the second year of the Plan. Additionally, CDBG funding has been contemplated for roadway improvements on Pine St. S. (off 84th St. S) in the fourth year of the Plan, and Seminole Rd. SW (Tyee Park Elementary access) in the final year of the plan.

By phasing the funding approach between housing and infrastructure improvements over the five-year period, staff believe CDBG funding will have a better chance of remaining timely, all while remaining flexible enough to pivot funding should an infrastructure project run long or require additional funding.

Proposed CDBG funding allocations consistent with the new 5-YR 2025-2029 Consolidated Plan are listed in Table 3 below.

TABLE 3
CDBG FUNDING RECOMMENDATIONS – FY 2025

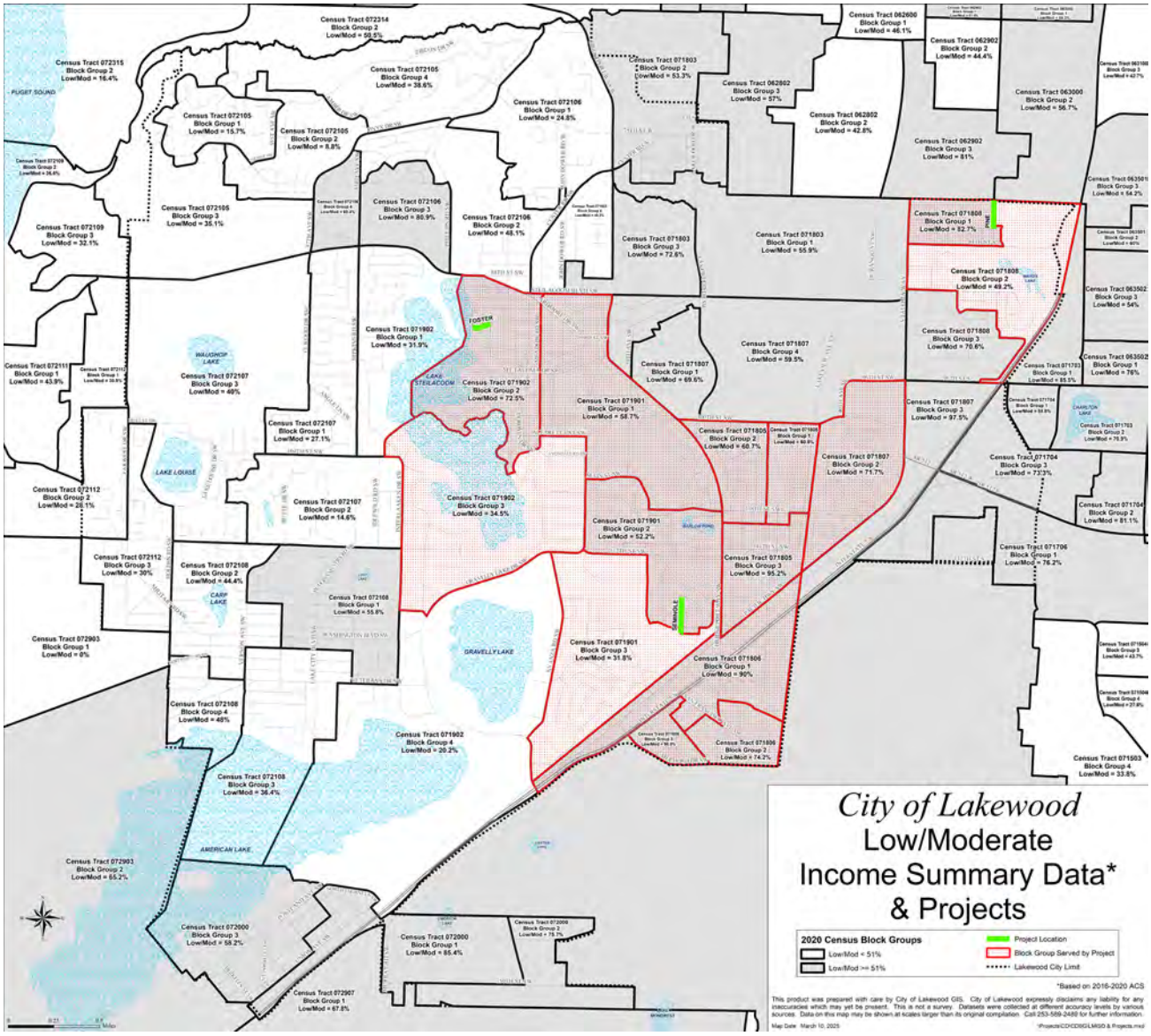
	CDBG	Program Income	Reprogram	TOTAL	Consistent With 5-YR Goal
Housing – Major Home Repair	$325,000	$100,000	$71,093.45	$496,093.45	Prevent/reduce homelessness & housing instability. Homeowner units rehabilitated- 4-8 households.
Housing – Emergency Assistance for Displaced Residents.	$35,000	$0	$0	$35,000	Prevent/reduce homelessness & housing instability. Homeless prevention- 15-20 individuals.
Services – CDBG Emergency Payments Program	$45,000	$0	$0	$45,000	Prevent/reduce homelessness & housing instability. Public Service activities and Homeless prevention- 40

					individuals.
CDBG Admin of HOME Housing Services	$15,000	$0	$0	$15,000	Support diverse rental & homeowner opportunities. Homeowner/renter housing added- 5 new HOME units.
Administration	$105,000	$0	$0	$105,000	Administration
NSP1 Abatement Program	$0	$292,000	$0	$292,000	Stabilize existing residents and neighborhoods. Buildings demolished- 5-10 buildings.
Total Funding	**$525,000**	**$392,000***	**$71,093.45****	**$988,093.45**	

**Program Income: The City anticipates approx. $100,000 in program income in repayments from the Major Home Repair Revolving Loan Fund and NSP1 Abatement Fund ($292,000). Program income will be used in accordance with HUD's requirements for RLF funds and shall be used to fund similar activities.*
***Reprogramming unexpended FY 2021 Fair Housing Counseling, Activity #233 ($47,000); and FY 2023 Administration, Activity #244 ($24,093.45).*

Where are the proposed infrastructure projects located? Figure 2 below identifies the location and estimated service area for each of the proposed roadway improvement projects.

FIGURE 2



Funding priority recommendation for HOME for FY 2025 Annual Action Plan (first year of 5-YR Plan): For FY 2025, staff is recommending the Council approve $104,995 in HOME program income to be used to implement a tenant-based rental assistance program offering one-time, rental deposit assistance to low-income households who are unable to move into stable housing due to the large initial rental deposits due. Staff fields multiple calls regarding this barrier for households on a weekly basis. Additionally, staff have heard from various housing providers and citizens during our public hearings that this remains an unfunded barrier to many. If funded, the City would develop the program guidelines and then partner with a providing agency who would complete client intakes, submit clients to the City for approval, and make payments to housing providers. We estimate approximately 40-60 persons (20 – 30 households) could be assisted with obtaining stable housing. With construction budgets and property valuations continuing to rise, staff anticipate the City could only partially

assist with the construction of one new single-family home or rental with the same $104,995.

In FY 2020-2022, the City conducted a similar emergency tenant-based rental assistance program with $655,892.63 in CDBG-CV3[1] funding and assisted a total of 178 households and 417 people.

Proposed HOME funding allocations consistent with the new 5-YR 2025-2029 Consolidated Plan are listed in Table 4 below.

TABLE 4
HOME FUNDING RECOMMENDATIONS – FY 2025

	HOME	Program Income	TOTAL	Consistent With 5-YR Goal
Affordable Housing Fund	$225,000	$100,000	$325,000	Support diverse rental & homeowner opportunities.
Tenant-based Rental Assistance	$0	$104,995	$104,995	Prevent/reduce homelessness & housing instability. TBRA Rental Deposits 40-60 persons.
Administration (Tacoma 10%)	$25,000	$0	$25,000	Administration
Total Funding	**$250,000**	**$204,995***	**$429,995**	

**Program Income: Program income received from prior year repayments as part of the HOME Affordable Housing Fund. Program income will be used in accordance with HUD's requirements for RLF funds and shall be used to fund similar activities.*

5-YR 2025-2029 Consolidated Plan timeline. Table 5 provides milestones and upcoming actions relating to the 5-YR 2025-2029 Consolidated Plan.

TABLE 5
CDBG/HOME TIMELINE – 5-YR 2025-2029 CONSOLIDATED PLAN

Date	Action
October 2024 – January 2025	Online survey for 5-YR Consolidated Plan. Conduct Needs Assessment of housing and community development needs. Conduct Market Analysis including housing and economic trends, barriers to affordable housing and population demographics.
October 16, 2024	Presentation to CSAB on 5-YR planning process.
November 13, 2024	Initial public hearing on 5-YR Consolidated Plan process before Human Services Community Collaboration monthly meeting.
November 20, 2024	Presentation to Neighborhood Connections Leadership Group on 5-YR Planning process.

[1] CDBG-CV3 was part of the Coronavirus Aid, Relief, and Economic Security (CARES) Act. Congress funded a total of $5 billion for the CDBG program to be allocated to the States. Lakewood received $807,337 in CDBG-CV3 funding through Washington State.

TABLE 5 CDBG/HOME TIMELINE – 5-YR 2025-2029 CONSOLIDATED PLAN	
Date	**Action**
December 2, 2024	Presentation to Youth Council on 5-YR Planning process.
December 3, 2024	Second public hearing on 5-YR Consolidated Plan before housing and services providers, governmental and quasi-governmental organizations, schools, fire, water, Health Department, and County utilities.
December 4, 2024	Presentation to Planning Commission on 5-YR planning process.
January 21, 2025	Council Study session on 5-YR planning process and 2025 AAP. City Council strategy session with consultant- JQUAD Planning Group.
March 17, 2025	***Council review of draft 5-YR Consolidated Plan, 2025 AAP and AI.***
March 19, 2025	CSAB review of draft 5-YR Consolidated Plan, 2025 AAP and AI.
April 1 – April 30, 2025	Citizen 30-day review and comment period.
April 21, 2025	Lakewood City Council public hearing on the Draft 5-YR Consolidated Plan and 2025 AAP.
April 22, 2025	Tacoma City Council public hearing on the Draft 5-YR Consolidated Plan and 2025 AAP.
May 5, 2025	Lakewood City Council adopts 5-YR Consolidated Plan & 2025 Annual Action Plan.
May 6, 2025	Tacoma City Council adopts 5-YR Consolidated Plan & 2025 Annual Action Plan.
May 15, 2025	Lakewood/Tacoma submit 5-YR 2025-29 Consolidated Plan, 2025 Annual Action Plan, and AI to HUD.
July 1, 2025	Begin new program year.

Next Steps:

1) Council may wish to alter CDBG or HOME funding recommendations or goals provided in Tables 3 and 4;
2) Conduct a 30-day public comment period (April 1 – April 30, 2025) and public hearing before Council on April 21st regarding the proposed 5-YR 2025-2029 Consolidated Plan and FY 2025 Annual Action Plan;
3) Evaluate public input received during the 30-day comment period and April 21st public hearing; update recommendations to Council, if necessary; and
4) Submit 5-YR 2025-2029 Consolidated Plan and FY 2025 Annual Action Plan to HUD on May 15, 2024.

EXECUTIVE SUMMARY

ES-05 EXECUTIVE SUMMARY – 24 CFR 91.200(C), 91.220(B)

1. Introduction

A Consolidated Plan is a strategic document prepared by participating jurisdictions receiving HUD entitlement funding. Entitlement communities, including Lakewood, Washington, in accordance with the U.S. Department of Housing and Urban Development (HUD) regulations, must complete this process and submit plan every 5 years. As an entitlement community, Lakewood must prepare and submit both the Consolidated Plan and Annual Action Plan to HUD. This entitlement status and requisite plan enables Lakewood to receive formula grant assistance from HUD for various programs, including the Community Development Block Grant (CDBG), the HOME Investment Partnership Program (HOME), and other funding.

5-Year Consolidated Plan

The Consolidated Plan, submitted to HUD every five years, is created as a result of a collaborative process involving local government, community, residents, industry, economic development, and nonprofit organizations. It incorporates assessing current housing and community development conditions, public participation and input, analyzing available resources, and identifying priority needs, area needs, and funding priorities. The plan ensures that the proposed strategies align with Lakewood residents' specific needs and aspirations.

1-Year Annual Action Plan

The Annual Action Plan, which complements the Consolidated Plan, is developed and submitted to HUD annually and provides a detailed breakdown of how allocated funds will be utilized in the upcoming 5 years. It outlines specific activities, projects, and programs that will be undertaken to address the identified needs and achieve the established goals. The Action Plan allows for flexibility, allowing adjustments and modifications in annual allocations received from HUD on an annual basis in response to changing circumstances and emerging priorities.

The success of the Consolidated Plan relies on collaboration among various stakeholders, including local and regional government agencies, community organizations, business and industry, nonprofits, and residents. By fostering partnerships and engaging in joint efforts, the plan aims to leverage collective resources and expertise to maximize the impact in the community.

2. Summary of the objectives and outcomes identified in the Plan Needs Assessment Overview

Housing Needs and Objectives

Stakeholders emphasized the critical need for affordable housing units, particularly for families, seniors, and veterans. Key objectives include:

- Expanding the stock of affordable housing through partnerships with local organizations.
- Preserving existing housing through rehabilitation programs and extending affordability restrictions for subsidized units at risk of expiring.
- Providing emergency rental and utility assistance to prevent displacement.
- Developing accessible housing for seniors and disabled individuals to promote aging in place.
- Leveraging and expanding resources to support housing initiatives.

Infrastructure and Public Facilities

Stakeholders highlighted the need for transportation upgrades, sustainable stormwater systems, and expanded public spaces. Objectives include:

- Enhancing multimodal transportation networks, including ADA-compliant sidewalks, improved roadways, and streetlighting improvements.
- Modernizing public facilities such as libraries, parks, and community centers to ensure accessibility and sustainability.
- Resilient infrastructure addressing climate challenges, neighborhood revitalization, flood mitigation, and energy-efficient designs.

Public Services

- Increasing access to mental and behavioral health care, programs for youth and disadvantaged populations, and housing and homelessness services.
- Enhancing food security through partnerships with local organizations.

- Providing tailored support for vulnerable groups, including LGBTQ+ youth and individuals with disabilities.

Addressing Disproportionate Needs

Housing problems among racial and ethnic groups, particularly for Black, Hispanic, and Pacific Islander households. Objectives include:

- Implementing culturally competent housing outreach programs.
- Expanding access to affordable housing in Opportunity Zones to mitigate gentrification risks.
- Support fair housing policies that assist everyone in finding an affordable and suitable place to live,

3. Evaluation of past performance

Over the last five years of the Consolidated Plan, Lakewood rehabilitated and preserved numerous housing units, provided critical rental and mortgage assistance, and supported infrastructure improvements that benefitted thousands of residents. Key achievements included creating or retaining jobs through targeted economic programs, assisting vulnerable households with homelessness prevention services, and advancing major affordable housing projects, such as partnerships with Habitat for Humanity and LASA. Notably, the City effectively adapted to the challenges posed by the COVID-19 pandemic, redirecting resources to emergency rental assistance and business grants.

2019 Performance

- **Affordable Housing**:
  - Assisted 36 low/moderate-income households with housing benefits (300% completion of the annual goal).
  - Rehabilitated 38 homeowner housing units (146% of the goal).
  - Added one new housing unit and demolished three unsafe structures.
- **Community Development**:
  - Supported infrastructure improvements benefiting over 30,000 residents.
  - Created 16 jobs through economic opportunity programs.
- **Homelessness Prevention**:
  - Provided assistance to eight individuals, achieving 40% of the goal.

- Initiated emergency relocation programs aiding three displaced households.

2020 Performance

- **COVID-19 Response**:
  - Provided rental and mortgage assistance to 113 households (226% of the annual goal).
  - Supported 38 jobs through emergency business grants.
- **Affordable Housing**:
  - Rehabilitated eight housing units, achieving 80% of the program year goal.
- **Homelessness Prevention**:
  - Assisted five individuals and redirected priorities to address pandemic-related impacts.
- **Economic Development**:
  - Supported 15 small businesses, creating or retaining jobs for low-income residents.

2021 Performance

- **Affordable Housing**:
  - Maintained focus on housing rehabilitation, completing eight projects.
  - Supported 121 households with emergency rental assistance.
- **Homelessness Services**:
  - Provided relocation assistance to nine households and initiated large-scale planning for transitional housing developments.
- **Community Infrastructure**:
  - Improved sidewalks, benefiting 5,345 residents

2022 Performance

- **Affordable Housing**:
  - Rehabilitated 19 housing units and supported 415 households with tenant-based rental assistance.
  - Completed rehabilitation of 64 rental units, sustaining 100% of planned housing stock.
- **Homelessness and Support Services**:

- Assisted 87 individuals with emergency payments.
- Provided homelessness prevention services to 517 individuals, achieving over 1,000% of the annual target.

- **Public Facilities**:
  - Undertook rehabilitation and enhancement projects to improve living conditions in affordable rental housing.

2023 Performance

- **Affordable Housing**:
  - Added one homeowner housing unit and rehabilitated six housing units.
  - Continued progress on major projects, including Habitat for Humanity and LASA's 26-unit development.
- **Homelessness and Services**:
  - Supported 560 individuals with homelessness prevention efforts (1,120% of annual goal).
  - Assisted 45 individuals with public service activities benefiting vulnerable populations.
- **Community Investments**:
  - Allocated significant resources to public infrastructure improvements and emergency payment programs.

2024 Performance

- While still underway, the City is on track to meet its goals identified in the 5-YR 2020-2024 Consolidated Plan.

4. Summary of citizen participation process and consultation process

Multiple meetings were held, including sessions with Lakewood agencies like the Tacoma-Pierce County Health Department, Pierce County Housing Authority, Tacoma Pierce County Affordable Housing Consortium, and the Fair Housing Center of Washington: department staff, youth councils, and service providers. Feedback was collected through an online survey and open forums, targeting specific groups such as low-income households, seniors, and minority populations. Focused discussions were held with underrepresented groups, including youth, veterans, and the elderly, to capture unique perspectives on housing barriers and service gaps.

5. Summary of public comments

To Be Completed After the 30-day comment period and Hearing.

6. Summary of comments or views not accepted and the reasons for not accepting them

All comments were considered and/or incorporated into the Consolidated Plan.

7. Summary

THE PROCESS

PR-05 LEAD & RESPONSIBLE AGENCIES - 91.200(B)

1. Describe the agency/entity responsible for preparing the Consolidated Plan and those responsible for the administration of each grant program and funding source

The following are the agencies/entities responsible for preparing the Consolidated Plan and those responsible for the administration of each grant program and funding source.

Agency Role	Name	Department/Agency
CDBG Administrator	LAKEWOOD	Planning & Public Works

Table 1 – Responsible Agencies

Narrative

The City of Tacoma acts as the lead agency for HOME Investment Partnership Act (HOME) funding received through the Tacoma-Lakewood HOME Consortium, with Lakewood acting as a consortium member. The City of Lakewood acts as the lead agency for Community Development Block Grant (CDBG) funding, which is received directly from the U.S. Department of Housing and Urban Development.

Consolidated Plan Public Contact Information

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PR-10 CONSULTATION - 91.100, 91.110, 91.200(B), 91.300(B), 91.215(L) AND 91.315(I)

1. Introduction

The City of Lakewood conducts multiple public hearings during the development process before the Consolidated Plan and the Action Plan is published, including at least one public hearing during the 30-day comment period to obtain citizens' views and to respond to comments and questions. The City also sends letters to various State and local groups, departments, and organizations as part of the consultation process. The 2025 – 2029 Consolidated Plan included consultation with the City of Tacoma, Pierce County, Pierce County Continuum of Care, Pierce County Housing Authority, Tacoma Housing Authority, Living Access Support Alliance (LASA), Tacoma/Pierce County Habitat for Humanity, Rebuilding Together South Sound, South Sound Housing Affordability Partners, Tacoma/Pierce County Affordable Housing Consortium, Fair Housing Center of Washington, Tacoma-Pierce County Health Department, and other stakeholders as provided in the Plan.

Provide a concise summary of the jurisdiction's activities to enhance coordination between public and assisted housing providers and private and governmental health, mental health, and service agencies (91.215(l)).

As part of the planning process, the City of Lakewood established a community advisory board to provide public oversight, comment on the process, and review funding recommendations for both the CDBG and HOME programs. As part of the development of the 5-YR Consolidated Plan (2025-2029), the City solicited input through interviews, meetings, and public hearings to determine community needs, priorities, and approaches to meeting those needs. Since

the development of the 5-Year Plan, the City has continued to consult with many of the agencies and organizations originally polled.

The Pierce County Housing Authority and the Tacoma Housing Authority continue to work closely with the cities of Lakewood and Tacoma, coordinating efforts to improve housing choices for low-income households in both communities. Additionally, local housing and services providers such as LASA, Greater Lakes Mental Health, Tacoma-Pierce County Habitat for Humanity, Associated Ministries, Tacoma/Lakewood/Pierce County Continuum of Care, South Sound Housing Affordability Partners, and the Tacoma/Pierce County Affordable Housing Consortium among others continue to provide input and support for mental health, services, and housing options in Lakewood, Tacoma, and throughout Pierce County.

As part of the City's human services funding process, monthly coalition meetings are held at the City to bring together non-profits, service providers, and governmental agencies to help determine and better understand the need for housing and human services in Lakewood and throughout Pierce County. Coordination through the South Sound Military and Communities Partnership (SSMCP) continues an ongoing partnership with Joint Base Lewis McChord to understand better what level of assistance military personnel and veterans are experiencing in terms of housing needs, health and human services, and mental health care assistance.

Lakewood sought internal comments from city departments on housing and community development needs and services for low-income and special-needs populations. On a regional level, the consolidated planning process involved consultation with Pierce County Community Connections, the City of Tacoma, United Way of Pierce County, Pierce County Housing Authority, Tacoma Housing Authority, Tacoma-Pierce County Habitat for Humanity, the Homeownership Center of Tacoma, LASA, South Sound Housing Affordability Partners, Tacoma/Pierce County Affordable Housing Consortium, Lakewood Community Services Advisory Board, Tacoma/Lakewood/Pierce County Continuum of Care, Tacoma-Pierce County Health Department, local school districts, police and fire departments, and the State of Washington, to understand better the needs of at-risk populations such as homeless families with children, single-parent households, victims of domestic violence, individuals with disabilities, ethnic minorities, and the elderly.

The plan describes additional efforts to enhance and coordinate efforts between housing, health, and service providers.

Describe coordination with the Continuum of Care and efforts to address the needs of homeless persons (particularly chronically homeless individuals and families, families with children, veterans, and unaccompanied youth) and persons at risk of homelessness.

The cities of Tacoma and Lakewood are actively engaged members of the Tacoma/Lakewood/Pierce Continuum of Care Committee. The three jurisdictions are the most involved governmental entities in the Continuum, cooperatively working on programs to meet needs for housing and services. Both Tacoma and Lakewood support the Continuum's priorities, focusing on the needs of the most vulnerable populations, including chronically homeless persons, unaccompanied youth, families with children, and veterans, among others. The mission of the Continuum of Care is to promote a community-wide commitment to ending homelessness through policy and resource alignment by implementing activities to achieve the goals and objectives of the Plan to End Homelessness.

In recent years, the Continuum has moved from a single point of access, or centralized intake, to that of a coordinated entry system providing many points of entry. This system, when coupled with an active diversion program known as Housing Solutions Conversations, aims to keep those in housing crisis from entering the system by supporting their identification of a solution and prioritizing them for a specific housing referral based on their vulnerabilities and the severity of their barriers to secure housing. Through this partnership and implementation of the Five-Year Plan to Address Homelessness, a countywide commitment is made to ensure all persons facing homelessness have access to shelter and support, no matter their social or economic circumstances or where they live within Pierce County.

As housing prices and market-rate rents continue to rise at alarming rates, further destabilizing housing affordability and limiting housing options for low- and moderate-income households, this coordinated and cooperative effort to ensure affordable housing stability and access to a safe home endures as a realistic and attainable goal for all in our community.

Describe consultation with the Continuum(s) of Care that serves the jurisdiction's area in determining how to allocate ESG funds, develop performance standards and evaluate outcomes, and develop funding, policies, and procedures for the administration of HMIS.

The Cities of Tacoma and Lakewood work closely with the Collaborative Applicant of the Continuum of Care (Pierce County) in planning the allocation and use of Emergency Solutions Grant (ESG) funds. ESG policies and procedures were created and are updated periodically in cooperation with Pierce County and Tacoma to ensure that ESG subrecipients are operating programs consistently across eligible activities. Both entities review performance. Pierce County, as the HMIS lead, works closely with the City of Tacoma to maximize the use of HMIS resources and to draw data for reports on project performance and program outcomes. The City of Lakewood does not receive ESG funding.

2. Describe Agencies, groups, organizations, and others who participated in the process and describe the jurisdiction's consultations with housing, social service agencies, and other entities.

Table 2 – Agencies, groups, and organizations that participated

1	**Agency/Group/Organization**	City of Tacoma
	Agency/Group/Organization Type	Other government - Local
	What section of the Plan was addressed by Consultation?	Housing Need Assessment Public Housing Needs Homeless Needs - Chronically homeless Homeless Needs - Families with children Homelessness Needs - Veterans Homelessness Needs - Unaccompanied youth Homelessness Strategy Non-Homeless Special Needs Market Analysis Economic Development Anti-poverty Strategy Lead-based Paint Strategy
	Briefly describe how the Agency/Group/Organization was consulted. What are the anticipated outcomes of the consultation or areas for improved coordination?	As the lead member of the Tacoma-Lakewood HOME Consortium, Tacoma remains a key partner in the development and implementation of the consolidated planning process. The City of Tacoma was consulted in the development of priorities and strategies designed to meet the various community and economic development needs identified in this Plan. Lakewood and Tacoma will continue to coordinate their efforts to ensure the goals and outcomes identified in the 5-YR Consolidated Plan (2025-2029) are satisfied.

2	**Agency/Group/Organization**	Pierce County Community Connections
	Agency/Group/Organization Type	Other government - County
	What section of the Plan was addressed by Consultation?	Housing Need Assessment Public Housing Needs Homeless Needs - Chronically homeless Homeless Needs - Families with children Homelessness Needs - Veterans Homelessness Needs - Unaccompanied youth Homelessness Strategy Non-Homeless Special Needs Market Analysis Economic Development Anti-poverty Strategy Lead-based Paint Strategy

	Briefly describe how the Agency/Group/Organization was consulted. What are the anticipated outcomes of the consultation or areas for improved coordination?	Pierce County Community Connections is a partner agency in a regional effort to end homelessness, encourage community and economic development efforts benefitting low-income individuals, to expand safe, decent, affordable housing, and in the provision of public and human services to individuals in need. As a recipient of CDBG, HOME, and ESG funding, the County is a natural partner with the cities of Lakewood and Tacoma in determining a regional approach to housing and community development activities. Pierce County is actively engaged in a funding partnership with Lakewood to fund the development of 26 new units of affordable rental housing in the Lakewood downtown core.
3	**Agency/Group/Organization**	Pierce County Continuum of Care
	Agency/Group/Organization Type	Regional organization Regional Continuum of Care
	What section of the Plan was addressed by Consultation?	Housing Need Assessment Public Housing Needs Homeless Needs - Chronically homeless Homeless Needs - Families with children Homelessness Needs - Veterans Homelessness Needs - Unaccompanied youth Homelessness Strategy Non-Homeless Special Needs

	Briefly describe how the Agency/Group/Organization was consulted. What are the anticipated outcomes of the consultation or areas for improved coordination?	Tacoma, Lakewood, and Pierce County all take active rolls on the Continuum of Care Committee. The goal of the Continuum is to promote community wide commitment to ending homelessness through policy and resource alignment by implementing activities to achieve the goals and objectives of the Plan to End Homelessness. Members of the Continuum strive to ensure all persons facing homelessness have critical access to shelter and support designed to make homelessness a brief event.
4	**Agency/Group/Organization**	Pierce County Housing Authority
	Agency/Group/Organization Type	PHA
	What section of the Plan was addressed by Consultation?	Housing Need Assessment Public Housing Needs Homelessness Strategy Market Analysis Anti-poverty Strategy

	Briefly describe how the Agency/Group/Organization was consulted. What are the anticipated outcomes of the consultation or areas for improved coordination?	The Pierce County Housing Authority (PCHA) is a vital partner to the City of Lakewood in its efforts to increase and preserve affordable housing options for low-income households. PCHA manages a number of programs such as scattered site public housing, Section 8 vouchers, and enterprise fund apartments to provide housing stability to many low-income Lakewood households. As an operator and developer of affordable housing serving in excess of 5,000 individuals, the housing authority was consulted to provide information on the need for public housing in Lakewood and in greater-Pierce County. As recently as FY 2022, Lakewood partnered with PCHA to fund the rehabilitation of two low-income public housing complexes within the City of Lakewood - Village Square and Oakleaf Apartments, serving 64 total households. Additionally, PCHA will provide housing vouchers to LASA for two low-income households at LASA's new 26-unit rental development in Lakewood.
5	**Agency/Group/Organization**	Tacoma Pierce County Habitat for Humanity
	Agency/Group/Organization Type	Housing

	What section of the Plan was addressed by Consultation?	Housing Need Assessment Homeless Needs - Families with children Homelessness Needs - Veterans Non-Homeless Special Needs Market Analysis Anti-poverty Strategy.

	Briefly describe how the Agency/Group/Organization was consulted. What are the anticipated outcomes of the consultation or areas for improved coordination?	Tacoma/Pierce County Habitat for Humanity remains an integral part of Lakewood's approach to providing safe, decent, affordable housing to low-income households in Lakewood and Tacoma. Lakewood recognizes the crucial link between wealth building and homeownership, especially for minority and low-income households. Consultation with the agency focused on housing need, market analysis, anti-poverty strategy, veteran housing opportunities, and special needs housing. Lakewood looks forward to ongoing and continued coordination with Habitat as it seeks to expand affordable housing options for low-income families and make much needed improvements to distressed communities through redevelopment activities focused on replacing older blighted homes with newly constructed affordable single-family homes. As housing and land prices continue to spiral, the City and Habitat have begun to explore land trust models to ensure investments in affordable housing continue for generations to come. In 2024-25, Habitat will bring eight newly constructed homes in the Tillicum neighborhood online for low-income homeownership opportunities.
6	**Agency/Group/Organization**	LASA

	Agency/Group/Organization Type	Housing Services - Housing Services-homeless
	What section of the Plan was addressed by Consultation?	Housing Need Assessment Homeless Needs - Chronically homeless Homeless Needs - Families with children Homelessness Needs - Veterans Homelessness Needs - Unaccompanied youth Homelessness Strategy

	Briefly describe how the Agency/Group/Organization was consulted. What are the anticipated outcomes of the consultation or areas for improved coordination?	LASA was consulted as part of the planning process to better define and understand the scope and type of homeless need in Pierce County. LASA continues to be an integral provider in the fabric of homeless services and housing assistance to the homeless and those at risk of homelessness. With LASA's ongoing partnerships with the Pierce County and Tacoma Housing Authorities, and operation of housing and services facilities for the homeless, LASA is uniquely positioned to understand and assist the homeless population in Lakewood and Pierce County. Partnership and coordination with LASA allow Lakewood a better understanding of the needs of those living at or below the poverty rate, as well as what seems to be an ever-increasing demand for homeless services. Partnerships include the recent expansion of the client services facility to include showers, laundry and bathroom facilities at LASA downtown headquarters. In 2025, LASA will begin construction of 26 new affordable rental units located in the downtown core.
7	**Agency/Group/Organization**	South Sound Housing Affordability Partners
	Agency/Group/Organization Type	Housing Regional Organization

	What section of the Plan was addressed by Consultation?	Housing Need Assessment Non-Homeless Special Needs Market Analysis Anti-poverty Strategy
	Briefly describe how the Agency/Group/Organization was consulted. What are the anticipated outcomes of the consultation or areas for improved coordination?	South Sound Housing Affordability Partners (SSHA3P) is an intergovernmental collaboration between the Cities and Towns of Auburn, DuPont, Edgewood, Fife, Fircrest, Gig Harbor, Lakewood, Milton, Puyallup, Sumner, Steilacoom, Tacoma, and University Place, Pierce County and the Puyallup Tribe of Indians, working together to create and preserve affordable, attainable, and accessible housing throughout the participating communities. Consultation focused on market trends, analysis of housing affordability, and means of advocacy to generate dedicated revenue streams in support of affordable housing development throughout Pierce County.
8	**Agency/Group/Organization**	Tacoma-Pierce County Affordable Housing Consortium
	Agency/Group/Organization Type	Housing Regional Organization
	What section of the Plan was addressed by Consultation?	Housing Need Assessment Non-Homeless Special Needs Market Analysis Anti-poverty Strategy

	Briefly describe how the Agency/Group/Organization was consulted. What are the anticipated outcomes of the consultation or areas for improved coordination?	Tacoma/Pierce County Affordable Housing Consortium is a non-profit organization designed to bring together various groups, organizations, business, and governmental agencies and jurisdictions with a focus on developing and preserving access to decent, safe, and high-quality affordable housing. Consultation is typically ongoing with advocacy efforts to fund and develop affordable housing, as well as current and ongoing market trends that may be causing inequities in the housing market.
9	**Agency/Group/Organization**	Fair Housing Center of Washington
	Agency/Group/Organization Type	Regional Organization
	What section of the Plan was addressed by Consultation?	Housing Need Assessment Non-Homeless Special Needs Market Analysis Anti-poverty Strategy

	Briefly describe how the Agency/Group/Organization was consulted. What are the anticipated outcomes of the consultation or areas for improved coordination?	The Fair Housing Center of Washington is a nonprofit agency dedicated to providing fair housing education, outreach, and enforcement services to western and central Washington. Explored various parts of Lakewood's 2024 Comprehensive Plan that overlap and intersect with the Consolidated Plan to identify strategic partnership opportunities. Consultation included pathways to ensure equitable housing opportunities exist for all Lakewood households, especially for those minority, disabled and senior households.

Identify any Agency Types not consulted and provide a rationale for not consulting.

No agencies were intentionally excluded from consultation. Every effort was made to ensure advance publication of meetings and opportunities to contribute.

Other local/regional/state/federal planning efforts considered when preparing the Plan

Name of Plan	Lead Organization	How do the goals of your Strategic Plan overlap with the goals of each plan?
Continuum of Care	Pierce County	Addresses homelessness on countywide basis.
City of Lakewood Comprehensive Plan	City of Lakewood	Plan updated September 2024 and approved by Puget Sound Regional Council in February 2025. The plan encourages infill housing, cottage-style development, changes in zoning to permit higher densities, and incentivizes the construction of affordable housing through housing tax credits and other practices. The plan projects future housing targets and identifies capacity for future land development for low-income housing, including shelters, and permanent supportive housing, among others.
Human Services Needs Analysis Report (2020)	City of Lakewood	Plan identifies gaps and needs in services for Lakewood citizens.
Legacy Plan	City of Lakewood, Parks Department	Identifies long-term park and recreation needs for Lakewood citizens.

Name of Plan	Lead Organization	How do the goals of your Strategic Plan overlap with the goals of each plan?
6-Year Comprehensive Transportation Imp. Program	City of Lakewood, Public Works (2024-29 TIP Report)	The plan identifies local infrastructure projects throughout the City. Projects occurring in low-income census tracts are evaluated for compatibility with federal program guidelines and funding opportunities.
Affordable Housing Action Strategy	City of Tacoma	Addresses the housing affordability crisis through anti-displacement, reducing barriers to housing access, the creation of affordable housing, and maintenance of existing affordable housing.
Five-Year Plan to End Homelessness (2024)	Pierce County Continuum of Care	The Plan identifies pathways to end homelessness throughout the County.

Table 3 – Other local / regional / federal planning efforts

Describe cooperation and coordination with other public entities, including the State and any adjacent units of general local government, in the implementation of the Consolidated Plan (91.215(l)).

The City of Tacoma and the City of Lakewood work closely with the Tacoma Housing Authority and the Pierce County Housing Authority. They participate in the Tacoma/Lakewood/Pierce County Continuum of Care. They are active in the Tacoma Pierce County Affordable Housing Consortium, the Economic Development Board for Tacoma-Pierce County, the Pierce County Human Services Coalition, and other public entities and associations that set priorities for the use of resources in the region, set goals, and measure progress in meeting those goals.

Narrative

The City of Lakewood conducted outreach and engagement activities to agencies, groups, and organizations in line with the City of Lakewood Community Development Block Grant and HOME Investment Partnership requirements and City of Lakewood Participation Plan.

Planned outreach activities were conducted as follows:

- Lakewood Planning Commission: The Commission (created by City ordinance), with members appointed by the City Council, reviewed the Con Plan and considered feedback and recommendations.
- Lakewood Community Service Advisory Board: The Board reviews the Consolidated and Annual Action Plans and provides input on housing and community development needs. CSAB recommendations are forwarded on to Council for action. To the extent possible, the Board includes low- and moderate-income persons, representatives of community groups, and members of minority groups. This group was consulted to provide feedback and recommendations and to review the draft Consolidated Plan prior to sending it to City Council for approval.
- Lakewood Neighborhood Connections Leadership Group: The Group brings together dynamic leadership from various neighborhood associations to foster community engagement to assist improve the quality of life for Lakewood's citizens. The group provided feedback on the development of goals and outcomes to be addressed in the Plan.
- Lakewood Youth Council: The Youth Council provided a unique perspective to the planning process in the way of feedback and opportunities impacting Lakewood's youth population.
- Tacoma/Lakewood/Pierce County Continuum of Care (CoC): The local planning body for homeless services. Members from this group were engaged in the planning process. Members of this group also provided useful data to inform the Consolidated Plan.
- Lakewood City Council: City of Lakewood staff presented the draft Consolidated Plan at the March 17, 2025 City Council study session. A public hearing was held before Council at the April 21st Council meeting. Additionally, the City Council adopted the final Consolidated Plan at its meeting on May 5, 2025.

Survey Conducted: A survey was made available online, posted on the City's website and social media platforms, and was distributed at all of its engagement activities. The survey was designed to gather public input to help prioritize needs addressed in the Consolidated Plan. A total of 58 individuals responded to the survey.

PR-15 CITIZEN PARTICIPATION - 91.105, 91.115, 91.200(C) AND 91.300(C)

1. Summary of citizen participation process/Efforts made to broaden citizen participation
Summarize the citizen participation process and how it impacted goal setting.

In addition to engaging and coordinating with agencies, commissions, and councils, the City of Lakewood also engaged organizations and the broader public in various ways.

The City of Lakewood conducted the following engagement activities:

Service Provider Roundtable: City of Lakewood staff engaged service and housing providers in roundtable discussions in November and December 2024. The objectives of these engagements are described below:

- Explain the Consolidated Plan process and opportunities for housing and service providers to engage in it.
- Share and vet high-level findings from the Consolidated Plan and Analysis of Impediments.
- Gather input to help prioritize the needs to be addressed in the Consolidated Plan by facilitating discussion on housing, community development, and service needs and by distributing and collecting an anonymous survey.

Numerous housing and service provider organizations were represented in these roundtable discussions, including:

- Catholic Community Services

- The Rescue Mission
- Tacoma-Pierce County Health Department
- Communities in Schools
- Emergency Food Network (EFN)
- Lakewood's Promise
- Tacoma-Pierce County Habitat for Humanity
- Living Access Support Alliance (LASA)
- YWCA
- Rebuilding Together
- Oasis Youth Center
- Ethical Leadership Group
- Project Access
- Rebuilding HOPE
- Answers Counseling
- Lakewood's CHOICE
- Springbrook Connections
- West Pierce Fire & Rescue
- Fair Housing Center of Washington
- Pierce County Housing Authority
- Northwest Cooperative Development Center
- Pierce County Aging & Long-Term Care
- Lakewood Water District

Public hearings were held in both cities and advertised in the Tacoma News Tribune and on city websites and social medial platforms. Hearings were held as follows:

- The City held two public hearings early in the planning process - November 13, 2024 and December 3, 2024. Both meetings focused on the general development of the Plan, including input on potential goals and funding opportunities for CDBG and HOME funding.
- A third public hearing was held before Council on April 21, 2025. This meeting sought broader public input on the proposed draft 5-YR 2025-2029 Consolidated Plan and 2025 Annual Action Plan, including goals, objectives, and funding opportunities identified in the plans.
- A 30-day public comment period on the Plan was held from April 1 – April 30, 2025.

Citizen Participation Outreach

Sort Order	Mode of Outreach	Target of Outreach	Summary of response/attendance	Summary of comments received	Summary of comments not accepted and reasons	URL (If applicable)
1	Public Meeting	Non-targeted/broad community	October 16, 2024 public meeting on housing and community development needs for CDBG and HOME funding and 5-YR 2025-2029 Consolidated Plan process.	No comments received.	N/A	

Sort Order	Mode of Outreach	Target of Outreach	Summary of response/attendance	Summary of comments received	Summary of comments not accepted and reasons	URL (If applicable)
2	Newspaper Ad	Non-targeted/broad community	Notification of public hearing at Community Collabotarion monthly meeting. Seeking input on community development and public service needs for CDBG and HOME funding- November 13, 2024.	Comments detailing the public hearing are summarized in #3 below.	N/A	

3	Public Hearing	Non-targeted community	November 13, 2024 public hearing on housing and community development needs for CDBG and HOME funding and 5-YR 2025-2029 Consolidated Plan process.	Need of affordable rental housing, programs to assist with upfront costs when seeking affordable housing, deposit program, rental assistance, central hub to find assistance programs, resources guide, housing for youth, seniors and veterans, more transitional housing, safe and healthy standards for existing housing, and low barrier housing options.	All comments accepted	

4	Public Meeting	Targeted outreach to neighborhood stakeholders	November 20, 2024 public meeting on housing and community development needs for CDBG and HOME funding and 5-YR 2025-2029 Consolidated Plan process.	Housing rehabilitation program for homeowner occupied homes, sidewalk improvements , assistance with illegal trash dumping, educational programs, affordable housing, financial literacy programs for youth, program to assist with rental deposits as a barrier to affordability, central humb for program assistance, resources for landlord affected by	All comments accepted	

Sort Order	Mode of Outreach	Target of Outreach	Summary of response/attendance	Summary of comments received	Summary of comments not accepted and reasons	URL (If applicable)
				nonpayment of rents by tenants, and roadway improvements.		
5	Public Meeting	Targeted outreach to Youth Council to seek youth perspective on housing and community development needs.	December 2, 2024 public meeting on housing and community development needs for CDBG and HOME funding and 5-YR 2025-2029 Consolidated Plan process.	Program ensuring rental housing is safe and properly maintained, rent restrictions, sidewalks and streetlighting, homeless resources, places for youth to gather, clean up illegal dumping, more affordable housing options.	All comments accepted	

Sort Order	Mode of Outreach	Target of Outreach	Summary of response/attendance	Summary of comments received	Summary of comments not accepted and reasons	URL (If applicable)
6	Newspaper Ad	Non-targeted/broad community, including housing providers, services providers, housing authority, Health Department and other quasi-governmental agencies.	Notification of December 3, 2024 public hearing on housing and community development needs for CDBG and HOME funding and 5-YR 2025-2029 Consolidated Plan process.	Comments detailing the public hearing are summarized in #7 below.	N/A	

7	Public Hearing	Non-targeted/broad community, including housing providers, services providers, housing authority, Health Department and other quasi-governmental agencies.	December 3, 2024 public hearing on housing and community development needs for CDBG and HOME funding and 5-YR 2025-2029 Consolidated Plan process.	Affordable homeownership options, maintenance of existing owner occupied housing, housing for seniors, preservation of all types of housing, rehabilitation program for rental housing, programs to develop affordable housing, infrastructure assistance programs, shared housing options, universal design housing, renter's insurance	All comments accepted	

Sort Order	Mode of Outreach	Target of Outreach	Summary of response/attendance	Summary of comments received	Summary of comments not accepted and reasons	URL (If applicable)
				program, protection of existing manufactured housing, and zoning changes allowing manufactured homes to be considered real property.		

Sort Order	Mode of Outreach	Target of Outreach	Summary of response/attendance	Summary of comments received	Summary of comments not accepted and reasons	URL (If applicable)
8	Public Meeting	Targeted outreach to Planning Commission on housing and community development needs.	December 4, 2024 public meeting on housing and community development needs for CDBG and HOME funding and 5-YR 2025-2029 Consolidated Plan process.	Supprt for neighborhood parks, funding for the Tillicum Community Center for maintenance, childcare assistance programs, affordable housing development, and economic development programs supporting low-income persons.	All comments accepted	

Sort Order	Mode of Outreach	Target of Outreach	Summary of response/attendance	Summary of comments received	Summary of comments not accepted and reasons	URL (If applicable)
9	Internet Outreach	Non-targeted/broad community	Notification of April 21, 2025 public hearing, April 1 – April 30, 2025 public comment period on 5- YR 2025-29 Comprehensive Plan and 2025 Annual Action Plan.	Comments detailing general notification and the public hearing will be summarized in items #11 and #12 below.	NA	
10	Newspaper Ad	Non-targeted/broad community	Notification of April 21, 2025 public hearing, April 1 – April 30, 2025 public comment period on 5- YR 2025-29 Comprehensive Plan and 2025 Annual Action Plan.	Comments detailing general notification and the public hearing will be summarized in items #11 and #12 below.	NA	

Sort Order	Mode of Outreach	Target of Outreach	Summary of response/attendance	Summary of comments received	Summary of comments not accepted and reasons	URL (If applicable)
11	Public Hearing	Non-targeted/broad community	Public hearing held before Lakewood City Council on April 21, 2025	Insert comments	All comments accepted	
12	30-Day Public Comment Period	Non-targeted/broad community	April 1 - April 30, 2025 30-day public comment period.	Insert comments	All comments accepted	

Table 4 – Citizen Participation Outreach

NEEDS ASSESSMENT

NA-05 OVERVIEW

Needs Assessment Overview

Guided by its Comprehensive Plan and informed by extensive community engagement and data analysis, the City has identified pressing priorities across housing, public services, and infrastructure. Rapid population growth, economic shifts, and the presence of Joint Base Lewis-McChord (JBLM) contribute to unique dynamics, highlighting the importance of strategic planning and collaboration with regional partners.

Housing affordability and accessibility remain critical concerns, with many residents, particularly low-income households, seniors, and veterans, struggling to secure stable and affordable living conditions. Public services, including emergency rental assistance, mental health care, and youth support programs, are vital for addressing social and economic disparities. Simultaneously, the City's infrastructure must adapt to growing demands, requiring upgrades to transportation systems, stormwater management, and public spaces.

This needs assessment provides a detailed examination of Lakewood's challenges and opportunities, outlining the data-driven priorities that shape its path forward. From housing shortages to the expansion of critical public facilities, the following sections explore the City's efforts to create a more inclusive, sustainable, and connected community.

NA-10 HOUSING NEEDS ASSESSMENT - 24 CFR 91.405, 24 CFR 91.205 (A, B, C)

Summary of Housing Needs

Demographics	Base Year: 2017	Most Recent Year: 2023	% Change
Population	59,102	63,034	7%
Households	24,129	26,165	8%
Median Income	$47,636	$70,524	48%

Table 5 - Housing Needs Assessment Demographics

Data Source: 2013-2017 ACS (Base Year), 2019-2023 ACS (Most Recent Year)

Number of Households Table

	0-30% HAMFI	>30-50% HAMFI	>50-80% HAMFI	>80-100% HAMFI	>100% HAMFI
Total Households	3,725	3,640	5,820	3,485	8,655
Small Family Households	1,910	2,615	4,660	2,955	8,630
Large Family Households	90	660	900	290	1,135
Household contains at least one person 62-74 years of age	750	985	970	720	2,395
Household contains at least one-person age 75 or older	455	490	685	280	820
Households with one or more children 6 years old or younger	485	720	920	700	485

Table 6 - Total Households Table

Data Source: 2019-2023 CHAS

Housing Needs Summary Tables

1. Housing Problems (Households with one of the listed needs)

	Renter					Owner				
	0-30% AMI	**>30-50% AMI**	**>50-80% AMI**	**>80-100% AMI**	**Total**	**0-30% AMI**	**>30-50% AMI**	**>50-80% AMI**	**>80-100 % AMI**	**Total**
NUMBER OF HOUSEHOLDS										
Substandard Housing - Lacking complete plumbing or kitchen facilities	70	-	-	-	70	0	0	0	0	0
Severely Overcrowded - With >1.51 people per room (and complete kitchen and plumbing)	160	450	90	80	1,110	0	20	0	0	0
Overcrowded - With 1.01-1.5 people per room (and none of the above problems)	170	725	60	-	1,075	60	50	220	30	230

	Renter					Owner				
	0-30% AMI	>30-50% AMI	>50-80% AMI	>80-100% AMI	Total	0-30% AMI	>30-50% AMI	>50-80% AMI	>80-100 % AMI	Total
Housing cost burden greater than 50% of income (and none of the above problems)	2,120	615	295	-	3,030	445	225	85	10	25
Housing cost burden greater than 30% of income (and none of the above problems)	285	955	1,725	250	3,255	175	310	390	495	1,790
Zero/negative Income (and none of the above problems)	310	0	0	0	310	275	0	0	0	275

Table 7 – Housing Problems Table

Data Source: 2019-2023 CHAS

2. Housing Problems 2 (Households with one or more Severe Housing Problems: Lacks kitchen or complete plumbing, severe overcrowding, severe cost burden)

	Renter					Owner				
	0-30% AMI	**>30-50% AMI**	**>50-80% AMI**	**>80-100% AMI**	**Total**	**0-30% AMI**	**>30-50% AMI**	**>50-80% AMI**	**>80-100% AMI**	**Total**
NUMBER OF HOUSEHOLDS										
Having 1 or more of four housing problems	2,625	2,160	2,115	290	7,435	650	585	585	520	2,905
Having none of four housing problems	125	450	1,850	1,725	5,535	110	445	1,265	950	110
Household has negative income, but none of the other housing problems	225	0	0	0	225	15	0	0	0	15

Table 8 – Housing Problems 2

Data Source: 2019-2023 CHAS

3. Cost Burden > 30%

	Renter				Owner			
	0-30% AMI	>30-50% AMI	>50-80% AMI	Total	0-30% AMI	>30-50% AMI	>50-80% AMI	Total
NUMBER OF HOUSEHOLDS								
Small Related	825	750	965	2,540	145	195	120	460
Large Related	15	40	110	165	30	-	35	65
Elderly	640	450	135	1,225	220	345	234	799
Other	1,130	605	810	2,545	115	20	80	215
Total need by income	2,610	1,845	2,020	6,475	510	560	469	1539

Table 9 – Cost Burden > 30%

Data Source: 2019-2023 CHAS

4. Cost Burden > 50%

	Renter				Owner			
	0-30% AMI	>30-50% AMI	>50-80% AMI	Total	0-30% AMI	>30-50% AMI	>50-80% AMI	Total
NUMBER OF HOUSEHOLDS								
Small Related	675	210	235	1,120	85	120	-	205
Large Related	15	20	0	35	30	0	-	30
Elderly	625	205	35	865	275	115	74	464
Other	1,005	210	25	1,240	55	0	10	65
Total need by income	2,320	645	295	3,260	445	235	84	764

Table 10 – Cost Burden > 50%

Data Source: 2019-2023 CHAS

5. Crowding (More than one person per room)

	Renter					Owner				
	0-30% AMI	>30-50% AMI	>50-80% AMI	>80-100% AMI	Total	0-30% AMI	>30-50% AMI	>50-80% AMI	>80-100% AMI	Total
NUMBER OF HOUSEHOLDS										
Single family households	165	545	75	25	810	30	35	45	15	125
Multiple, unrelated family households	0	25	0	0	25	0	0	65	0	65
Other, non-family households	0	20	0	15	35	0	0	0	0	0
Total need by income	165	590	75	40	870	30	35	110	15	190

Table 11 – Crowding Information - 1/2

Data Source: 2019-2023 CHAS

	Renter				Owner			
	0-30% AMI	>30-50% AMI	>50-80% AMI	Total	0-30% AMI	>30-50% AMI	>50-80% AMI	Total
Households with Children Present	435	710	650	1,795	50	40	270	360

Table 12 – Crowding Information – 2/2

Describe the number and type of single-person households in need of housing assistance.

While the City has increased its stock of smaller housing units growing from 5,114 studio and one-bedroom units in 2017 to 6,092 in 2022, this still falls far short of addressing the needs of Lakewood's 17,454 one- and two-person households, which make up 66.2% of all households. This gap highlights a critical mismatch between the supply of appropriately sized units and the demographic demand, particularly as the senior population continues to grow. Rising housing costs compound this issue. Between 2017 and 2022, median rents in Lakewood surged by 42.3%, significantly outpacing the growth in incomes. For comparison, median family income increased by only 36.7% over the past decade, contributing to widespread affordability challenges. As a result, more than half of all renters (51.4%) in Lakewood are cost-burdened, spending over 30% of their income on housing. Among senior renters, the situation is even more severe, with 55.7% experiencing cost burdens, illustrating the economic vulnerability of older adults in the rental market.

Affordable housing options remain scarce, with federally subsidized housing accounting for just 3% of the city's rental stock (445 units). Alarmingly, 120 of these units are set to lose affordability restrictions by 2025, potentially displacing low-income households and further tightening the rental market. This scarcity is particularly concerning given the rising poverty rate among seniors, which increased from 8.8% in 2017 to 9.4% in 2022. These older adults often face additional financial strain in maintaining their properties or affording rising rental costs, further exacerbating their housing instability.

Many seniors on fixed incomes struggle to secure stable housing due to the financial burden of security deposits and first-month rent requirements, often pushing them into housing instability or even homelessness. Data from Pierce County's Homeless Crisis Response System indicates a growing crisis, with nearly 10,000 individuals seeking services in 2023, the highest number on record, and seniors disproportionately affected. Without assistance, many face eviction, homelessness, or premature institutionalization, increasing public healthcare costs and diminishing their quality of life. Lakewood's senior population, particularly the 31% of householders aged 65 and older who earn less than $40,550 annually, is classified as Very Low Income (50% AMI).

Estimate the number and type of families in need of housing assistance who are disabled or victims of domestic violence, dating violence, sexual assault, and stalking.

The 2024 Point-in-Time (PIT) data provides critical insights into the housing needs of vulnerable populations in Lakewood, WA. Among people experiencing homelessness, 6% (163 individuals) are adult survivors of domestic violence, with 113 sheltered and 50 unsheltered, emphasizing the importance of safe, trauma-informed housing solutions. Disabilities are prevalent across the homeless population, with 26% (698 individuals) experiencing substance abuse issues, 25% (658 individuals) living with chronic health conditions, and 22% (598 individuals) having physical disabilities. Mental health challenges affect 20% (522 individuals), while developmental disabilities impact 8% (223 individuals). Notably, substance abuse and chronic health conditions have a high unsheltered representation, with 340 and 171 individuals, respectively, lacking shelter. Additionally, chronically homeless persons make up 25% of the total population.

What are the most common housing problems?

The consultations and meetings with community stakeholders identified pressing housing challenges in Lakewood. There is a significant need for more affordable rental and homeownership options, especially for families, seniors, veterans, and individuals with disabilities. Many households face barriers such as high rent costs, poor credit, and a lack of affordable deposits, making it difficult to secure stable housing. The shortage of transitional and permanent supportive housing further exacerbates issues for low-income residents.

Community members emphasized the lack of affordable housing near schools and essential services and the need for low-barrier housing to accommodate those facing significant challenges like credit issues or high-income requirements. Gentrification, coupled with the increasing demand for housing from Joint Base Lewis-McChord (JBLM) military families, has intensified affordability concerns in Lakewood. Specific needs include better access to resources, such as a centralized location for housing information and support, and enhanced communication about programs like the City's proactive Rental Housing Safety Program.

Stakeholders suggested innovative solutions, including allowing accessory dwelling units (ADUs) in manufactured home parks, establishing neighborhood revitalization strategies, and expanding programs like Lakewood's Multi-Family Tax Exemption Program to incentivize mixed-income developments. Maintenance and rehabilitation programs for existing owner-occupied and rental housing were also highlighted as critical priorities, alongside infrastructure improvements in affordable housing areas, including sewer updates.

The CHAS in the above tables show Renters earning 0-30% AMI face the most severe issues, including high rates of cost burden (2,120 households spending more than 50% of income on housing), overcrowding, and substandard living conditions. Overcrowding, defined as more than 1.01 people per room, affects 1,075 renter households, with severe overcrowding impacting an additional 1,110 households, primarily in the 30-50% AMI group. Owner households also face cost burdens, with 445 low-income owners spending over half their income on housing. While 7,435 renter and 2,905 owner households report one or more severe housing problems, a significant number of households with zero or negative income highlight the need for supportive services. These issues emphasize the urgent need for affordable housing solutions, rental assistance, and programs to address substandard housing and overcrowding, particularly for households earning less than 50% of AMI.

Are any populations/household types more affected than others by these problems?

Low-income households, particularly renters earning 0-30% of AMI, face the most severe challenges, including significant cost burdens, overcrowding, and substandard living conditions. Families are especially vulnerable, with a critical shortage of affordable 2–3-bedroom units near schools, forcing many into overcrowded or unsuitable housing. Seniors and disabled individuals also face rising housing costs and a lack of accessible housing options, putting them at risk of displacement. Veterans are similarly affected by high rents and a lack of housing subsidies tailored to their needs. Youth, especially LGBTQ+ individuals, lack transitional and supportive housing, leaving them with few safe and stable options. Immigrant and refugee households face barriers such as language access, high application fees, and limited knowledge of available resources, further compounding their struggles.

Describe the characteristics and needs of Low-income individuals and families with children (especially extremely low-income) who are currently housed but are at imminent risk of either residing in shelters or becoming unsheltered 91.205(c)/91.305(c). Also discuss the needs of formerly homeless families and individuals who are receiving rapid re-housing assistance and are nearing the termination of that assistance.

ACS data typically provides 5-year estimates that can become outdated; Esri Business Analyst enhances and adjusts this data using advanced modeling and analysis techniques to reflect more recent trends. Esri's housing data reveals a severe shortage of affordable units for extremely low-income families. For example, in census tracts with the highest concentrations of low-income families, fewer than 10% of available rental units are affordable to households earning below 30% AMI.

The spatial mismatch between affordable housing and essential services, such as schools and healthcare, exacerbates the instability for families with children.

Rental Assistance and Financial Support: Esri's income data identifies over 1,400 households earning below $15,000 annually, many of whom are at immediate risk of eviction without rental assistance. For example, nearly 1,200 households in the City require emergency rental or utility assistance to avoid becoming unsheltered.

Access to Childcare and Employment Opportunities: Families face barriers to maintaining stable employment due to limited access to affordable childcare. Esri’s data shows that neighborhoods with the highest rates of child poverty also lack licensed childcare facilities, with some tracts serving fewer than 5% of children under 5 years old.

Transportation Gaps: Esri’s transportation data highlights that 15% of low-income households lack access to a vehicle, limiting their ability to reach employment and essential services.

Support Services: Minority and immigrant families need customized support to access housing resources, with Esri’s demographic data indicating that in certain areas, as many as 20% of residents are non-English speakers.

Suppose a jurisdiction provides estimates of the at-risk population(s). In that case, it should also include a description of the operational definition of the at-risk group and the methodology used to generate the estimates:

Of the At-Risk Population, according to Esri Business Analyst, Of the 25,970 households, 8,710 include members with disabilities, 11% (3,015 families) live below the poverty level, and 2,013 lack access to a vehicle. Additionally, 11,118 residents are aged 65 or older, underscoring the need for support for aging and mobility challenges. Linguistic diversity adds complexity, with Spanish being the most common non-English language among older adults, 215 individuals speak only Spanish, potentially limiting access to vital services. Esri's methodology leverages the American Community Survey variables. It defines "at-risk population" as those who face heightened challenges in accessing resources or navigating daily life due to factors such as poverty, age, disability, lack of transportation, or limited English proficiency.

Specify particular housing characteristics that have been linked with instability and an increased risk of homelessness

Insufficient availability of affordable housing options forces individuals and families to spend a significant portion of their income on housing costs, leaving little financial cushion for other necessities and increasing the risk of eviction and homelessness. When households are burdened by high housing costs, meaning they spend a large percentage of their income on housing expenses, it leaves little room for financial stability. Any unexpected expenses or income disruptions can quickly lead to housing instability and potential homelessness. A lack of affordable housing is widely considered to be the greatest predictor of homelessness.

Living in housing with structural deficiencies, safety hazards, or poor maintenance can contribute to housing instability. Unaddressed maintenance issues or unsafe living conditions may result in evictions or the inability to maintain stable housing.

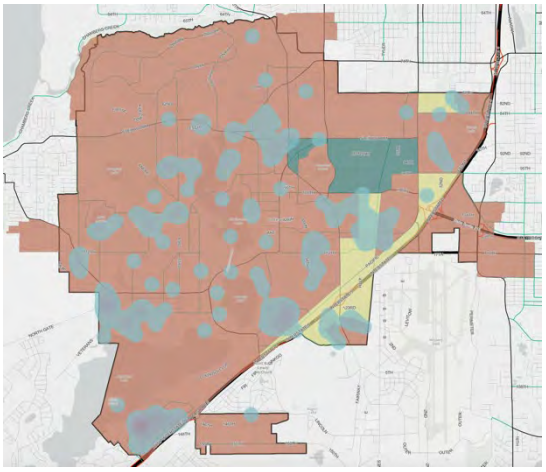
Discussion

Intentionally Left Blank

NA-15 DISPROPORTIONATELY GREATER NEED: HOUSING PROBLEMS - 91.405, 91.205 (B)(2)

Assess the need of any racial or ethnic group that has disproportionately greater need in comparison to the needs of that category of need as a whole.

Introduction



This map uses local parcel information with 2023 population estimates to highlight housing quality disparities in Lakewood. Approximately 140 residential parcels (green circles on the map) are considered either poor, very poor, or uninhabitable, of which 30 are located in Hispanic (yellow shaded census tracts and Black (blue shaded census tracts predominately populated census tracts. The areas with the highest concentration of poorly conditioned parcels are mainly located along key corridors like Pacific Highway and near I-5, particularly around Tillicum and Springbrook. These neighborhoods, shown with overlapping clusters of poor conditions, also align with higher densities of Hispanic (yellow) and Black (green) populations.

Evaluating housing issues can provide valuable insights into the prevalence and distribution of problems faced by different racial and ethnic groups. By examining data on housing issues across various income categories, the city can gain a comprehensive understanding of the overall housing needs within Lakewood.

According to HUD guidelines, “disproportionately greater need” exists when the percentage of individuals in a category of need who belong to a particular racial or ethnic group is at least ten percentage points higher than the percentage of individuals in the category as a whole. HUD also defines "housing problems" as whether or not a household lacks one of the following: complete kitchen facilities, complete plumbing, overcrowding (more than one person per room), or housing costs (rent or mortgage) that exceed 30% of the household’s income.

0%-30% of Area Median Income

Housing Problems	Has one or more of four housing problems	Has none of the four housing problems	Household has no/negative income, but none of the other housing problems
Jurisdiction as a whole	3255	475	0
White	1505	270	0
Black / African American	735	30	0
Asian	300	100	0
American Indian, Alaska Native	60	0	0
Pacific Islander	95	0	0
Hispanic	2950	450	0

Table 13 - Disproportionally Greater Need 0 - 30% AMI

Data Source: 2019-2023 CHAS

*The four housing problems are:
1. Lacks complete kitchen facilities, 2. Lacks complete plumbing facilities, 3. More than one person per room, 4. Cost Burden greater than 30%

30%-50% of Area Median Income

Housing Problems	Has one or more of four housing problems	Has none of the four housing problems	Household has no/negative income, but none of the other housing problems
Jurisdiction as a whole	2745	895	0
White	1390	470	0
Black / African American	280	60	0
Asian	260	60	0

Housing Problems	Has one or more of four housing problems	Has none of the four housing problems	Household has no/negative income, but none of the other housing problems
American Indian, Alaska Native	20	0	0
Pacific Islander	150	0	0
Hispanic	2575	810	0

Table 14 - Disproportionally Greater Need 30 - 50% AMI

Data Source: 2019-2023 CHAS

*The four housing problems are: 1. Lacks complete kitchen facilities, 2. Lacks complete plumbing facilities, 3. More than one person per room, 4. Cost Burden greater than 30%

50%-80% of Area Median Income

Housing Problems	Has one or more of four housing problems	Has none of the four housing problems	Household has no/negative income, but none of the other housing problems
Jurisdiction as a whole	2700	3115	0
White	1220	1660	0
Black / African American	475	479	0
Asian	175	185	0
American Indian, Alaska Native	0	14	0
Pacific Islander	25	80	0
Hispanic	2355	2873	0

Table 15 - Disproportionally Greater Need 50 - 80% AMI

Data Source: 2019-2023 CHAS

*The four housing problems are:
1. Lacks complete kitchen facilities, 2. Lacks complete plumbing facilities, 3. More than one person per room, 4. Cost Burden greater than 30%

80%-100% of Area Median Income

Housing Problems	Has one or more of four housing problems	Has none of the four housing problems	Household has no/negative income, but none of the other housing problems
Jurisdiction as a whole	810	2675	0
White	530	1360	0
Black / African American	45	330	0
Asian	75	140	0
American Indian, Alaska Native	0	20	0
Pacific Islander	0	0	0
Hispanic	780	2455	0

Table 16 - Disproportionally Greater Need 80 - 100% AMI

Data Source: 2019-2023 CHAS

*The four housing problems are:
1. Lacks complete kitchen facilities, 2. Lacks complete plumbing facilities, 3. More than one person per room, 4. Cost Burden greater than 30%

Discussion

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NA-20 DISPROPORTIONATELY GREATER NEED: SEVERE HOUSING PROBLEMS - 91.405, 91.205 (B)(2)

Assess the need of any racial or ethnic group that has disproportionately greater need in comparison to the needs of that category of need as a whole.

Introduction

0%-30% of Area Median Income

Severe Housing Problems*	Has one or more of four housing problems	Has none of the four housing problems	Household has no/negative income, but none of the other housing problems
Jurisdiction as a whole	2790	935	0
White	1235	545	0
Black / African American	710	55	0
Asian	300	100	0
American Indian, Alaska Native	60	0	0
Pacific Islander	80	15	0
Hispanic	185	120	0

Table 17 – Severe Housing Problems 0 - 30% AMI

Data Source: 2019-2023 CHAS

*The four severe housing problems are:
1. Lacks complete kitchen facilities, 2. Lacks complete plumbing facilities, 3. More than 1.5 persons per room, 4. Cost Burden over 50%

30%-50% of Area Median Income

Severe Housing Problems*	Has one or more of four housing problems	Has none of the four housing problems	Household has no/negative income, but none of the other housing problems
Jurisdiction as a whole	1480	2160	0
White	640	1220	0
Black / African American	175	165	0
Asian	105	215	0
American Indian, Alaska Native	4	15	0
Pacific Islander	105	45	0
Hispanic	405	285	0

Table 18 – Severe Housing Problems 30 - 50% AMI

Data Source: 2019-2023 CHAS

*The four severe housing problems are:
1. Lacks complete kitchen facilities, 2. Lacks complete plumbing facilities, 3. More than 1.5 persons per room, 4. Cost Burden over 50%

50%-80% of Area Median Income

Severe Housing Problems*	Has one or more of four housing problems	Has none of the four housing problems	Household has no/negative income, but none of the other housing problems
Jurisdiction as a whole	590	5230	0
White	290	2590	0
Black / African American	65	895	0
Asian	0	360	0

Severe Housing Problems*	Has one or more of four housing problems	Has none of the four housing problems	Household has no/negative income, but none of the other housing problems
American Indian, Alaska Native	0	14	0
Pacific Islander	0	105	0
Hispanic	395	825	0

Table 19 – Severe Housing Problems 50 - 80% AMI

Data Source: 2019-2023 CHAS

*The four severe housing problems are:
1. Lacks complete kitchen facilities, 2. Lacks complete plumbing facilities, 3. More than 1.5 persons per room, 4. Cost Burden over 50%

80%-100% of Area Median Income

Severe Housing Problems*	Has one or more of four housing problems	Has none of the four housing problems	Household has no/negative income, but none of the other housing problems
Jurisdiction as a whole	65	3420	0
White	25	1855	0
Black / African American	10	360	0
Asian	30	190	0
American Indian, Alaska Native	0	20	0
Pacific Islander	0	0	0
Hispanic	65	735	0

Table 20 – Severe Housing Problems 80 - 100% AMI

Data Source: 2019-2023 CHAS

*The four severe housing problems are:
1. Lacks complete kitchen facilities, 2. Lacks complete plumbing facilities, 3. More than 1.5 persons per room, 4. Cost Burden over 50%

Discussion

NA-25 DISPROPORTIONATELY GREATER NEED: HOUSING COST BURDENS - 91.405, 91.205 (B)(2)

Assess the need of any racial or ethnic group that has disproportionately greater need in comparison to the needs of that category of need as a whole.

Introduction

Housing Cost Burden

Housing Cost Burden	<=30%	30-50%	>50%	No / negative income (not computed)
Jurisdiction as a whole	14,465	4,780	3,710	245
White	8,615	2,810	1,955	125
Black / African American	1,925	650	900	10
Asian	1,000	470	355	80
American Indian, Alaska Native	155	15	65	-
Pacific Islander	390	115	120	-
Hispanic	2,380	720	315	30

Table 21 – Greater Need: Housing Cost Burdens AMI

Data Source: 2019-2023 CHAS

Discussion

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NA-30 DISPROPORTIONATELY GREATER NEED: DISCUSSION - 91.205 (B)(2)

Are there any Income categories in which a racial or ethnic group has disproportionately greater need than the needs of that income category as a whole?

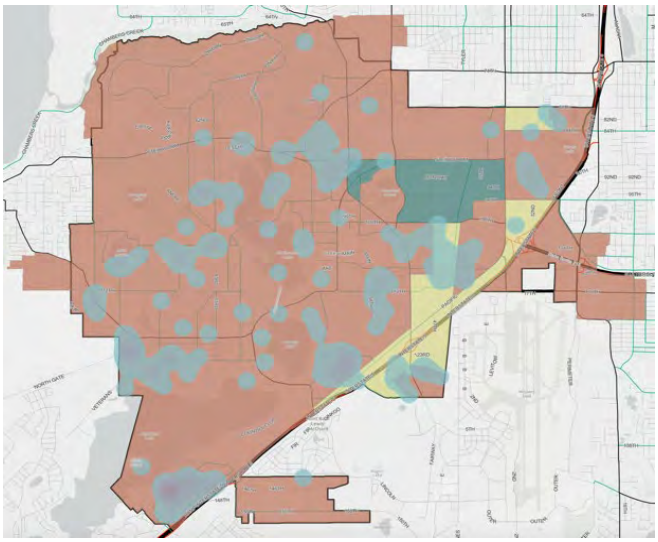
Housing Problems At the 0%-30% AMI level, both American Indian/Alaska Native and Pacific Islander households show significantly greater need, with 100% of households in these groups experiencing at least one housing problem, exceeding the jurisdictional rate by 12.7 percentage points. Similarly, at the 30%-50% AMI level, these two groups again demonstrate disproportionate need, with 100% of households facing housing challenges, surpassing the jurisdictional rate by 24.6 percentage points. At the 80%-100% AMI level, Asian households exhibit disproportionate greater need, with 34.9% experiencing housing problems, 11.7 percentage points higher than the jurisdictional average.

Severe Housing Problems At the 0%-30% AMI level, Black/African American households (+17.9%) and American Indian/Alaska Native households (+25.1%) face disproportionate severe housing needs. In the 30%-50% AMI category, Black/African American (+10.8%), Pacific Islander (+29.3%), and Hispanic (+18%) households experience disproportionately greater severe housing challenges. At the 50%-80% AMI level, Hispanic households exhibit a disproportionate need (+22.3%). Lastly, in the 80%-100% AMI category, Asian households face disproportionately severe housing problems (+11.7%).

If they have needs not identified above, what are those needs?

The data focuses on housing problems, particularly severe ones, and housing cost burden, primarily highlighting challenges related to affordability and quality of housing. While the data touches upon housing problems, it does not delve into the stability of housing situations. Factors such as evictions, frequent moves, or precarious living arrangements can impact households' overall stability and well-being.

Are any of those racial or ethnic groups located in specific areas or neighborhoods in your community?



The map highlights areas in Lakewood, WA, with a predominantly Black population (green-shaded block groups) near Seeley Lake Park and the Lakewood Town Center and a predominantly Hispanic population (yellow-shaded block groups) concentrated around Interstate 5 and St. Clare Hospital, many within HUD Qualified Opportunity Zones (yellow outlines). These zones target economically distressed areas, encompassing mixed residential, commercial, and industrial uses. Housing in Black-dominated areas is likely affordable but at risk of gentrification, while Hispanic-dominated areas feature multifamily housing influenced by proximity to industrial zones and healthcare facilities. While Opportunity Zones present investment potential, challenges like displacement, systemic barriers to economic mobility, and the need for affordable housing persist.

NA-35 PUBLIC HOUSING - 91.405, 91.205 (B)

Introduction

Two primary housing authorities, the Tacoma Housing Authority (THA) and the Pierce County Housing Authority (PCHA), support public housing in Lakewood, Washington. PCHA is the primary authority in Lakewood; however, THA does provide support to some Lakewood households though various rental assistance programs and partnership with PCHA. Both organizations play critical roles in providing affordable housing options and administering housing vouchers to meet the needs of low-income families and individuals in the community.

Pierce County Housing Authority (PCHA):

The Pierce County Housing Authority serves Lakewood, offering affordable housing solutions through programs like Section 8 vouchers and property management. PCHA focuses on providing stable housing for low- and moderate-income households and supports efforts to reduce homelessness in the region. The agency operates and manages multiple properties and offers direct assistance to help families secure safe and affordable housing in Lakewood.

Tacoma Housing Authority (THA):

The Tacoma Housing Authority operates primarily in Tacpoma, but does provide assistance within the City of Lakewood as part of its regional affordable housing initiative. THA provides a range of housing programs, including the Low-Income Public Housing (LIPH) program and the Housing Choice Voucher (Section 8) program, to assist families, seniors, and individuals with disabilities. THA's commitment to housing includes direct property management and partnerships with local landlords to expand the availability of affordable rental units in the City of Tacoma and surrounding areas.

Lakewood takes a collaborative and proactive approach to addressing housing needs. The City works closely with PCHA and THA to align efforts and maximize resources. This partnership extends to regional initiatives like the South Sound Housing Affordability Partners (SSHA^{3}P), an intergovernmental agreement designed to

create and preserve affordable housing across Pierce County. Lakewood's participation in SSHA³P demonstrates its commitment to a collective strategy for addressing housing affordability and stability.

PCHA administers 591 vouchers in Lakewood, representing 23.47% of its total vouchers, and owns 215 housing units, which account for approximately 32% of its total portfolio. Among heads of households, the largest racial group is White (55.17%), followed by Black/African American (30.25%). A similar trend is observed among all participants, including family members and children, with Whites comprising 41.09% and Black/African Americans 33.42%. Residents span a wide age range, with a notable concentration of heads of households aged 60-69 (27.35%), while among all participants, the most represented age group is 60-69 years (21.53%). Disability is also a significant factor, with 51.51% of heads of households and 30.71% of all participants meeting HUD disability criteria.

Totals in Use

Program Type									
				Vouchers					
							Special Purpose Voucher		
	Certificate	**Mod-Rehab**	**Public Housing**	**Total**	**Project-based**	**Tenant-based**	**Veterans Affairs Supportive Housing**	**Family Unification Program**	**Disabled ***
# of units/vouchers available	0	0	215	591	0	0	0	0	0

Table 22 - Public Housing by Program Type *includes Non-Elderly Disabled, Mainstream One-Year, Mainstream Five-year, and Nursing Home

Race of Residents

Program Type									
				Vouchers					
							Special Purpose Voucher		
Race	Certificate	Mod-Rehab	Public Housing	Total	Project-based	Tenant-based	Veterans Affairs Supportive Housing	Family Unification Program	Disabled *
White	0	0	0	1,505	0	0	0	0	0
Black/African American	0	0	0	761	0	0	0	0	0
Asian	0	0	0	89	0	0	0	0	0
American Indian, Alaska Native	0	0	0	39	0	0	0	0	0
Pacific Islander	0	0	0	68	0	0	0	0	0
Other	0	0	0	47	0	0	0	0	0
***includes Non-Elderly Disabled, Mainstream One-Year, Mainstream Five-year, and Nursing Home Transition**									

Table 23 – Race of Public Housing Residents by Program Type

Data Source: PIC (PIH Information Center)

Ethnicity of Residents

Program Type									
				Vouchers					
							Special Purpose Voucher		
Ethnicity	Certificate	Mod-Rehab	Public Housing	Total	Project-based	Tenant-based	Veterans Affairs Supportive Housing	Family Unification Program	Disabled *
Hispanic	0	0	0	0	0	0	0	0	0
Not Hispanic	0	0	0	0	0	0	0	0	0
*includes Non-Elderly Disabled, Mainstream One-Year, Mainstream Five-year, and Nursing Home Transition									

Table 24 – Ethnicity of Public Housing Residents by Program Type

Data Source: PIC (PIH Information Center)

Section 504 Needs Assessment: Describe the needs of public housing tenants and applicants on the waiting list for accessible units:

The needs of public housing tenants and applicants on the waiting list for accessible units in Lakewood highlight the demand for housing accommodations that address physical and cognitive disabilities. With over 51% of heads of households identified as disabled and approximately 31% of all participants meeting HUD disability criteria, there is a significant need for accessible units. This includes housing with features like ramps, widened doorways, grab bars, and lower counters to ensure independent and safe living environments for tenants. Additionally, support services such as transportation assistance and in-home care are critical to meeting the comprehensive needs of disabled residents.

What are the number and type of families on the waiting lists for public housing and Section 8 tenant-based rental assistance? Based on the information above and any other information available to the jurisdiction, what are the most immediate needs of residents of public housing and Housing Choice voucher holders?

PCHA and THA manage extensive waiting lists for public housing and Section 8 tenant-based rental assistance. Families on these lists are diverse, including low-income households, seniors, disabled individuals, and families with children. The most immediate needs of these residents include:

Affordable Housing Units: A high demand for units reflects a lack of availability, particularly for larger families or those requiring specific accessibility features.

Support Services: Many families need assistance navigating housing processes, overcoming credit or rental history barriers, and securing stable housing in areas with access to transportation and services.

Stability: Housing Choice Voucher holders often face challenges in finding landlords who accept vouchers or in relocating to neighborhoods offering better opportunities and amenities

How do these needs compare to the housing needs of the population at large.

Compared to the general population of Lakewood, public housing residents and voucher holders disproportionately include individuals from very low-income brackets, seniors, and persons with disabilities. The general population may also face housing affordability challenges, but the public housing community exhibits a higher concentration of severe needs. For example, the broader population may have a mix of moderate and high-income residents with greater access to homeownership. In contrast, public housing tenants often rely entirely on subsidized housing and supportive services. Addressing the distinct needs of this group requires targeted resources and policies that differ from strategies employed for the general population. This includes fostering landlord participation in voucher programs, ensuring fair housing practices, and increasing the stock of affordable and accessible housing.

Discussion

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NA-40 HOMELESS NEEDS ASSESSMENT - 91.405, 91.205 (C)

Introduction:

The homeless coalition serving Lakewood operates as part of a broader collaborative effort to address homelessness across Pierce County. Guided by the Pierce County Comprehensive Plan to End Homelessness, this coalition brings together regional policies, resources, and intelligence to create a unified response to homelessness. Efforts include the annual Point-in-Time Count, which relies on volunteers to gather critical data about the local homeless population and the factors contributing to homelessness. Partnerships with organizations like the Living Access Support Alliance (LASA) enable the coalition to provide supportive and rapid rehousing services. At the same time, the acquisition and conversion of various hotel facilities in both Lakewood and Tacoma illustrates innovative solutions for emergency and permanent supportive housing. Funding from the American Rescue Plan Act (ARPA) and the City's contracts with shelters like the Tacoma Rescue Mission and Catholic Community Services further bolster these initiatives. By integrating community-driven programs, leveraging regional resources, and fostering collaboration, the coalition takes significant steps toward preventing homelessness and supporting those in need.

If data is not available for the categories "number of persons becoming and exiting homelessness each year" and "number of days that persons experience homelessness," describe these categories for each homeless population type (including chronically homeless individuals and families, families with children, veterans and their families, and unaccompanied youth):

Chronically Homeless Persons: This group constitutes a significant portion of the homeless population, with 674 individuals (25% of the total). Among them, 452 (17%) are sheltered, while 222 (8%) remain unsheltered. The data indicates that while many chronically homeless individuals access shelter services, a substantial number still experience unsheltered homelessness, highlighting the persistent need for long-term supportive housing and outreach programs.

Adult Domestic Violence Survivors: This subgroup accounts for 163 individuals, representing 6% of the total population. Of these, 113 individuals

(4%) are sheltered, and 50 (2%) are unsheltered. The data emphasizes the critical role of shelters in providing immediate safety for survivors, though the unsheltered percentage signals gaps in resources or barriers to accessing services for some survivors.

Veterans: Veterans make up 202 individuals (8% of the total homeless population). Among them, 164 (6%) are sheltered, while 38 (2%) are unsheltered. These figures demonstrate that existing veteran-focused initiatives, such as HUD-VASH, successfully provide shelter for a majority of this group. Still, additional efforts are needed to address the unsheltered veterans who remain vulnerable.

Unaccompanied Youth and Young Adults: This group includes 181 individuals, accounting for 7% of the total population. Of these, 109 (5%) are sheltered, and 32 (2%) are unsheltered. The data underscores this population's particular vulnerability, which requires targeted interventions like youth-specific housing and support services to reduce risks and provide stability.

Nature and Extent of Homelessness: (Optional)

Race	#	% of Total Persons Counted	Sheltered		Unsheltered	
			#	%	#	%
Total Homeless Persons Counted	2,661	100%	1,445	54%	806	30%
American Indian/Alaskan Native	108	4%	39	1%	57	2%
Asian	51	2%	21	1%	23	1%
Black/African Americans	556	21%	380	14%	119	4%
Middle Eastern or North African	4	0%	1	0%	1	0%
Multi- Racial	196	7%	155	6%	38	1%
Native Hawaiian/Other Pacific Islander	78	3%	58	2%	19	1%
Unknown	229	9%	51	2%	38	1%
White	1227	46%	607	23%	453	17%
Hispanic/Latino	212	8%	133	5%	58	2%

Estimate the number and type of families in need of housing assistance, including families with children and families of veterans.

Targeted Populations	#	% of Total Persons Counted	Sheltered		Unsheltered	
			#	%	#	%
Chronically* Homeless Persons	674	25%	452	17%	222	8%
Adult Domestic Violence Survivor	163	6%	113	4%	50	2%
Veterans	202	8%	164	6%	38	1%
Unaccompanied Youth & Young Adults	181	7%	109	4%	32	1%

Describe the Nature and Extent of Homelessness by Racial and Ethnic Group.

Out of a total of 2,661 homeless individuals, 54% are sheltered, while 30% remain unsheltered. White individuals make up the largest proportion of the homeless population, with 1,227 individuals (46%), including 607 sheltered and 453 unsheltered. Black/African Americans account for 21% of the population (556 individuals), with 380 sheltered and 119 unsheltered, indicating systemic inequities that disproportionately affect this group. Hispanic/Latino individuals represent 8% of the population (212 individuals), with most accessing shelters but a notable portion remaining unsheltered.

Other groups face unique challenges as well. American Indian/Alaskan Native individuals account for 4% of the homeless population (108 individuals), with a significant portion unsheltered (57). Similarly, Native Hawaiian/Other Pacific Islanders (3%, or 78 individuals) have higher access to shelters, but barriers persist for a smaller unsheltered group. Multi-racial individuals represent 7% (196 individuals), with a majority sheltered, though 38 remain unsheltered. Asian individuals, while a smaller group at 2% (51 individuals) face similar proportions of shelter access and unsheltered living.

A notable segment of the population (9%, or 229 individuals) is categorized under "unknown" race, indicating gaps in data collection that hinder targeted interventions. Small groups like Middle Eastern/North African individuals (4 individuals) also highlight the need for tailored outreach and support.

Describe the Nature and Extent of Unsheltered and Sheltered Homelessness.

In 2020, the total number of homeless individuals was 1,897, with 983 (52%) sheltered and 567 (30%) unsheltered. By 2021, the total homeless population dropped significantly to 1,005, with all recorded individuals categorized as sheltered. This suggests a data collection or reporting issue for the unsheltered population that year. In 2022, the total homeless population increased to 1,851, with 1,184 individuals (64%) sheltered and 343 (19%) unsheltered. This indicates a growing unsheltered population as the overall numbers rebounded. The trend continued in 2023, with the total homeless population rising to 2,148. Of these, 1,385 (65%) were sheltered, while the unsheltered count increased to 477

(22%). By 2024, the total homeless population surged to 2,661, with 1,445 (54%) sheltered and 806 (30%) unsheltered, marking the highest number of unsheltered individuals across the years.

Discussion:

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NA-45 NON-HOMELESS SPECIAL NEEDS ASSESSMENT - 91.405, 91.205 (B, D)

Introduction

Describe the characteristics of special needs populations in your community:

Active Military The South Sound Military and Communities Partnership details Lakewood's military population, which reflects its pivotal role as a community for active-duty personnel and their families, particularly those connected to Joint Base Lewis-McChord (JBLM). Lakewood is home to 2,728 active-duty sponsors, 1,575 spouses, and 2,274 children, highlighting the strong family-oriented composition of the military population in the area.

In addition to active-duty members, the city hosts 817 Guard and Reserve sponsors, along with 422 spouses and 499 children. This demonstrates the diverse military presence in Lakewood, encompassing not only active-duty personnel but also those serving in Reserve capacities. Retirees also constitute a significant segment, with 2,433 retiree sponsors residing in Lakewood, alongside 1,670 spouses and 681 children. These demographic underscores the city's importance as a retirement destination for military personnel, with strong ties to JBLM and the amenities it provides.

Beyond direct military affiliations, Lakewood supports additional military-dependent groups, such as other dependents and civilian employees associated with JBLM. For instance, 360 appropriated fund civilians and 470 non-appropriated fund civilians reside in Lakewood, reflecting the city's economic interdependence with JBLM operations.

Veterans According to the 2023 American Community Survey (ACS) 5-Year data, Lakewood is home to 6,341 civilian veterans aged 18 and older, making up 13.3% of the city's population. Among these, 5,961 (78.6%) are male veterans, while 1,402 (21.4%) are female veterans. This gender distribution highlights the predominantly male composition of the veteran population but also reflects the increasing presence of female veterans. These figures underline Lakewood's position as a critical hub for veterans, offering proximity to Joint Base Lewis-McChord and a community that values and supports their contributions.

Elderly, Frail Elderly, and Persons with Disabilities: In Lakewood, the prevalence of disabilities varies significantly across age groups and disability types, reflecting the diverse needs of the population. Among young children under the age of 5, only 2.1% are reported to have a disability, while the percentage increases to 4.6% for school-age children (5 to 17 years). Young adults (18 to 34 years) show a disability rate of 9.3%, which slightly decreases to 7.6% among middle-aged adults (35 to 64 years). However, the rate rises sharply for older adults, with 25.3% of individuals aged 65 to 74 having a disability and 45.5% among those 75 years and older. Regarding disability types, ambulatory difficulties are the most prevalent, affecting 9.6% of the population, followed closely by independent living challenges at 10.4%. Cognitive disabilities impact 8.5%, while hearing and vision difficulties affect 4.2% and 3.5%, respectively. Additionally, 3.6% of individuals experience self-care challenges.

What are the housing and supportive service needs of these populations, and how are these needs determined?

Active Military The primary housing need for active military members is affordable housing near Joint Base Lewis-McChord (JBLM). With JBLM projected to grow by 2,800 service members by 2025, there is a 750-unit housing shortfall near the base. Many service members and their families live off-base in Lakewood, which is increasing demand for rental units and driving up housing costs. Supportive services like affordable childcare and transportation infrastructure are essential to support these families. The SSMCP has also highlighted the importance of community resilience projects to improve housing availability and mitigate external risks like natural disasters
.

Veterans: Lakewood's 7,363 civilian veterans represent a significant demographic, accounting for 15.21% of the city's population. Housing stability remains a critical need, particularly for veterans on fixed incomes who struggle with rising rents. Veterans Affairs Supportive Housing (VASH) vouchers and community programs are pivotal in addressing these needs.

Elderly & Disabled Populations Seniors on fixed incomes are increasingly at risk of losing housing due to rising costs. There is a shortage of affordable, age-friendly housing with universal design features, making it difficult for elderly residents to age in place. Additional supportive services, such as home repair assistance and transportation options, are needed to stabilize this vulnerable population. Housing for individuals with disabilities is scarce, with limited accessible units available in the market. Many homes, such as ramps and accessible bathrooms, are not equipped to meet the physical needs of disabled residents. The Fair Housing Center of Washington has advocated for programs that facilitate post-purchase modifications to improve accessibility. Transitional and supportive housing options tailored to the disabled population are also needed to ensure long-term stability.

The needs of these populations were identified through multiple channels, including public hearings, stakeholder interviews, and data from housing and health agencies. Community feedback has consistently highlighted the importance of affordable housing, rent stabilization, and expanded supportive services. Initiatives like the Pierce County Housing Authority's five-year plan and SSMCP's resilience reviews further refine these priorities by incorporating long-term regional planning and economic analysis.

Discuss the size and characteristics of the population with HIV/AIDS and their families within the Eligible Metropolitan Statistical Area:

Using data from Washington State and Pierce County, the population of individuals living with HIV/AIDS in Lakewood can be estimated by adjusting for its population size and demographic characteristics. Washington has approximately 15,000 people living with HIV, with about 11% residing in Pierce County. Lakewood, accounting for a substantial portion of Pierce County's population, is estimated to have between 250 and 300 individuals living with HIV/AIDS.

This population is primarily made up of individuals assigned male at birth, with men who have sex with men (MSM) being the most impacted group, reflecting state and national trends. Key needs for this population include access to stable housing, comprehensive healthcare, and social support services. Challenges like stigma, healthcare access disparities, and poverty further complicate their stability. Families of individuals with HIV/AIDS also require supportive services such as counseling and financial assistance to cope with associated healthcare costs and social challenges.

If the PJ will establish a preference for a HOME TBRA activity for persons with a specific category of disabilities (e.g., persons with HIV/AIDS or chronic mental illness), describe their unmet need for housing and services needed to narrow the gap in benefits and services received by such persons. (See 24 CFR 92.209(c)(2) (ii))

N/A

Discussion:

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NA-50 NON-HOUSING COMMUNITY DEVELOPMENT NEEDS - 91.415, 91.215 (F)

Describe the jurisdiction's need for Public Facilities:

According to Lakewood's 2024 Comprehensive Plan, the City must address growing demands for utilities, transportation infrastructure, emergency services, and community resources. Public facilities are critical for meeting Lakewood's projected growth targets, which include accommodating an additional 9,378 housing units and 9,863 jobs by 2044.

Key facility needs include upgrading stormwater and sewer systems to meet increased residential and commercial demands. Improvements to transportation infrastructure, such as arterial roads and multimodal connections, including sidewalk and streetlighting investments, are also essential to support growth and reduce congestion, especially given the city's proximity to Joint Base Lewis-McChord and major highways like I-5 and SR-512.

Emergency services, including police and fire protection, require enhancements to maintain adequate response times amid population growth. Public spaces like parks, community centers, and libraries also need expansion and modernization to meet the recreational and cultural needs of a diverse and growing population. The City's emphasis on sustainability calls for energy-efficient infrastructure and resilient designs to address climate change and environmental challenges.

How were these needs determined?

The needs for public facilities in Lakewood were determined through growth projections, infrastructure assessments, community engagement, and alignment with regional policies. Growth targets from the Puget Sound Regional Council and Pierce County highlighted the need for additional housing, transportation, and utilities to support population and employment growth. Community input through surveys and public hearings identified local priorities. At the same time, compliance with the Growth Management Act ensured infrastructure met future demands of environmental sustainability and equitable distribution of resources, particularly in underserved areas, further shaping facility planning.

Describe the jurisdiction's need for Public Improvements:

Lakewood's need for public improvements, as detailed in the Six-Year Comprehensive Transportation Improvement Program (2024-2029), focuses on upgrading transportation, infrastructure, and public facilities to support growth and improve quality of life. These needs are identified through compliance with the Growth Management Act, alignment with regional goals, and community feedback.

Key priorities include widening 150th Street for industrial development, creating multimodal pathways on Gravelly Lake Drive, upgrading stormwater systems, enhancing ADA-compliant sidewalks, and installing sidewalks and streetlighting where none presently exist. Public safety improvements, like new traffic signals at critical intersections, and neighborhood projects address traffic volumes and enhance livability.

How were these needs determined?

The City of Lakewood identified its public facilities and public improvement needs through comprehensive studies, and plans developed resulting from those studies, the City of Lakewood 6-Year Capital Improvement Plan.

Describe the jurisdiction's need for Public Services:

Housing Assistance and Homeless Prevention: There is a significant need for emergency rental assistance and housing stabilization services. Programs like those operated by LASA and STEP address critical gaps by providing emergency shelters, hygiene centers, and homelessness prevention resources.

Access to Health and Behavioral Health Services: Mental health and behavioral health services remain a priority, with organizations like the Asia Pacific Cultural Center, Greater Lakes Mental Health, and Community Health Care focusing on providing affordable access to care.

Food Security: Organizations like the Emergency Food Network and St. Leo's Food Connection provide access to food for underserved populations. Many low-income households, seniors, and individuals with disabilities face barriers to accessing nutritious food due to transportation limitations, financial hardship, and mobility issues.

Youth Support and Programming: Programs targeting emotional and social well-being, such as those offered by Communities in Schools and the Boys & Girls Club, are critical for supporting Lakewood's youth. The Oasis Youth Center, providing wraparound services for LGBTQ+ youth, is another resource.

Support for Vulnerable Populations: Services for individuals living with HIV/AIDS and their families, provided by organizations like the Pierce County AIDS Foundation (PCAF), are essential. PCAF focuses on maintaining health insurance, transportation access, and prevention efforts for high-risk groups.

How were these needs determined?
These needs are identified through public engagement, reviews of grant applications, and discussions with service providers, ensuring resources align with community priorities.

HOUSING MARKET ANALYSIS

MA-05 OVERVIEW

Housing Market Analysis Overview:

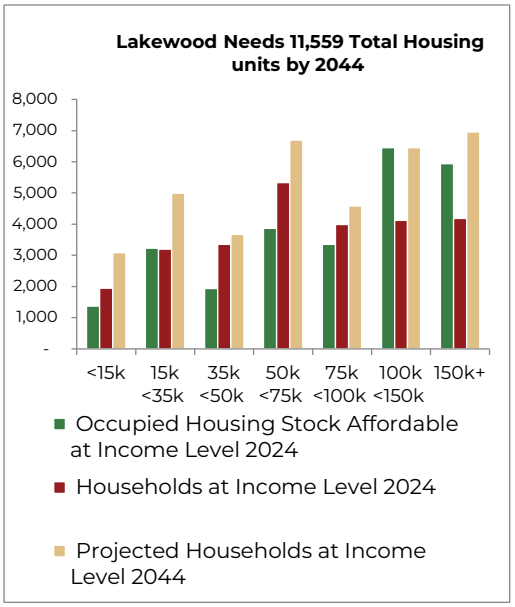
The Balanced Housing Model

The Balanced Housing Model calculates housing needs based on projected household growth at each income level, using past trends and anticipated changes in social, economic, and demographic factors. This includes considerations like housing stock age, immigration, and population changes. Its projections can be summarized as follows:

1. *Using census data, population projections, and key indicators, establish the forecasted number of housing units needed by 2044.*

2. *Subtract the City's existing number of housing units from the county's 2044 projected housing units.*

Lakewood's 2024 Comprehensive Plan projects steady growth, with the population increasing by 37% from 63,034 in 2023 to 86,792 by 2044. Households are expected to grow from 26,125 to 36,443, with an average of 2.34 persons per household. The City will need 12,174 total housing units by 2044. By 2044, Lakewood's population will shift with 31.7% under age 25, 27.7% aged 25–44, 22.4% aged 45–64, and 18.1% aged 65 and older. This demographic evolution underlines the importance of strategic planning to address evolving housing needs across all income levels.



Renter Housing Demand By 2044, Lakewood will need an additional 10,289 rental housing units to meet demand and replace obsolete stock. The greatest need is for households earning less than $35,000 annually, which accounts for over 5,800 units (2,074 for incomes under $15k and 3,785 for $15k–$35k).

Owner Housing Demand Based on the Balanced Housing Model projections, Lakewood will need 2,619 additional owner-housing units to meet demand and replace obsolete housing. The greatest need is in the $35k—$50k income bracket, which requires 1,885 units. This highlights a gap in moderately affordable ownership opportunities. Other income brackets show limited demand or even surpluses in certain ranges, such as the $15k—$35k range.

MA-10 HOUSING MARKET ANALYSIS: NUMBER OF HOUSING UNITS - 91.410, 91.210(A)&(B)(2)

Introduction

The majority of Lakewood homes are 1-unit detached structures, comprising 44% (12,320 units) of the total. Smaller segments include 1-unit attached structures at 6% (1,565 units) and multifamily units ranging from 2-4 units at 13% (3,573 units) to larger developments of 5-19 units at 23% (6,425 units) and 20 or more units at 10% (2,910 units). Mobile homes and other nontraditional units such as boats, RVs, and vans account for the remaining 4% (1,217 units).

All residential properties by number of units

Property Type	Number	%
1-unit detached structure	12,320	44%
1-unit, attached structure	1,565	6%
2-4 units	3,573	13%
5-19 units	6,425	23%
20 or more units	2,910	10%
Mobile Home, boat, RV, van, etc	1,217	4%
Total	***28,010***	***100%***

Table 25 – Residential Properties by Unit Number

Data Source: 2019-2023 ACS

Unit Size by Tenure

	Owners		Renters	
	Number	%	Number	%
No bedroom	57	0.5%	1,062	7%
1 bedroom	176	2%	4,750	33%

	Owners		Renters	
	Number	**%**	**Number**	**%**
2 bedrooms	1,970	17%	5,990	42%
3 or more bedrooms	9,503	81%	2,617	18%
Total	***11,706***	***100%***	***14,419***	***100%***

Table 26 – Unit Size by Tenure

Data Source: 2019-2023 ACS

Describe the number and targeting (income level/type of family served) of units assisted with federal, state, and local programs.

Lakewood has a total of 471 federally assisted housing units across seven subsidized properties, representing approximately 3.3% of the city's 14,419 rental units. These properties primarily serve low-income households, with specific targeting for families, seniors, and persons with disabilities. The units include a mix of studio, one-bedroom, two-bedroom, and three-plus-bedroom options, ensuring accessibility for a variety of household types. Most of the properties are funded through programs such as Low-Income Housing Tax Credits (LIHTC), Project-Based Vouchers (PBV), and HOME, with affordability levels typically set for households earning below 60% of the Area Median Income (AMI).

Provide an assessment of units expected to be lost from the affordable housing inventory for any reason, such as the expiration of Section 8 contracts.

Of the 471 federally assisted units, a small portion could transition to market-rate housing within the next 10–15 years if affordability agreements are not renewed. Key properties include those funded through Section 8, such as Wisteria Walk Apartments and Lakewood Meadows Apartments, whose contracts expire in 2038 and 2032, and HOME-assisted units, which may lose affordability after 2036. Project-based voucher units, which rely on annual funding, also present risks if funding priorities shift.

Does the availability of housing units meet the needs of the population?

Lakewood's housing stock does not adequately meet the needs of low-income households, particularly those earning less than $50,000 annually. For households earning less than $15,000, there are 1,459 households but only 594 affordable units, leaving a gap of 865 units. The shortage is even more severe for households earning between $15,000 and $35,000, where 2,371 households are competing for just 332 affordable units, resulting in a gap of 2,039 units. Households earning between $35,000 and $50,000 also face a deficit, with 2,563 households and only 1,449 affordable units, leaving a gap of 1,114 units. In total, there is a shortfall of 4,018 affordable housing units for households earning below $50,000 annually.

Describe the need for specific types of housing:

Feedback from public hearings and community engagement reports highlights gaps in affordable family housing, with a particular demand for larger units (2-3 bedrooms) to accommodate households with children. Seniors and persons with disabilities face a lack of accessible and affordable options, as many units are not equipped to meet physical accessibility standards, and rising rental costs are pushing these populations out of stable housing. Veterans and active-duty military personnel, particularly those associated with Joint Base Lewis-McChord (JBLM), face unique challenges due to income variability, short-term housing needs, and insufficient availability of units tailored to military families. Reports also emphasize the need for extremely low-income (ELI) housing, particularly for households earning less than $35,000 annually, as well as transitional and supportive housing for homeless individuals, youth, and veterans. Additionally, the need for housing that integrates supportive services for those experiencing homelessness, domestic violence survivors, and individuals with mental health challenges has been repeatedly raised.

Discussion

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MA-15 HOUSING MARKET ANALYSIS: COST OF HOUSING - 91.410, 91.210(A)

Introduction

To afford homeownership in Lakewood, a family would need to earn significantly more than the median household income due to rising housing costs. With the median home value at $420,500 in 2023, monthly housing costs, including mortgage payments, taxes, and insurance, would typically range from $2,000 to $2,500. This requires an annual income of approximately $85,000 to $100,000 to avoid spending more than 30% of income on housing, the standard measure of affordability. However, with the City's median household income estimated well below this threshold, many families face barriers to homeownership. The cost of housing in Lakewood has risen significantly in recent years, reflecting substantial affordability challenges for residents. Between 2017 and 2023, the median home value increased by 81%, from $232,600 to $420,500, while the median contract rent rose by 61%, from $809 to $1,304. Current rental data shows that 40% of renters pay between $1,000 and $1,499 monthly, while nearly half (47%) spend $1,500 or more, indicating limited affordability for low-income households. Housing affordability data reveals critical gaps, particularly for renters earning 30% of the Area Median Family Income (HAMFI), with only 435 units affordable at this income level. Although more units are available for households earning 50% and 80% of HAMFI, they are still insufficient to meet the demand, with 13,230 rental units needed. Homeownership affordability is even tighter, with only 745 units affordable for those earning 50% of HAMFI and 2,235 for 80% of HAMFI.

Cost of Housing

	Base Year: 2017	Most Recent Year: 2023	% Change
Median Home Value	$232,600	$420,500	81%
Median Contract Rent	$809	$1,304	61%

Table 27 – Cost of Housing

Data Source: 2013-2017 ACS (Base Year), 2019-2023 ACS (Most Recent Year)

Rent Paid	Number	%
Less than $500	113	1%
$500-999	1,721	12%
$1,000-1,499	5,501	40%
$1,500-1,999	4,081	29%
$2,000 or more	2,462	18%
Total	***13,878***	***100%***

Table 28 - Rent Paid

Data Source: 2019-2023 ACS

Housing Affordability

Number of Units affordable to Households earning	Renter	Owner
30% HAMFI	435	No Data
50% HAMFI	3,190	745
80% HAMFI	9,605	2,235
100% HAMFI	No Data	3,800
Total	***13,230***	***6,780***

Table 29 – Housing Affordability

Data Source: 2019-2023 CHAS

Monthly Rent

Monthly Rent ($)	Efficiency (no bedroom)	1 Bedroom	2 Bedroom	3 Bedroom	4 Bedroom
Fair Market Rent	$1,430	$1,603	$1,987	$2,800	$3,236
High HOME Rent	$1,298	$1,391	$1,672	$1,923	$2,125
Low HOME Rent	$1,013	$1,086	$1,303	$1,505	$1,680

Data Source: HUD FMR and HOME Rents

Is there sufficient housing for households at all income levels?

There are 1,459 households earning less than $15,000 annually, yet only 594 occupied housing units are affordable to them, resulting in a shortfall of 865 units. Similarly, households earning between $15,000 and $35,000 total 2,371, but there are only 332 affordable occupied units, leaving a gap of 2,039 units. Households with incomes between $35,000 and $50,000 number 2,563, with 1,449 affordable occupied units available, indicating a deficit of 1,114 units.
The shortage is most severe for those earning below $35,000, where the combined deficit exceeds 2,900 units.

How is the affordability of housing likely to change, considering changes to home values and/or rents?

Between 2017 and 2023, the median home value increased by 81%, from $232,600 to $420,500, and median contract rent rose by 61%, from $809 to $1,304. As of 2024, the average rent in Lakewood is approximately $1,202 per month, which is 23% lower than the national average rent of $1,560. It is anticipated this upward trend in average rent and house valuation will continue, causing further affordability for Lakewood households, especially those at or below 80% AMI

How do HOME rents / Fair Market Rent compare to Area Median Rent? How might this impact your strategy to produce or preserve affordable housing?

Low HOME rents are below the AMR for smaller units, making them accessible to low-income households. Still, rents for larger units (e.g., 3- and 4-bedroom homes) often exceed the AMR, creating challenges for families needing more space. Fair Market Rents are significantly higher than AMR and HOME rents, especially for larger units: 3-bedroom units at $2,800 (92% above AMR) and 4-bedroom units at $3,236 (122% above AMR).

Lakewood's 2024 Comprehensive Plan emphasizes key barriers to affordability, including restrictive zoning regulations that limit higher-density development and the lack of incentives for affordable housing production in high-opportunity neighborhoods.

Discussion

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MA-20 HOUSING MARKET ANALYSIS: CONDITION OF HOUSING - 91.410, 91.210(A)

Introduction

Regarding housing conditions in Lakewood, CHAS data shows that 24% of owner-occupied units and 48% of renter-occupied units have at least one selected condition, such as issues with plumbing, heating, or structural integrity. A smaller percentage, 0.5% of owner-occupied and 5% of renter-occupied units exhibit two such conditions. Notably, no units were reported with three or four conditions. Conversely, 75% of owner-occupied and 47% of renter-occupied units have no reported issues, suggesting a significant portion of the housing stock is in good condition.

Approximately 69% of owner-occupied and 54% of renter-occupied units were built before 1980, two years after lead-based paint was banned for residential use in 1978. These numbers present a substantial risk of lead-based paint exposure to Lakewood households occupying these units.

The City's proximity to Joint Base Lewis-McChord (JBLM) exposes residential areas to noise pollution and vibrations from military activities, potentially accelerating structural wear and reducing the desirability of affected neighborhoods. Additionally, Lakewood's location within the Puget Sound region subjects it to high humidity and frequent rainfall, which can lead to moisture-related issues such as mold growth, wood rot, and weakened foundations if proper maintenance is neglected. Furthermore, certain neighborhoods in Lakewood, such as Tillicum/Woodbrook and Springbrook, are identified as HUD "Qualified Census Tracts" and have high scores for Washington Environmental Health Disparities, indicating a combination of environmental exposures and socioeconomic factors that may exacerbate housing deterioration.

Describe the jurisdiction's definition of "substandard condition" and "substandard condition but suitable for rehabilitation:

For purposes of this Consolidated Plan, units which are considered in "substandard condition" are units which do not meet HUD Uniform Physical Condition Standards (UPCS) and/or current applicable code standards. Units in "substandard condition but suitable for rehabilitation" are those that may not meet one or more of UPC Standards but can be reasonably repaired to extend the life of the building, contribute to the safety of the occupant, and improve conditions or livability of the structure. Substandard and not suitable for rehabilitation are units that are in poor condition and not structurally and/or financially feasible to rehabilitate.

Condition of Units

Condition of Units	Owner-Occupied		Renter-Occupied	
	Number	%	Number	%
With one selected Condition	2,828	24%	6,920	48%
With two selected Conditions	60	0.5%	729	5%
With three selected Conditions	0	0%	0	0%
With four selected Conditions	0	0%	0	0%
No selected Conditions	8,818	75%	6,770	47%
Total	***11,706***	***100%***	***14,419***	***100%***

Table 30 - Condition of Units

Data Source: 2019-2023 ACS

Year Unit Built

Year Unit Built	Owner-Occupied		Renter-Occupied	
	Number	%	Number	%
2000 or later	1,095	9%	2,712	19%
1980-1999	2,514	21%	3,922	27%
1950-1979	7,202	62%	6,690	46%
Before 1950	895	8%	1,095	8%
Total	***11,706***	***100%***	***14,419***	***100%***

Table 31 – Year Unit Built

Data Source: 2019-2023 CHAS

Risk of Lead-Based Paint Hazard

Risk of Lead-Based Paint Hazard	Owner-Occupied		Renter-Occupied	
	Number	%	Number	%
Total Number of Units Built Before 1980	8,097	69%	7,785	54%
Housing Units build before 1980 with children present	1,080	10%	1,275	9%

Table 32 – Risk of Lead-Based Paint

Data Source: 2019-2023 ACS (Total Units) 2019-2023 CHAS (Units with Children present)

Describe the need for owner and rental rehabilitation based on the condition of the jurisdiction's housing.

Among owner-occupied units, 24% have at least one selected condition, such as structural issues, outdated plumbing, or inadequate heating, while 0.5% have two chosen conditions. For renter-occupied units, the need is even more acute, with 48% having at least one condition and 5% having two conditions. Additionally, the age of the housing stock compounds the need for rehabilitation, as 69% of owner-occupied and 54% of renter-occupied units were built before 1980, increasing the likelihood of lead-based paint hazards. Rental properties, in particular, may lack ongoing maintenance due to absentee landlords or limited resources, posing health and safety risks for tenants.

Permitting delays in Lakewood have been identified as a significant barrier to housing construction, contributing to increased costs and extended project timelines. In response, Lakewood has implemented measures to streamline its permitting process. The City is transitioning to a new permitting software looking to offer a streamlined experience for applicants. This new platform provides an online dashboard for document submission, fee payments,

inspection scheduling, and permit status reviews, and allows better interconnectivity between internal departments in order to enhance efficiency and transparency.

Additionally, new State legislation effective January 2025 introduced specific timelines for permit reviews, including 28 days to determine application completeness. With the new software upgrades and better interconnectivity, the City anticipates a much-improved permitting experience moving forward.

Estimate the number of housing units within the jurisdiction that are occupied by low- or moderate-income families and contain lead-based paint hazards. 91.205(e), 91.405

It is estimated that approximately 6,353 housing units in Lakewood occupied by low- or moderate-income families contain potential lead-based paint hazards. This estimate is based on the city's data showing that 69% of owner-occupied and 54% of renter-occupied units were built before 1980. Applying income distribution data, where approximately 40% of households are low- or moderate-income, results in an estimate of 3,239 owner-occupied units and 3,114 renter-occupied units at risk.

Discussion

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MA-25 PUBLIC AND ASSISTED HOUSING - 91.410, 91.210(B)

Introduction

Totals Number of Units

Program Type									
	Certificate	Mod-Rehab	Public Housing	Vouchers					
				Total	Project-based	Tenant-based	Special Purpose Voucher		
							Veterans Affairs Supportive Housing	Family Unification Program	Disabled *
# of units/vouchers available				3,101	232	2,699	319	-	200
# of accessible units									

***includes Non-Elderly Disabled, Mainstream One-Year, Mainstream Five-year, and Nursing Home Transition**

Table 33 – Total Number of Units by Program Type

Data Source: PIC (PIH Information Center)

Describe the supply of public housing developments:

There are no Public Housing Developments in Lakewood.

Describe the number and physical condition of public housing units in the jurisdiction, including those that are participating in an approved Public Housing Agency Plan:

The Pierce County Housing Authority (PCHA) manages a limited portfolio of public housing units and Section 8 Housing Choice Vouchers. The housing supply includes scattered site units and larger developments, with ongoing efforts to expand through acquisitions and leveraging tax credits. For example, PCHA plans to develop additional affordable units using proceeds from the disposition of existing properties and through new construction projects. However, the available housing does not sufficiently meet the demand from low- and moderate-income families, as demonstrated by long waitlists and the need for more VASH and Emergency Housing Vouchers. PCHA operates 124 scattered site units, which have presented operational challenges due to high maintenance costs and inefficiencies. Many of these units are in need of significant repairs or updates. Recent approvals for Section 18 Disposition are allowing PCHA to sell some properties and replace them with more sustainable housing options. The occupancy rate of public housing units remains high, reflecting the significant demand for affordable housing. However, outdated infrastructure and deferred maintenance issues persist, particularly in older units.

Public Housing Condition

Public Housing Development	Average Inspection Score

Table 34 - Public Housing Condition

Describe the restoration and revitalization needs of public housing units in the jurisdiction:

Many public housing units require upgrades to meet current safety and accessibility standards. PCHA has outlined plans to revitalize its portfolio by pursuing tax credits for rehabilitation projects and implementing the Faircloth-to-RAD conversion program to ensure long-term affordability. Infrastructure improvements, such as updated plumbing and electrical systems, are also priorities.

Describe the public housing agency's strategy for improving the living environment of low- and moderate-income families residing in public housing:

PCHA has adopted a multi-layered strategy to enhance the living environment for low- and moderate-income families. This includes expanding housing choice through increased voucher availability, targeted outreach to landlords, and prioritizing housing for veterans, persons with disabilities, and other vulnerable populations. The agency also focuses on community engagement, offering programs like “Ready to Rent” to address common leasing barriers. Partnerships with local organizations and additional funding sources are being leveraged to increase housing options and provide supportive services.

Discussion:

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MA-30 HOMELESS FACILITIES AND SERVICES - 91.410, 91.210(C)

Introduction

Households with adults and children have 502 emergency, 67 transitional, and 1,035 supportive housing beds targeted to homeless persons. Adult-only households have 1,106 emergency and 1,497 supportive beds. Unaccompanied youth have fewer. Youth under 18, along with other vulnerable groups, often remain in temporary housing for prolonged periods without successfully transitioning to permanent housing. Data from Pierce County's Homeless Crisis Response System shows that only about one in three individuals receiving services exit to permanent housing, a rate that has declined over time as the number of individuals in need has doubled between 2015 and 2023.

Facilities Targeted to Homeless Persons

	Emergency Shelter Beds		Transitional Housing Beds	Permanent Supportive Housing Beds	
	Year-Round Beds (Current & New)	Voucher / Seasonal / Overflow Beds	Current & New	Current & New	Under Development
Households with Adult(s) and Child(ren)	502	-	67	1,035	-
Households with Only Adults	1,106	-	101	1,497	-
Chronically Homeless Households	n/a	-		611	-
Veterans	40	-	71	675	-
Unaccompanied Youth	24	-	0	15	-

Table 35 - Facilities Targeted to Homeless Persons

Describe mainstream services, such as health, mental health, and employment services, to the extent those services are used to complement services targeted to homeless persons.

The City collaborates with organizations like the Continuum of Care, Tacoma-Pierce County Health Department and the Pierce County Housing Authority to address the medical, mental health, and economic challenges that exacerbate homelessness.

- **Health Services**: Programs like Madigan Army Medical Center, which provides Level II trauma care, extend services beyond military beneficiaries to assist vulnerable populations, including those experiencing homelessness. Collaborative efforts also support vaccination drives and preventive care for unhoused individuals.
- **Mental Health Services**: Organizations such as Greater Lakes Mental Health offer therapy, substance abuse treatment, and crisis intervention, which align with housing-first initiatives to stabilize individuals
- **Employment Support**: Partnerships with agencies like the Tacoma Goodwill aim to improve job readiness among homeless individuals through skills training and employment matching services

List and describe services and facilities that meet the needs of homeless persons, particularly chronically homeless individuals and families, families with children, veterans and their families, and unaccompanied youth. If the services and facilities are listed on screen SP-40 Institutional Delivery Structure or screen MA-35 Special Needs Facilities and Services, describe how these facilities and services specifically address the needs of these populations.

LIHI's operation of Maureen Howard Place in Lakewood serves as an enhanced shelter, providing 77 suites for homeless persons who are actively camping along state right-of-ways. The facility was opened in 2024 with funding provided through the state Department of Commerce Right-of-Way program. Additionally, LIHI operates Aspen Court, a one-time emergency shelter offering housing assistance to chronically homelessness persons. Currently Aspen Court is in the process of being converted into permanent supportive housing for low-income households. Families with children benefit from programs offered by Catholic Community Services and LASA, which provide safe housing,

rental assistance, childcare resources, and access to emergency services for those experiencing homelessness. Veterans' housing and healthcare needs are met through resources like Veterans Affairs Supportive Housing (VASH) vouchers, while unaccompanied youth, including LGBTQ+ individuals, are supported by organizations like the Oasis Youth Center.

MA-35 SPECIAL NEEDS FACILITIES AND SERVICES - 91.410, 91.210(D)

Introduction

Including the elderly, frail elderly, persons with disabilities (mental, physical, developmental), persons with alcohol or other drug addictions, persons with HIV/AIDS and their families, public housing residents, and any other categories the jurisdiction may specify and describe their supportive housing needs.

Special populations in Lakewood, such as the elderly and frail elderly, require age-appropriate, accessible housing options integrated with health care and mobility services. Persons with disabilities, including mental, physical, and developmental disabilities, often need supportive housing with accommodations such as ADA-compliant units, access to medical services, and case management. Individuals with alcohol or drug addictions benefit from transitional and supportive housing that includes recovery and counseling services. Similarly, persons with HIV/AIDS and their families need stable housing coupled with health care, case management, and nutritional support. Public housing residents, many of whom are low-income, require access to programs that promote self-sufficiency, such as job training and financial literacy. Lakewood's proactive approach ensures these populations receive tailored services to address their unique challenges.

Describe programs for ensuring that persons returning from mental and physical health institutions receive appropriate supportive housing.

To support individuals returning from mental and physical health institutions, Lakewood collaborates with partners such as Greater Lakes Mental Health the Pierce County Health Department, and the Continuum of Care coalition. These programs ensure a smooth transition into community settings by providing wraparound services, including case management, access to housing vouchers, and integration into supportive housing. The City also works with reentry organizations to assist those recovering from substance use disorders or physical injuries, ensuring they have access to both housing and necessary rehabilitative services.

Specify the activities that the jurisdiction plans to undertake during the next year to address the housing and supportive services needs identified in accordance with 91.215(e) with respect to persons who are not homeless but have other special needs. Link to one-year goals. 91.315(e).

In the upcoming year, Lakewood will focus on expanding housing options and enhancing service delivery for non-homeless special populations. Planned activities include programs in support of the maintenance of existing affordable housing stock by way of housing rehabilitation programs designed to maintain both owner-occupied and renter-occupied housing units. Ensuring existing rental housing units are adequately maintained and continue to provide safe, decent affordable housing to Lakewood residents through the City's rental inspection program. Emergency assistance programs supporting vulnerable populations, including the elderly, those with disabilities, and minority households, will continue to assist persons displaced from their homes through no fault of their own resulting from displacement actions such as fire, natural disasters, and redevelopment activities. Rental housing deposit assistance programs designed to provide housing stability to those households otherwise unable to secure rental housing. Partnerships with LASA, Habitat and Rebuilding Together seek to increase the availability of affordable housing for seniors through the development of age-friendly units and retrofitting existing housing to improve accessibility. Many seniors on fixed incomes struggle to secure stable housing due to the financial burden of security deposits and first-month rent requirements, often pushing them into housing instability or even homelessness. Data from Pierce County's Homeless Crisis Response System indicates a growing crisis, with nearly 10,000 individuals seeking services in 2023, the highest number on record, and seniors disproportionately affected. Without assistance, many face eviction, homelessness, or premature institutionalization, increasing public healthcare costs and diminishing their quality of life. Lakewood's senior population, particularly the 31% of householders aged 65 and older who earn less than $40,550 annually, is classified as Very Low Income (50% AMI). The City will look to expand partnerships with organizations like LASA and the Pierce County AIDS Foundation to ensure individuals with HIV/AIDS and their families receive comprehensive care. Programs targeting individuals with disabilities will emphasize independent living, vocational training, and access to medical services. Additionally, the City will continue its efforts to stabilize and revitalize

existing neighborhoods through the removal and remediation of blighted properties.

For entitlement/consortia grantees: Specify the activities that the jurisdiction plans to undertake during the next year to address the housing and supportive services needs identified in accordance with 91.215(e) with respect to persons who are not homeless but have other special needs. Link to one-year goals. (91.220(2)).

The activities below align with the City's overarching goals of stabilizing existing residents, increasing access to affordable housing, and addressing the unique needs of special populations, particularly through services designed to enable independence and enhance the quality of life.

Major Home Repair Program: This program provides loans for significant home repairs, including accessibility improvements, to help low-income homeowners, particularly elderly and disabled residents, remain in their homes safely and affordably. The project includes accessibility upgrades, such as the installation of ramps and ADA-compliant fixtures.

Habitat for Humanity Aging-in-Place Program: This initiative, which focuses on small-scale repairs and accessibility improvements, assists elderly and disabled homeowners in maintaining safe, livable housing.

Rebuilding Together South Sound Repair Program: This program provides funding to make general repairs, accessibility improvements, or emergency repairs related to deferred maintenance for low-income households, with priority for families with children, senior, and disabled households.

Emergency Assistance Payments: Funding supports emergency payments for basic needs such as food, housing, and housing-related expenses. This program prioritizes elderly, disabled, and cost-burdened households disproportionately affected by rising living costs.

Affordable Housing Development: Living Access Support Alliance (LASA) will begin constructing 26 affordable rental units in Lakewood's downtown core, targeting low-income families and special needs populations.

Relocation Assistance: Emergency relocation services assist households displaced through no fault of their own due to fires, redevelopment, or building code closures, ensuring access to safe and stable housing.

Fair Housing and Culturally Competent Services: Funding is allocated for education and outreach to ensure equitable housing access, with a focus on minority and immigrant populations disproportionately impacted by housing inequities.

MA-40 BARRIERS TO AFFORDABLE HOUSING - 91.410, 91.210(E)

Describe any negative effects of public policies on affordable housing and residential investment

Public policies can impose a variety of restrictions that limit the development of affordable housing and discourage residential investment, thus highlighting the broad challenges that come with balancing growth, urban design, and accessibility. Zoning laws, particularly in areas like the Colonial Overlay (C-O) and Town Center Incentive Overlay (TCI-O), prohibit standalone residential developments and certain housing types such as mobile home parks, boarding houses, and some group homes, thereby excluding options that cater to lower-income and special needs populations in favor of maintaining certain uniformity of development and design standards. These policies could potentially lead to a reduction in the availability of affordable housing development, thus worsening housing scarcity for vulnerable community groups. Further, density restrictions complicate the issue, as they inherently increase development complexity and costs, making affordable housing projects less financially viable. Strict design standards, like those in the Colonial District, could increase construction costs and limit affordable residential development.

Of additional concern for the future of affordable housing development are the outdated and lagging regulatory policies of the HOME and CDBG programs. In today's frenzied economy, with ever-increasing property valuations and construction costs spiraling out of sight, the very programs designed to assist communities in the support and development of affordable housing are hindering that development. Certain regulations like the restriction of investment in homes whose value exceeds that of 95% of median purchase

price, outdated per-unit investment subsidy limits, onerous environmental regulations, construction and materials regulations, contracting provisions including prevailing wage, Buy America Build America and Section 3 hiring requirements, ever-changing property inspection and monitoring standards, and a restriction of CDBG investments in the constructing of new housing units unless conducted by a Community Based Development Organization. As economies and markets evolve, regulatory policies need to be evaluated and either updated or eliminated in order to keep pace with the changing economic times.

MA-45 NON-HOUSING COMMUNITY DEVELOPMENT ASSETS - 91.410, 91.210(F)

Introduction

Total employment in the City increased from 31,804 jobs in Q1 2022 to 32,670 jobs in Q1 2024, with significant contributions from health care and social assistance (11,758 jobs) and retail trade (3,309 jobs). However, sectors like transportation and warehousing experienced declines, dropping to 1,894 jobs from 2,060 in Q1 2022.

The unemployment rate in Lakewood is 5.7%, slightly higher than the Pierce County average of 5.0%. Median household income rose to $65,531, although it remains below the Pierce County and state averages. The assessed property value reached $11 billion, and annual property tax revenue increased steadily to $7.76 million in 2023.

Lakewood's largest employers include Joint Base Lewis-McChord (55,000 employees), Western State Hospital, and St. Clare Franciscan. The report also notes an active business environment with 4,710 licensed businesses. Investments in public safety and education continue, with improvements in high school graduation rates and public infrastructure.

Economic Development Market Analysis

Business Activity

Business by Sector	Number of Workers	Number of Jobs	Share of Workers %	Share of Jobs %	Jobs less workers %
Agriculture, Mining, Oil & Gas Extraction	130	12	1	0	-1

Business by Sector	Number of Workers	Number of Jobs	Share of Workers %	Share of Jobs %	Jobs less workers %
Arts, Entertainment, Accommodations	2,468	3,403	15	18	3
Construction	991	1,283	6	7	1
Education and Health Care Services	3,586	4,423	22	24	2
Finance, Insurance, and Real Estate	1,082	1,062	7	6	-1
Information	355	154	2	1	-1
Manufacturing	1,345	935	8	5	-3
Other Services	819	1,265	5	7	2
Professional, Scientific, Management Services	1,074	729	7	4	-3
Public Administration	114	0	1	0	-1
Retail Trade	2,627	3,370	16	18	2
Transportation and Warehousing	910	781	6	4	-2
Wholesale Trade	960	1,024	6	6	0
Total	16,461	18,441	--	--	--

Table 36 - Business Activity

Data Source: 2019-2023 ACS (Workers), 2015 Longitudinal Employer-Household Dynamics (Jobs)

Total - All Industries	31,859	11.0%	3,155
Agriculture, Forestry, Fishing and Hunting	48	-12.6%	-7
Utilities	73	27.0%	16
Construction	1,636	36.7%	439
Manufacturing	1,042	18.7%	164
Wholesale Trade	997	-2.2%	-22
Retail Trade	3,023	-4.2%	-132
Transportation and Warehousing	2,510	18.9%	399
Information	215	-12.5%	-31
Finance and Insurance	611	-1.4%	-9
Real Estate and Rental and Leasing	750	25.3%	152
Professional, Scientific, and Technical Services	919	9.2%	78
Administrative and Support and Waste Management and Remediation Services	1,020	36.2%	271
Educational Services	2,882	7.9%	211
Health Care and Social Assistance	10,930	14.8%	1,407
Arts, Entertainment, and Recreation	712	21.4%	125
Accommodation and Food Services	2,743	12.1%	295
Other Services (except Public Administration)	1,280	-7.7%	-106
Public Administration	468	-16.8%	-95

Labor Force

Total Population in the Civilian Labor Force	29,530
Civilian Employed Population 16 years and over	27,902
Unemployment Rate	3.2
Unemployment Rate for Ages 16-24	10%
Unemployment Rate for Ages 25-65	5%

Table 37 - Labor Force

Data Source: 2019-2023 ACS

Occupations by Sector	Number of People
Management, business and financial	3,690
Farming, fisheries and forestry occupations	1,100
Service	2,960
Sales and office	5,755
Construction, extraction, maintenance and repair	2,430
Production, transportation and material moving	1,755

Table 38 – Occupations by Sector

Data Source: 2019-2023 ACS

Travel Time

Travel Time	Number	Percentage
< 30 Minutes	16,740	62%
30-59 Minutes	7,484	28%
60 or More Minutes	2,790	10%
Total	***27,014***	***100%***

Table 39 - Travel Time

Data Source: 2019-2023 ACS

Education:

Educational Attainment by Employment Status (Population 16 and Older)

Educational Attainment	In Labor Force		Not in Labor Force
	Civilian Employed	Unemployed	
Less than high school graduate	2,252	340	1,704
High school graduate (includes equivalency)	5,799	262	2,588
Some college or associate's degree	8,997	278	3,035
Bachelor's degree or higher	5,246	300	972

Table 40 - Educational Attainment by Employment Status

Data Source: 2019-2023 ACS

Educational Attainment by Age

	Age				
	18–24 yrs	25–34 yrs	35–44 yrs	45–65 yrs	65+ yrs
Less than 9th grade	448	382	455	599	591
9th to 12th grade, no diploma	630	894	715	1,251	805
High school graduate, GED, or alternative	2,775	3,138	2,361	3,608	2,063
Some college, no degree	1,469	3,418	1,971	3,724	2,863
Associate's degree	592	1,406	927	1,770	1,114
Bachelor's degree	102	1,402	601	2,187	1,655
Graduate or professional degree	6	629	748	1,346	1,387

Table 41 - Educational Attainment by Age

Data Source: 2019-2023 ACS

Educational Attainment – Median Earnings in the Past 12 Months

Educational Attainment	Median Earnings in the Past 12 Months
Less than high school graduate	$39,392

Educational Attainment	Median Earnings in the Past 12 Months
High school graduate (includes equivalency)	$39,433
Some college or associate's degree	$49,866
Bachelor's degree	$59,479
Graduate or professional degree	$85,779

Table 42 – Median Earnings in the Past 12 Months

Data Source: 2019-2023 ACS

Based on the Business Activity table above, what are the major employment sectors within your jurisdiction?

The major employment sectors in Lakewood span public services, healthcare, retail, education, and specialized industries. The public sector is a cornerstone, led by Joint Base Lewis-McChord (JBLM) with 55,000 employees, including 5,580 at Madigan Army Medical Center, alongside Western State Hospital (2,700 employees), Clover Park School District (1,502), Pierce Transit (900), and Camp Murray (838). Healthcare and social assistance is a critical sector, employing 11,758 individuals, while retail trade supports 3,309 jobs, reflecting strong local demand. Education provides 2,558 jobs, encompassing both public schools and private institutions. Accommodation and food services employ 3,272 individuals, bolstering tourism and hospitality. The construction and manufacturing sectors account for 1,795 and 1,008 jobs, respectively, while transportation and warehousing employ 1,894 despite recent declines. Administrative, support, and waste management services provide 744 jobs, and professional, scientific, and technical services, a growing sector, employs 1,074 workers.

Describe the workforce and infrastructure needs of the business community:

A major challenge is hiring and retaining skilled workers, particularly in key sectors like healthcare, retail, and professional services. Businesses often struggle with insufficient access to talent, competitive wages, and high turnover rates. To address these issues, robust training programs are needed,

focusing on technical skills and workplace competencies such as communication and leadership. Institutions like Clover Park Technical College and Pierce College play a critical role in workforce development through degree programs and apprenticeship opportunities. Additionally, commuting patterns highlight significant infrastructure gaps, with 93% of workers commuting into or out of Lakewood, causing traffic congestion and emphasizing the need for better transportation options and transit-oriented development near hubs like Lakewood Station. Businesses also require upgraded facilities, including Class A office spaces and industrial sites, as well as reliable technology and utilities to meet operational demands. Small businesses, particularly micro-enterprises and minority-owned ventures, need enhanced support through financial assistance, streamlined permitting, and tailored resources to thrive. Meanwhile, homelessness and crime are persistent concerns, impacting business operations and employee safety, requiring collaborative public safety investments.

Describe any major changes that may have an economic impact, such as planned local or regional public or private sector investments or initiatives that have affected or may affect job and business growth opportunities during the planning period. Describe any needs for workforce development, business support, or infrastructure that these changes may create.

One of the largest initiatives is the $750-$800 million construction of a new 350-bed forensic hospital at Western State Hospital, which is expected to be completed by 2028. This project will create thousands of construction jobs and long-term opportunities in healthcare and supporting industries. Additionally, the Lakewood Station District is seeing substantial investment, including the development of 245 affordable housing units and mixed-use projects designed to leverage the city's transit connections, which will enhance accessibility and attract businesses.

The redevelopment of the downtown and other key areas, such as the Pacific Highway Corridor and Tillicum neighborhood, includes mixed-use developments, new commercial spaces, and upgraded infrastructure. For example, the Springbrook neighborhood is transforming, with planned infrastructure improvements and a new multifamily housing project that will add residential density and support business growth. In the private sector,

investments in logistics, retail, and healthcare are increasing, as seen with new facilities like the Momentum and Wellstone Apartments and expansions in the International District.

These developments create substantial needs for workforce development, business support, and infrastructure improvements. Workforce development will need to focus on equipping workers with the skills required for construction, healthcare, retail, and logistics. Expanded partnerships with local educational institutions, such as Clover Park Technical College and Pierce College, will be critical for providing training programs and apprenticeships tailored to these industries. Businesses will need support through financial incentives, permitting assistance, and advisory services to capitalize on the expanding economic opportunities.

In terms of infrastructure, the City must improve transportation systems, enhance walkability, and upgrade utilities to meet the demands of growing businesses and a larger workforce. Transit-oriented developments, such as those in the Lakewood Station District, will require multimodal transportation solutions to reduce congestion and improve connectivity. Additionally, addressing housing shortages and ensuring affordable housing availability will be critical to supporting a growing population and workforce.

How do the skills and education of the current workforce correspond to employment opportunities in the jurisdiction?

Lakewood's workforce demonstrates a mix of educational attainment and skills that aligns with certain local employment opportunities but reveals gaps in skills matching emerging demands. The civilian labor force includes 27,902 employed individuals, with an overall unemployment rate of 3.2%. However, youth aged 16-24 face a higher unemployment rate of 10%, compared to 5% for those aged 25-65, indicating challenges in connecting younger individuals with job opportunities. Most jobs in the jurisdiction are concentrated in sectors such as sales and office roles (5,755 workers), management and financial occupations (3,690), and service positions (2,960), reflecting demand for mid- to high-level skills in these areas.

The City's workforce skews heavily toward individuals with some college education or associate degrees (8,997 employed), followed by high school graduates (5,799). Those with a bachelor's degree or higher constitute a smaller but critical segment (5,246), aligning with higher-paying sectors such as management and professional services. However, nearly 2,592 individuals in the labor force lack a high school diploma, earning significantly lower median wages ($39,392) compared to their peers with advanced degrees ($85,779).

Describe any current workforce training initiatives, including those supported by Workforce Investment Boards, community colleges, and other organizations. Describe how these efforts will help the jurisdiction's Consolidated Plan.

Regional efforts, such as those led by Invista Performance Solutions, a collaboration of four Pierce County community and technical colleges, including Clover Park Technical College and Pierce College, offer customized training programs. These programs focus on technical skills, workplace competencies, and soft skills such as leadership and conflict resolution, ensuring that participants are well-prepared for roles in high-demand sectors like healthcare, logistics, and technical services. Additionally, bachelor's degree programs offered by local institutions in fields like cybersecurity, business management, and construction management contribute to a highly skilled workforce, addressing gaps in advanced education.

The City's outreach efforts with minority-owned businesses and small enterprises further enhance inclusivity by connecting underserved populations with workforce development resources. These training initiatives directly support the Consolidated Plan by reducing unemployment, addressing skills mismatches, and fostering economic equity within the community.

Does your jurisdiction participate in a Comprehensive Economic Development Strategy (CEDS)?

No

If so, what economic development initiatives are you undertaking that may be coordinated with the Consolidated Plan? If not, describe other local/regional plans or initiatives that impact economic growth.

Lakewood does not participate in a Comprehensive Economic Development Strategy (CEDS); however, the City actively engages in other regional initiatives that significantly impact economic growth. The Lakewood Station District, with its focus on transit-oriented development, aligns with the Consolidated Plan by creating mixed-use, affordable housing projects and improving accessibility to employment hubs. Redevelopment efforts in the Pacific Highway Corridor, downtown, and Tillicum neighborhoods focus on revitalizing commercial spaces, enhancing infrastructure, and attracting new businesses, all of which contribute to job creation and economic vitality. Regional collaborations, such as partnerships with the Pierce County Economic Development Board and workforce development organizations, help the city align local efforts with broader financial goals. Additionally, investments in public infrastructure, like the $750-$800 million Western State Hospital project, and new multifamily housing, are poised to stimulate job growth in construction and healthcare while addressing critical housing needs.

Discussion

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MA-50 NEEDS AND MARKET ANALYSIS DISCUSSION

Are there areas where households with multiple housing problems are concentrated? (include a definition of "concentration")

For this discussion, areas were considered to have a concentration of multiple housing problems if they fell within the top quintile of Census Tracts for the percent of households experiencing more than one of the following housing problems reported in CHAS data: cost burden, overcrowding (more than 1.5 persons per room), and incomplete plumbing or kitchen facilities. No areas in Lakewood exhibited a concentration of multiple housing problems.

Are there any areas in the jurisdiction where racial or ethnic minorities or low-income families are concentrated? (include a definition of "concentration").

The map previously mentioned on page 63 highlights areas in Lakewood, WA, with a predominantly Black population (blue-shaded block groups) or census tract block group 718.074 near Seeley Lake County Park and the Lakewood Town Center and a predominantly Hispanic population (green-shaded block groups) in census tracts concentrated around Interstate 5 and St. Clare Hospital, many within HUD Qualified Opportunity Zones (yellow outlines). Census tract:

Block Group	Highest Race/Ethnicity	Population
530530718.074	Black Population	237
530530718.051	Hispanic Population	352
530530718.053	Hispanic Population	498
530530718.061	Hispanic Population	682
530530718.063	Hispanic Population	389
530530718.073	Hispanic Population	418
530530718.081	Hispanic Population	957

What are the characteristics of the market in these areas/neighborhoods?

These areas tend to have fewer homes built before 1980 than the share of homes built in this period across Lakewood. These areas are mostly renter-occupied, and more than 10% of renters receive housing subsidies (project—or tenant-based). Even so, more than 50% of renters in these areas experience a cost burden, and more than 30% of owners also experience a cost burden.

Are there any community assets in these areas/neighborhoods?

All of the census tracts listed above are in close proximity to transit hubs, with the Lakewood Station providing commuter access to the Sounder trains and multiple Pierce Transit bus lines with connectivity to greater Pierce County and beyond. The Pierce County Housing Authority owns and operates various properties in these neighborhoods, providing safe, decent, affordable housing to low-income Lakewood families. Many of Lakewood's service providers and nonprofits operate in these communities, with Greater Lakes Mental Healthcare (main client services facility) and Living Access Support Alliance (client services center and permanent affordable housing development) operating in the 718.07 tract, and organizations like Center Force providing employment and life services to disabled individuals in census tract 718.06.

Are there other strategic opportunities in any of these areas?

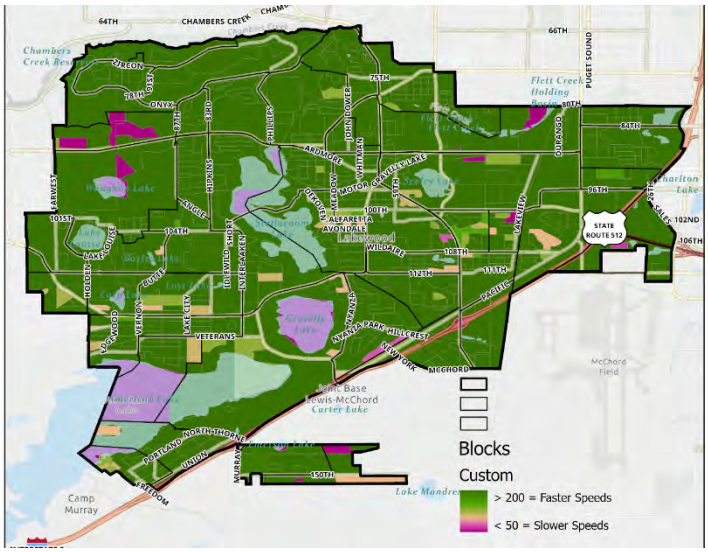
Census Tracts 718.05 and 718.06, designated Opportunity Zones and Low Mod Areas, face significant socioeconomic challenges. The median household income is $46,121, which is $22,236 lower than Lakewood’s $68,357, with an unemployment rate of 8.6% compared to 5.4% in Lakewood. Poverty affects 19.9% of households, while renter-occupied housing dominates at 85.23%, significantly higher than Lakewood’s 51.99%, with owner-occupied housing lagging at 14.77%. These tracts, spanning 1.18 square miles and including Lakeview and Tyee Park Elementary Schools and apartments such as Bridgeport Way, Lakewood Meadows, and Ridgewood, offer NRSA opportunities for workforce training, affordable housing, and infrastructure upgrades along I-5, leveraging Opportunity Zone incentives to reduce disparities in income, unemployment, and housing stability.

MA-60 BROADBAND NEEDS OF HOUSING OCCUPIED BY LOW- AND MODERATE-INCOME HOUSEHOLDS - 91.210(A)(4), 91.310(A)(2)

Describe the need for broadband wiring and connections for households, including low- and moderate-income families and neighborhoods.

The Broadband map showcases the broadband speeds across different census blocks in Lakewood. The color-coding reveals that:

Dark Green Areas (100 Mbps+):



Dark green areas, predominantly in more developed and urbanized neighborhoods, highlight where broadband speeds exceed 100 Mbps. Neighborhoods closer to the city center and along major roads such as Gravelly Lake Drive SW experience these high speeds, enabling residents to perform multiple simultaneous high-bandwidth activities like video conferencing, gaming, and 4K streaming without interruption. These speeds provide a critical advantage for educational and professional purposes.

Pink Areas (Sub-10 Mbps):

The pink areas, concentrated in pockets of American Lake Gardens and Tillicum (notably near Portland Ave SW and Ponders Corner), represent the most underserved zones. These areas, often semi-rural or economically disadvantaged, suffer from outdated infrastructure and their distance from primary service lines. Sub-10 Mbps speeds render them functionally excluded from essential digital services such as virtual healthcare, online education platforms, and even reliable video calls.

During public hearings and discussions, residents and stakeholders voiced significant concerns regarding educational barriers and digital equity in their communities. They highlighted those students in areas like American Lake Gardens and Tillicum struggle to access online learning due to poor connectivity, creating unfair challenges, especially for families with multiple children relying on remote education. Furthermore, those in low-income neighborhoods face similar issues, as these areas often lack robust broadband access. There is a pressing need for targeted interventions to enhance the speed and affordability of Internet services, which are crucial for accessing job opportunities and essential online resources.

Additionally, feedback from public hearings reflected frustration over outdated infrastructure in underserved regions, prompting calls for investments in modern broadband technologies to bridge the digital divide. A recurring theme was the lack of awareness about existing broadband programs and services, even in areas with higher internet speeds. Attendees urged the City to take a proactive role in promoting digital literacy and connecting residents to affordable broadband options to ensure equitable access for all.

Describe the need for increased competition by having more than one broadband Internet service provider serve the jurisdiction.

The limited competition among broadband providers in Lakewood has led to high costs, inconsistent service quality, and inadequate coverage, particularly in underserved areas like American Lake Gardens and parts of Tillicum. Residents and stakeholders have expressed frustration over the lack of affordable and reliable options, noting that monopolies or duopolies discourage infrastructure investment and innovation. Increased competition would drive down costs, improve service quality, and foster innovation, ensuring equitable access for all households, including low-income communities.

MA-65 HAZARD MITIGATION - 91.210(A)(5), 91.310(A)(3)

Describe the jurisdiction's increased natural hazard risks associated with climate change.

The City of Lakewood's 2024 Comprehensive Plan highlights the necessity of incorporating climate considerations into hazard mitigation strategies, acknowledging that climate change may intensify existing natural hazards and present new challenges. In 2023, Lakewood received a FEMA Hazard Mitigation Planning Grant to evaluate the effects of projected climate change on the city's natural hazards, focusing specifically on the unequal distribution of these impacts on socially vulnerable populations. Furthermore, the City has included an Energy & Climate Change Chapter in its Comprehensive Plan, detailing a multi-year work plan aimed at reducing greenhouse gas emissions and bolstering community resilience. This entails creating a five-year emissions reduction plan, updating the Nonmotorized Transportation Plan, and promoting infrastructure improvements to mitigate flood risks and address environmental concerns.

Describe the vulnerability to these risks of housing occupied by low- and moderate-income households based on an analysis of data, findings, and methods.

According to the CDC's Social Vulnerability Index, the areas with the highest vulnerability are concentrated along the Pacific Highway corridor and neighborhoods near Tillicum and Springbrook. Moderately vulnerable areas are distributed across central and southern Lakewood, particularly near the lakes in central Lakewood. The lowest vulnerability areas are located primarily in the western parts of the city, near Chambers Creek and suburban neighborhoods, where socioeconomic conditions and infrastructure are more favorable.

STRATEGIC PLAN

SP-05 OVERVIEW

Strategic Plan Overview

SP-10 GEOGRAPHIC PRIORITIES - 91.415, 91.215(A)(1)

Geographic Area

Table 43 - Geographic Priority Areas

General Allocation Priorities

There are currently no designated or HUD-approved geographic target areas in Lakewood. Lakewood recognizes the advantages gained in concentrating efforts to make a noticeable and sustainable difference in an area for the benefit of the neighborhood and the larger jurisdiction and so will continue to focus improvements on areas that qualify because of concentrations of lower-income households. Additional effort will be made to improve walkability in neighborhoods where access to safe roadway improvements and sidewalks are lacking, or where neighborhoods lack access to neighborhood parks, schools, and other facilities.

In Lakewood, the City has made a concerted effort to align its activities with needs and strategic locations, such as the areas with older or blighted properties or around community assets, such as schools and Lakeview Station. The City will continue to focus on underserved neighborhoods, such as Tillicum, Lake City, Springbrook, and Woodbrook neighborhoods which often lack infrastructure improvements or are where the existing facilities are outdated or inadequate. In the past, this focus has resulted in improved infrastructure (sewers, sidewalks, roads, and parks), new housing opportunities (in partnership with Tacoma-Pierce County Habitat for Humanity and the Homeownership Center of Tacoma), blight removal, and delivery of a variety of services.

SP-25 PRIORITY NEEDS - 91.415, 91.215(A)(2)

Priority Needs

Table 44 – Priority Needs Summary

1	**Priority Need Name**	Housing instability, including homelessness
	Priority Level	High
	Population	Extremely Low Low Elderly Chronic Homelessness Individuals Families with Children Mentally Ill Chronic Substance Abuse veterans Persons with HIV/AIDS Victims of Domestic Violence Unaccompanied Youth Elderly Persons with Mental Disabilities Persons with Physical Disabilities Persons with Developmental Disabilities Other
	Geographic Areas Affected	
	Associated Goals	Stabilize existing residents Prevent/reduce homelessness & housing instability
	Description	Using severe cost-burden as a proxy for housing stability, 17,319 renters and 5,888 owners in Tacoma and Lakewood are living in unstable housing situations. These households pay at least half of their income toward housing costs each month. Housing instability is most acute among extremely low-income households. Nearly seven out of ten Tacoma and Lakewood extremely low-income households experience at least one severe housing problem.

	Basis for Relative Priority	Priorities were established after quantitative and qualitative data analysis, broad discussions with community members and stakeholders, and review and consideration of strategic plans of local and regional partner agencies and providers and public planning documents. These needs have been well-documented in complementary local and regional studies and planning efforts over the last several years: *Five-Year Plan to End Homelessness* (2019); *Lakewood Human Services Needs Analysis Report* (2014); *Tacoma Human Services Strategic Plan* (2015-2019); *Tacoma Affordable Housing Action Strategy* (2019); *Tacoma 2025*; and *One Tacoma Comprehensive Plan*, to name a few. Lack of affordable housing remains a barrier to stability for lower income households, including minority and immigrant households, persons with special needs, and many senior households.
2	**Priority Need Name**	Affordable rental and homeowner opportunities
	Priority Level	High

	Population	Extremely Low Low Elderly Chronic Homelessness Individuals Families with Children Mentally Ill Chronic Substance Abuse veterans Persons with HIV/AIDS Victims of Domestic Violence Unaccompanied Youth Elderly Persons with Mental Disabilities Persons with Physical Disabilities Persons with Developmental Disabilities Other
	Geographic Areas Affected	
	Associated Goals	Stabilize existing residents Increase rental and homeownership opportunities
	Description	In Tacoma, there are the fewest housing options (across both the rental and ownership market) for the lowest income households. In Lakewood, this pattern holds true in the rental market, with only five percent of rental units affordable to households at 30% AMI or less.

	Basis for Relative Priority	Priorities were established after quantitative and qualitative data analysis, broad discussions with community members and stakeholders, and review and consideration of strategic plans of local and regional partner agencies and providers and public planning documents. These needs have been well-documented in complementary local and regional studies and planning efforts over the last several years: *Five-Year Plan to End Homelessness* (2019); *Lakewood Human Services Needs Analysis Report* (2014); *Tacoma Human Services Strategic Plan* (2015-2019); *Tacoma Affordable Housing Action Strategy* (2019); *Tacoma 2025*; and *One Tacoma*, to name a few. Affordable housing options remain limited in both Lakewood and Tacoma with many lower income households, including minority and immigrant households, persons with special needs, and many senior households cost-burdened due to ever-increasing housing costs.
3	**Priority Need Name**	Need for accessible, culturally competent services
	Priority Level	High

	Population	Extremely Low Low Elderly Chronic Homelessness Individuals Families with Children Mentally Ill Chronic Substance Abuse veterans Persons with HIV/AIDS Victims of Domestic Violence Unaccompanied Youth Elderly Persons with Mental Disabilities Persons with Physical Disabilities Persons with Developmental Disabilities Other
	Geographic Areas Affected	
	Associated Goals	Prevent/reduce homelessness & housing instability Stabilize existing residents
	Description	The need for services—ranging from case management, economic and workforce development—to complement housing activities was consistently cited through past studies and community engagement activities. Stakeholders shared that people with limited English proficiency often do no use existing programs or resources due to language barriers. Transportation serves as another barrier, underscoring the need to deliver services in accessible places.

	Basis for Relative Priority	Priorities were established after quantitative and qualitative data analysis, broad discussions with community members and stakeholders, and review and consideration of strategic plans of local and regional partner agencies and providers and public planning documents. These needs have been well-documented in complementary local and regional studies and planning efforts over the last several years: *Five-Year Plan to End Homelessness* (2019); *Lakewood Human Services Needs Analysis Report* (2014); *Tacoma Human Services Strategic Plan* (2015-2019); *Tacoma Affordable Housing Action Strategy* (2019); *Tacoma 2025*; and *One Tacoma*, to name a few. Accessibility to culturally competent services remain a need for many low-income households, especially among persons of color, immigrants, and those very low-income households.
4	**Priority Need Name**	Need for safe, accessible homes and facilities
	Priority Level	High

	Population	Extremely Low Low Elderly Chronic Homelessness Individuals Families with Children Mentally Ill Chronic Substance Abuse veterans Persons with HIV/AIDS Victims of Domestic Violence Unaccompanied Youth Elderly Persons with Mental Disabilities Persons with Physical Disabilities Persons with Developmental Disabilities Non-housing Community Development Other
	Geographic Areas Affected	
	Associated Goals	Stabilize existing residents and neighborhoods Increase rental and homeownership opportunities Support of public infrastructure improvements
	Description	Tacoma has a large share of both owner- and renter-occupied units that were built before 1950 (40% of owner units and 34% of renter units). Units in Lakewood were most commonly built between 1950 and 1979, with 60% of the owner-occupied units and 64% of the renter-occupied units built in that time period. In Lakewood, at the neighborhood level there is an ongoing need for basic infrastructure, such as sewers; improvements to parks and recreational facilities, community facility renovations; and access to improved transportation options and support.
	Basis for Relative Priority	

Narrative (Optional)

Tacoma and Lakewood will use its federal entitlement funds to address the following four priority needs over the next five years, each a high priority:

1. Housing instability among residents, including homelessness
2. Limited supply of diverse rental and homeownership opportunities
3. Need for accessible, culturally competent services
4. Need for safe, accessible homes and facilities

Priorities were established after quantitative and qualitative data analysis, broad discussions with community members and stakeholders, and review and consideration of strategic plans of local and regional partner agencies and providers and public planning documents. These needs have been well-documented in complementary local and regional studies and planning efforts over the last several years: *Five-Year Plan to End Homelessness* (2019); *Lakewood Human Services Needs Analysis Report* (2014); *Tacoma Human Services Strategic Plan* (2015-2019); *Tacoma Affordable Housing Action Strategy* (2019); *Tacoma 2025*; and *One Tacoma*, to name a few.

The cities of Tacoma and Lakewood are committed to serving the varied needs among low- and moderate-income residents and special populations. The needs outlined in Table below affect populations that are underserved by homes and services in Tacoma and Lakewood today:

- Extremely low-income households
- Very low-income households
- Immigrants
- Seniors
- People of color
- Persons living with disabilities
- Persons experiencing homelessness

These groups increasingly face competition for homes designed to serve their needs, as well as barriers to accessing existing affordable subsidized and unsubsidized homes in both cities. Severe housing problems like severe cost-burdens and overcrowding disproportionately affect householders that identify as Black and African American; Hispanic; and Asian-Pacific Islander.

SP-30 INFLUENCE OF MARKET CONDITIONS - 91.415, 91.215(B)

Influence of Market Conditions

Affordable Housing Type	Market Characteristics that will influence the use of funds available for housing type
Tenant Based Rental Assistance (TBRA)	
TBRA for Non-Homeless Special Needs	
New Unit Production	
Rehabilitation	
Acquisition, including preservation	

Table 45 – Influence of Market Conditions

SP-35 Anticipated Resources - 91.420(b), 91.215(a)(4), 91.220(c) (1,2)

Introduction

The table below shows the first year of estimated funds for 2025 based on estimated funding for the cities of Tacoma and Lakewood and estimated amounts over the remainder of the funding cycle for 2025 - 2029. The amounts assumed to be available in the remaining four years of the plan are based on a combination of strategies needed to meet the goals for the 5-year period.

Estimates for Tacoma assume consistent allocations and program income over the 5 years for this Consolidated Plan. Estimates for Lakewood used a more conservative approach, assuming lower annual allocations (consistent with historic trends) and variation in program income.

Anticipated Resources

Program	Source of Funds	Uses of Funds	Expected Amount Available Year 1				Expected Amount Available Remainder of ConPlan $	Narrative Description
			Annual Allocation: $	Program Income: $	Prior Year Resources: $	Total: $		
CDBG	public - federal	Acquisition Admin and Planning Economic Development Housing Public Improvements Public Services	525,000	100,000	71,093	696,093	2,100,000	

Other	public - federal	Economic Development Housing Public Improvements Other	292,000	0	0	292,000	0	NSP1 funds were awarded to Lakewood in 2009 through the Washington State Department of Commerce to address issues of slums and blight through the demolition of homes that have been foreclosed, abandoned or have been left vacant. Funds may also be used to acquire and redevelop foreclosed and

Program	Source of Funds	Uses of Funds	Expected Amount Available Year 1				Expected Amount Available Remainder of ConPlan $	Narrative Description
			Annual Allocation: $	Program Income: $	Prior Year Resources: $	Total: $		
								abandoned properties for the purpose of constructing safe, decent, affordable housing for low-income individuals. Anticipated program income of $292,000 for NSP1 Abatement Fund RLF activities.

Other	public - state	Housing	95,000	0	0	95,000	306,000	The City's SHB 1406 Home Repair Program is intended to utilize state tax revenues raised pursuant to RCW 82.14.540 in support of affordable housing. The goal of the program is to foster and maintain affordable housing for the citizens of Lakewood by providing affordable housing opportunities, eliminating

								slum and blight, and conditions which are detrimental to the health and safety of the public welfare. Housing and services may be provided only to persons whose income is at or below 60% of area median income. Annual tax revenue totaling approximately $95,000.

Table 46 - Anticipated Resources

Explain how federal funds will leverage those additional resources (private, state and local funds), including a description of how matching requirements will be satisfied If appropriate, describe publically owned land or property located within the jurisdiction that may be used to address the needs identified in the plan.

The City of Tacoma matches CDBG and HOME funds with grants, local funds, nonprofit organizations, Low-Income Housing Tax Credits, corporate grants, and donations (among other sources) to increase the benefit and success of projects using federal CDBG, HOME, and ESG dollars. In the past, Tacoma has committed federal CDBG and HOME funds to affordable projects early; the city's upfront support has been critical in anchoring projects and obtaining additional funding.

The Affordable Housing Fund, under the oversight of the Tacoma Community Redevelopment Authority, increases the ability of partners to provide affordable housing by providing a stable source of funding to leverage additional resources.

In Lakewood, as in Tacoma, CDBG expenditures leverage funding from multiple sources on nearly all projects, except for homeowner rehabilitation/repair program (Major Home Repair). In 2025, LASA's development of 26-units of affordable rental housing will leverage over $10 million of the project's $13 million dollar project budget. Lakewood continues to coordinates its public improvements closely with capital improvement planning to leverage planned infrastructure improvements, including state and federal funding for infrastructure.

HOME match requirements for the Consortium are met through multiple sources, including private grants and donations, commercial lending, local funding, and the State Housing Trust Fund. HOME funds match requirements and leverage is provided as part of the HOME Consortium and is reported in Tacoma's portion of the Plan. In Tacoma, ESG match requirements are met through various sources, depending on the project. Sources in past years have included Washington State, Pierce County, foundations and corporate grants, private donations and City of Tacoma General Fund dollars.

Discussion

SP-40 Institutional Delivery Structure - 91.415, 91.215(k)

Explain the institutional structure through which the jurisdiction will carry out its consolidated plan including private industry, non-profit organizations, and public institutions.

Responsible Entity	Responsible Entity Type	Role	Geographic Area Served
City of Tacoma	Government	Economic Development Homelessness Non-homeless special needs Ownership Planning Rental neighborhood improvements public facilities public services	Jurisdiction
City of Lakewood	Government	Economic Development Homelessness Non-homeless special needs Ownership Planning Rental neighborhood improvements public facilities public services	Jurisdiction

Responsible Entity	Responsible Entity Type	Role	Geographic Area Served
Tacoma Community Redevelopment Authority	Redevelopment authority	Economic Development Homelessness Non-homeless special needs Ownership Planning Rental neighborhood improvements public facilities public services	Jurisdiction

Table 47 - Institutional Delivery Structure

Assess of Strengths and Gaps in the Institutional Delivery System

In Lakewood, CDBG funds are administered by the Planning & Public Works Department, with public oversight by the Council-appointed CDBG Community Services Advisory Board (CSAB). Tacoma and Lakewood receive Home Investment Partnership Program (HOME) funds jointly as a Consortium. The Tacoma Community Redevelopment Authority administers housing programs using both CDBG and HOME funds, with support from city staff.

Availability of services targeted to homeless persons and persons with HIV and mainstream services.

Homelessness Prevention Services	Available in the Community	Targeted too Homeless	Targeted to People with HIV
Homelessness Prevention Services			
Counseling/Advocacy	X	X	X
Legal Assistance	X	X	X
Mortgage Assistance	X		
Rental Assistance	X	X	X
Utilities Assistance	X	X	X
Street Outreach Services			
Law Enforcement	X	X	
Mobile Clinics	X		
Other Street Outreach Services	X	X	X
Supportive Services			
Alcohol & Drug Abuse	X	X	X
Child Care	X		
Education	X	X	X
Employment and Employment Training	X	X	
Healthcare	X		X
HIV/AIDS	X		X
Life Skills	X	X	X
Mental Health Counseling	X	X	X
Transportation	X	X	X
Other			
Access to Food	X	X	X

Table 48 - Homeless Prevention Services Summary

Describe how the service delivery system including, but not limited to, the services listed above meet the needs of homeless persons (particularly chronically homeless individuals and families, families with children, veterans and their families, and unaccompanied youth).

An array of agencies provide services in Pierce County covering virtually all areas of need, including most areas of need for persons who are homeless or at risk of homelessness. Detailed information on service availability is regularly updated (Tacoma-Pierce County Coalition to End Homelessness, Member Resource Directory). Pierce County is currently engaged in revamping its homeless delivery services to include a more collaborative effort between the County and cities of Lakewood and Tacoma. The County has engaged Uncommon Bridges to help develop a Uniform Regional Approach to Homelessness (URA). Improvements to the system will provide for a more efficient and effective way to serve persons experiencing homelessness across the county.

Currently, persons experiencing homelessness can access the countywide Coordinated Entry system through multiple points: 1) Call United Way at 2-1-1 for live support or set-up an appointment; 2) speak with a Mobile Outreach team member; or 3) Drop-in to facilities for a same-day conversation.

The City of Lakewood is the convener of monthly human services collaboration meetings. Collaboration partners include for-profit and nonprofit providers of housing, services, homeless programs, dv and family services, youth programs, HIV services, food banks, mental health and healthcare services. Monthly meetings allow partners to better coordinate services and to work together to eliminate duplication or gaps in service.

Describe the strengths and gaps of the service delivery system for special needs population and persons experiencing homelessness, including, but not limited to, the services listed above.

There is considerable coordination between agencies. Agencies and organizations in Lakewood participate in the countywide Coordinated Entry system and use the Homeless Crisis Response System Prioritization policies to assess the needs of persons experiencing homelessness and prioritize them for a referral to a housing program in the Homeless Management Information

System (HMIS). This system creates a centralized way for persons experiencing homeless to access the help they need and enables service providers to track clients following their intake assessment—closing a gap in the formerly used Centralized Intake System. It also provides a transparent, consistent way for service providers to prioritize access to housing programs.

Overwhelmingly the gaps can be attributed to lack of resources to meet the needs. Services are available, but there is not enough relative to the needs that exist for emergency, rapid re-housing, and permanent housing solutions.

The *Five-Year Plan to End Homelessness* (2019) prepared by the Pierce County Continuum of Care Committee; *Human Services Needs Analysis Report* (2014) prepared by the City of Lakewood; and the City of Tacoma *Human Services Strategic Plan* (2015-2019) are among key reports identifying gaps in services and strategies to meet the needs.

Provide a summary of the strategy for overcoming gaps in the institutional structure and service delivery system for carrying out a strategy to address priority needs.

Once developed, the new Uniform Regional Approach to Homelessness in Pierce County will better coordinate resources and provide for a more efficient and effective way to serve persons experiencing homelessness across the county.

SP-45 Goals - 91.415, 91.215(a)(4)
Goals Summary Information

Sort Order	Goal Name	Start Year	End Year	Category	Geographic Area	Needs Addressed	Funding	Goal Outcome Indicator
1	Prevent/reduce homelessness & housing instability	2025	2029	Affordable Housing Homeless		Housing instability, including homelessness Affordable rental and homeowner opportunities Need for accessible, culturally competent services Need fo safe, accessible homes and facilities		Public service activities other than Low/Moderate Income Housing Benefit: 60 Persons Assisted Homeowner Housing Rehabilitated: 20 Household Housing Unit Tenant-based rental assistance / Rapid Rehousing: 150 Households Assisted Homelessness Prevention: 90 Persons Assisted

Sort Order	Goal Name	Start Year	End Year	Category	Geographic Area	Needs Addressed	Funding	Goal Outcome Indicator
2	Support diverse rental & homeowner opportunities	2025	2029	Affordable Housing		Affordable rental and homeowner opportunities Need for safe, accessible homes and facilities		Rental units constructed: 5 Household Housing Unit Homeowner Housing Added: 8 Household Housing Unit
3	Support public infrastructure improvements	2025	2029	Non-Housing Community Development		Need for safe, accessible homes and facilities		Public Facility or Infrastructure Activities other than Low/Moderate Income Housing Benefit: 20,910 Persons Assisted
4	Stabilize existing residents and neighborhoods	2025	2029	Non-Housing Community Development		Need for safe, accessible homes and facilities Need for accessible, culturally competent services		Buildings Demolished: 15 Buildings

Table 49 – Goals Summary

Goal Descriptions

1	**Goal Name**	Prevent/reduce homelessness and housing instability
	Goal Description	Prevent and reduce homelessness and housing instability by supporting a wide range of housing programs, services, and facilities intended to maintain existing housing affordability through the rehabilitation and weatherization of existing housing and through programs designed to prevent homelessness. Activities include a wide array of services from fair housing, education, client services, medical and financial assistance, emergency relocation assistance, and emergency assistance payments; the engagement of various providers and facilities designed to serve those experiencing homelessness; housing rehabilitation programs designed to assist with long-term affordability and sustainability of existing affordable housing; and the provision of tenant-based rental assistance.
2	**Goal Name**	Support diverse rental and homeowner opportunities
	Goal Description	Stabilize and increase diverse rental and homeownership opportunities through the construction or rehabilitation of rental and homeownership properties. Activities include the creation of new or maintenance of existing affordable housing stock for low-income homeowners or renters, support of down payment assistance programs for low-income homebuyers, and the provision of developer subsidies to be used to create or maintain a broad range of affordable housing.
3	**Goal Name**	Support public infrastructure improvements
	Goal Description	Support high-quality public infrastructure improvements that improve accessibility in conjunction with other housing and economic development investments and those activities that support infrastructure improvements whose target is to create safe and vibrant neighborhoods and attract businesses and jobs. Projects may support multimodal transportation, new or improved access to community facilities, new or improved accessible infrastructure improvements, and the development of infrastructure where facilities are substandard, aged, or are lacking completely.

4	**Goal Name**	Stabilize existing residents and neighborhoods
	Goal Description	Support and stabilize residents and neighborhoods experiencing homelessness, displacement pressure, blight, and other negative economic impacts. Activities include eliminating slums and blight through the demolition and redevelopment of blighted properties; economic redevelopment activities, including supporting business reinvestment and creating or retaining jobs for low-and moderate-income persons; and creating economic opportunities through job training activities.

Estimate the number of extremely low-income, low-income, and moderate-income families to whom the jurisdiction will provide affordable housing as defined by HOME 91.315(b)(2).

The cities of Lakewood and Tacoma anticipate the following to be achieved over the term of the 2020-2024 Consolidated Plan:

- HOME funds will be used in Lakewood to assist 13 low- and moderate-income households through the production of new homes for owners and renters.
- HOME funds will be used in Lakewood to assist 150 low-income households with rental deposit assistance through a one-time, tenant-based, rental assistance program.
- CDBG public infrastructure improvements will benefit 20,910 persons in Lakewood.
- CDBG will assist 150 extremely low- and low-income persons through homeless services including, emergency assistance for displaced residents, emergency assistance payment programs, and fair housing assistance and education programs.

SP-50 PUBLIC HOUSING ACCESSIBILITY AND INVOLVEMENT - 91.415, 91.215(C)

Need to Increase the Number of Accessible Units (if Required by a Section 504 Voluntary Compliance Agreement).
Activities to Increase Resident Involvements
Is the public housing agency designated as troubled under 24 CFR part 902? Plan to remove the 'troubled' designation.

SP-55 STRATEGIC PLAN BARRIERS TO AFFORDABLE HOUSING - 91.415, 91.215(H)

Barriers to Affordable Housing
Strategy to Remove or Ameliorate the Barriers to Affordable Housing

SP-60 HOMELESSNESS STRATEGY - 91.415, 91.215(D)

Describe how the jurisdiction's strategic plan goals contribute to:

Reaching out to homeless persons (especially unsheltered persons) and assessing their individual needs
Addressing the emergency and transitional housing needs of homeless persons
Helping homeless persons (especially chronically homeless individuals and families, families with children, veterans and their families, and unaccompanied youth) make the transition to permanent housing and independent living, including shortening the period of time that individuals and families experience homelessness, facilitating access for homeless individuals and families to affordable housing units, and preventing individuals and families who were recently homeless from becoming homeless again.
Help low-income individuals and families avoid becoming homeless, especially extremely low-income individuals and families who are likely to become homeless after being discharged from a publicly funded institution or system of care, or who are receiving assistance from public and private agencies that address housing, health, social services, employment, education or youth needs.

SP-65 LEAD-BASED PAINT HAZARDS - 91.415, 91.215(I)

Actions to address LBP hazards and increase access to housing without LBP hazards.

Consistent with Title X of the Housing and Community Development Act of 1992, Lakewood provides information on lead-safe practices to owners of all properties receiving up to $5,000 of federally funded assistance. If work on painted surfaces is involved in properties constructed prior to 1978, the presence of lead is assumed and safe work practices are followed.

In addition to the above, homes with repairs in excess of $5,000 in federally funded rehabilitation assistance are assessed for risk (completed by a certified Lead Based Paint firm) or are presumed to have lead. If surfaces to be disturbed are determined to contain lead, interim controls are exercised, occupants notified, and clearance test performed by an EPA-certified firm. Properties constructed prior to 1978 and acquired with federal funds are inspected for hazards and acquired rental properties are inspected periodically.

The City conducts lead paint inspections on all pre-1978 properties where persons are relocated with the Emergency Assistance for Displaced Residents and/or Emergency Assistance Payments programs, and where homeownership assistance is provided for existing housing. Risk assessments are conducted on all pre-1978 homes served by housing repair programs where painted surfaces are to be disturbed as part of the scope of repairs. When completed, all homes will be free of lead-based paint hazards.

How are the actions listed above related to the extent of lead poisoning and hazards?

With approximately 75% of Lakewood's housing units being constructed prior to 1980, there exists the potential for some 20,000+ housing units to contain lead-based paint hazards. To inform the community of the hazards of lead-based paint, the City offers copies of the EPA's "Protect Your Family from Lead in Your Home" and HUD's "Renovate Right" pamphlets at City Hall and provides copies of these pamphlets to all housing repair program applicants. As part of the City's single and multifamily housing programs, XRF paint inspections and Risk Assessments are conducted, lead-safe work is conducted by Washington State certified RRP renovation contractors,

abatement work is conducted by certified abatement contractors, and clearance testing of all disturbed surfaces is performed by certified Risk Assessors to ensure all lead hazards are properly mitigated.

How are the actions listed above integrated into housing policies and procedures?

Lead-safe practices are required in all rehabilitation programs where housing was constructed prior to 1978, and all rental housing units rehabilitated or inhabited as a result of the various city programs as described above.

SP-70 ANTI-POVERTY STRATEGY - 91.415, 91.215(J)

Jurisdiction Goals, Programs and Policies for reducing the number of Poverty-Level Families

How are the Jurisdiction poverty reducing goals, programs, and policies coordinated with this affordable housing plan

There has been a lot of work in the cities of Tacoma and Lakewood, Pierce County, and the region to coordinate anti-poverty strategies with affordable housing planning initiatives. These initiatives aim to lower the overall cost of housing for residents or increase their earnings (or both), and in turn increase their ability to pay for other critical necessities and build wealth and assets.

Both Tacoma and Lakewood are represented on the Tacoma/Pierce County Affordable Housing Consortium to work on issues of affordable housing, including state-level policies and programs to increase resources and opportunities to address local housing needs. Tacoma and Lakewood participate in a multicounty planning system (Puget Sound Regional Council) that is looking at regional growth and economic development, as well as equal access to opportunities.

SP-80 MONITORING - 91.230

Describe the standards and procedures that the jurisdiction will use to monitor activities carried out in furtherance of the plan and will use to ensure long-term compliance with requirements of the programs involved,

including minority business outreach and the comprehensive planning requirements.

Remote Monitoring Desk monitoring will consist of close examination of periodic reports submitted by subrecipients or property owners for compliance with program regulations and subrecipient agreements as well as compliance with requirements to report on progress and outcome measures specific to each award. As a condition of loan approval, the Tacoma Community Redevelopment Authority (TCRA) may have imposed additional requirements in the form of targeted set-asides (e.g., homeless units). Document review will occur at least annually and more frequently if determined necessary. Wherever possible, problems are corrected through discussions or negotiation with the subrecipient. As individual situations dictate, additional desk monitoring, onsite monitoring, and/or technical assistance is provided. Timing and frequency of onsite monitoring depends on the complexity of the activity and the degree to which an activity or subrecipient is at risk of noncompliance with program requirements. More frequent visits may occur depending on identification of potential problems or risks. The purpose of monitoring, which can include reviewing records, property inspections, or other activities appropriate to the project, is to identify any potential areas of noncompliance and assist the subrecipient in making the necessary changes to allow for successful implementation and completion of the activity.

Onsite monitoring TCRA will contract with an independent third-party inspection company to conduct onsite inspections of its rental housing portfolio. The purpose of the inspections is to ensure that rental housing meets or exceeds the Uniform Physical Condition Standards (UPCS). Inspections of each property will take place at least every three years. Lakewood staff will conduct onsite monitoring of CDBG subrecipients as necessary.

EXPECTED RESOURCES

AP-15 EXPECTED RESOURCES - 91.420(B), 91.220(C) (1,2)

Introduction - The estimated resources for 2025 are based on prior year allocations trends for the cities of Tacoma and Lakewood and the same annual funding for the remainder of the funding cycle.

Anticipated Resources

Program	Source of Funds	Uses of Funds	Expected Amount Available Year 1				Expected Amount Available Remainder of ConPlan $	Narrative Description
			Annual Allocation: $	Program Income: $	Prior Year Resources: $	Total: $		
CDBG	public - federal	Acquisition Admin and Planning Economic Development Housing Public Improvements Public Services	525,000.00	100,000.00	71,093.45	696,093.45	2,100,000.00	

Other	public - federal	Other	292,000.00	0.00	0.00	292,000.00	0.00	NSP1 funds were awarded to Lakewood in 2009 through the Washington State Department of Commerce to address issues of slums and blight through the demolition of homes that have been foreclosed, abandoned or have been left vacant. Funds may also be used to acquire and redevelop foreclosed and abandoned properties for the purpose of

Program	Source of Funds	Uses of Funds	Expected Amount Available Year 1				Expected Amount Available Remainder of ConPlan $	Narrative Description
			Annual Allocation: $	Program Income: $	Prior Year Resources: $	Total: $		
								constructing safe, decent, affordable housing for low-income individuals. Anticipated program income of $292,000 for NSP1 Abatement Fund RLF activities.

Other	public - state	Housing	95,000.00	0.00	0.00	95,000.00	306,000.00	The City's SHB 1406 Home Repair Program is intended to utilize state tax revenues raised pursuant to RCW 82.14.540 in support of affordable housing. The goal of the program is to foster and maintain affordable housing for the citizens of Lakewood by providing affordable housing opportunities, eliminating slum and blight, and conditions which are

Program	Source of Funds	Uses of Funds	Expected Amount Available Year 1				Expected Amount Available Remainder of ConPlan $	Narrative Description
			Annual Allocation: $	Program Income: $	Prior Year Resources: $	Total: $		
								detrimental to the health and safety of the public welfare. Housing and services may be provided only to persons whose income is at or below 60% of area median income. Annual tax revenue totaling approximately $95,000.

Table 50 - Expected Resources – Priority Table

Explain how federal funds will leverage those additional resources (private, state and local funds), including a description of how matching requirements will be satisfied

The City of Tacoma matches CDBG and HOME funds with grants, local funds, nonprofit organizations, Low-Income Housing Tax Credits, corporate grants, and donations (among other sources) to increase the benefit and success of projects using federal CDBG, HOME, and ESG dollars. In the past, Tacoma has committed federal CDBG and HOME funds to affordable projects early; the city's upfront support has been critical in anchoring projects and obtaining additional funding.

The Affordable Housing Fund, under the oversight of the Tacoma Community Redevelopment Authority, increases the ability of partners to provide affordable housing by providing a stable source of funding to leverage additional resources.

In Lakewood, as in Tacoma, CDBG expenditures leverage funding from multiple sources on nearly all projects, except for homeowner rehabilitation/repair program (Major Home Repair). In 2025, LASA's development of 26-units of affordable rental housing will leverage over $10 million of the project's $13 million dollar project budget. Lakewood continues to coordinates its public improvements closely with capital improvement planning to leverage planned infrastructure improvements, including state and federal funding for infrastructure.

HOME match requirements for the Consortium are met through multiple sources, including private grants and donations, commercial lending, local funding, and the State Housing Trust Fund. HOME funds match requirements and leverage is provided as part of the HOME Consortium and is reported in Tacoma's portion of the Plan. In Tacoma, ESG match requirements are met through various sources, depending on the project. Sources in past years have included Washington State, Pierce County, foundations and corporate grants, private donations and City of Tacoma General Fund dollars.

If appropriate, describe publically owned land or property located within the jurisdiction that may be used to address the needs identified in the plan.

Use of publicly owned land or property is not anticipated in projects currently planned or underway although if those opportunities arise, such land and property will be included.

The City of Tacoma has a public land disposition policy that prioritizes affordable housing on publicly owned property. This policy may result in publicly owned property becoming available over this funding cycle.

Discussion

ANNUAL GOALS AND OBJECTIVES

AP-20 ANNUAL GOALS AND OBJECTIVES - 91.420, 91.220(C)(3) &(E)

Goals Summary Information

Sort Order	Goal Name	Start Year	End Year	Category	Geographic Area	Needs Addressed	Funding	Goal Outcome Indicator
1	Prevent/reduce homelessness & housing instability	2025	2029	Affordable Housing Homeless		Housing instability, including homelessness Affordable rental and homeowner opportunities	CDBG: $576,093.45 SHB-1406: $95,000.00	Public service activities other than Low/Moderate Income Housing Benefit: 40 Persons Assisted Homeowner Housing Rehabilitated: 8 Household Housing Unit Homelessness Prevention: 20 Persons Assisted
2	Support diverse rental & homeowner opportunities	2025	2029	Affordable Housing		Affordable rental and homeowner opportunities	CDBG: $15,000.00	Rental units constructed: 5 Household Housing Unit

Sort Order	Goal Name	Start Year	End Year	Category	Geographic Area	Needs Addressed	Funding	Goal Outcome Indicator
3	Stabilize existing residents and neighborhoods	2025	2029	Non-Housing Community Development		Need for safe, accessible homes and facilities	NSP1: $292,000.00	Buildings Demolished: 5 Buildings

Table 51 – Goals Summary

Goal Descriptions

1	**Goal Name**	Prevent/reduce homelessness & housing instability
	Goal Description	Activities include homeowner rehabilitation; emergency relocation assistance to low-income individuals displaced due to no fault of their own; emergency asssitance payments; and tenant-based rental assistance (HOME).
2	**Goal Name**	Support diverse rental & homeowner opportunities
	Goal Description	Activities include the expansion of affordable housing through the construction of new rental units.
3	**Goal Name**	Stabilize existing residents and neighborhoods
	Goal Description	Activities include the demolition and removal of blighted properties (NSP1).

AP-35 PROJECTS - 91.420, 91.220(D)

Introduction

The City of Lakewood will aim to implement its federal funds in 2025 to accomplish the following goals and corresponding activities:

- ***Prevent/reduce homelessness & housing instability*** – Through funds for rehabilitation of existing single-family homes to maintain existing affordability; emergency assistance for displaced residents; emergency assistance payments to low-income households; and for tenant-based rental assistance directed at assisting tenants with the high cost of initial rental deposits neecessary to secure housing.
- ***Support diverse rental & homeowner opportunities*** – Through funds for the creation of new rental and homeownership opportunities using the Affordable Housing Fund administered by TCRA.
- ***Stabilize existing residents and neighborhoods*** – Through funds for the demolition or clearance of dangerous buildings.

#	Project Name
1	Administration
2	CDBG Administration of Home Housing Services
3	Major Home Repair
4	CDBG Emergency Assistance Payments
5	Emergency Assistance for Displaced Residents
6	NSP1 Abatement Program

Table 52 – Project Information

Describe the reasons for allocation priorities and any obstacles to addressing underserved needs.

The allocation priorities are based on a combination of factors identified through a planning and public participation process; direction from elected officials; input from community members and boards; ability to serve priority needs among Lakewood residents; alignment with strategic locations, such as schools and transportation centers; prioritization of development in areas

with underserved or aging infrastructure and improvements; and ability to leverage additional local and state funding.

The primary obstacle to addressing underserved needs remains declining resources relative to growing needs in Lakewood and and ever-increasing regulatory environment. While the city has approved funding for more local resources, the city's low-and moderate-income population living in qualifying block groups has largely remained the same over time. Another barrier is the mismatch between local market conditions and maximum house values allowed by federal programs. In Lakewood, this mismatch has continued to mean that many seniors in need who have lived in their home for extended periods of time, have seen house values increase to a point where the City is no longer able to assist those households with federal funding because their home valuation has long exceeded HUD's maximum home valuation limitations.

Lakewood will continue to coordinate across its departments, local and regional partners, its regional HUD field office, and community members to address any obstacles that arise and maximize its limited federal dollars.

Funding over the coming five-year period will focus on all four goals established: 1) Prevent/reduce homelessness & housing instability; 2) Support diverse rental & homeowner opportunities; 3) Support public infrastructure improvements; and 4) Stabilize existing residents and neighborhoods.

AP-38 PROJECT SUMMARY

Project Summary Information

1	**Project Name**	Administration
	Target Area	
	Goals Supported	Prevent/reduce homelessness & housing instability Support diverse rental & homeowner opportunities Support public infrastructure improvements Stabilize existing residnets and neighborhoods
	Needs Addressed	Housing instability, including homelessness Affordable rental and homeownership opportunities Need for accessible, culturally competent services Need for safe, accessible homes and facilities
	Funding	CDBG: $105,000.00
	Description	Administration to implement and manage the Consolidated Plan funds. Activities include providing fair housing and landlord tenant outreach and education.
	Target Date	6/30/2026
	Estimate the number and type of families that will benefit from the proposed activities	Administration funds are anticipated to be expended in support of general administration activities to administer the 2025 Annual Action Plan, including funding for fair housing activities in support of 30 low- and moderate-income individuals. Fair housing activities will not be able to be reported as clients served in IDIS due to CDBG Administration reporting requirements. Lakewood will report clients served for this goal in text only in annual Consolidated Annual Performance Evaluation Reports (CAPER).
	Location Description	

	Planned Activities	Administration funds are anticipated to be expended in support of general administration activities to administer the 2025 Annual Action Plan, including funding for fair housing activities in support of 30 low- and moderate-income individuals.
2	**Project Name**	CDBG Administration of Home Housing Services
	Target Area	
	Goals Supported	Support diverse rental & homeowner opportunities
	Needs Addressed	Affordable rental and homeowner opportunities
	Funding	CDBG: $15,000.00
	Description	Program administration and housing services in support of HOME Program.
	Target Date	6/30/2026
	Estimate the number and type of families that will benefit from the proposed activities	A total of 5 low- and moderate-income households will be assisted with HOME-funded activities, through the construction of 5 new HOME rental housing units for low-income households.
	Location Description	
	Planned Activities	Program administration and housing services in support of HOME Program.
3	**Project Name**	Major Home Repair
	Target Area	
	Goals Supported	Prevent/reduce homelessness & housing instability
	Needs Addressed	Housing instability, including homelessness Affordable rental and homeowner opportunities
	Funding	CDBG: $496,093.45 SHB-1406: $95,000.00

	Description	Program provides home repair and/or sewer connection loans to eligible low-income homeowners. Funding for program provided through FY 2025 entitlement funding ($325,000), reprogrammed funding ($71,093.45), and revolving loan funds ($100,000).
	Target Date	6/30/2026
	Estimate the number and type of families that will benefit from the proposed activities	A total of 6-8 low- and moderate-income households will be assisted with owner-occupied, housing rehabilitation activities.
	Location Description	city-wide
	Planned Activities	The project will provide major home repair loans which include connection of side-sewer to sewer main, decommissioning of septic systems, roofing, removal of architectural barriers, plumbing, electrical, weatherization, major systems replacement/upgrade, and general home repairs for eligible low- and moderate-income homeowners. Program funding includes $100,000 in anticipated program income and $95,000 in SHB-1406 local funding.
4	**Project Name**	CDBG Emergency Assistance Payments
	Target Area	
	Goals Supported	Prevent/reduce homelessness & housing instability
	Needs Addressed	Housing instability, including homelessness Need for accessible, culturally competent services
	Funding	CDBG: $45,000.00
	Description	Program provides for the provision of emergency assistance payments for basic services such as food, clothing or housing-related expenses to low-income households, with a focus on cost-burdened households, elderly, disabled, and minority populations.
	Target Date	6/30/2025

	Estimate the number and type of families that will benefit from the proposed activities	A total of 40 low- and moderate-income individuals will be assisted through the provision of emergency assistance payments to low-income households, with a focus on cost-burdened households, elderly, disabled, and minority populations.
	Location Description	city-wide
	Planned Activities	Program provides funding for services engaged in the reduction and prevention of homelessness through the provision of emergency assistance payments to low- and moderate-income households, with focus on cost burdened households, elderly, disabled, and minority populations continuing to be disproportionately impacted.
5	**Project Name**	Emergency Assistance for Displaced Residents
	Target Area	
	Goals Supported	Prevent/reduce homelessness & housing instability
	Needs Addressed	Housing instability, including homelessness
	Funding	CDBG: $35,000.00
	Description	Program provides emergency relocation assistance to eligible low income households that are displaced through no fault of their own during building and code enforcement closures, fires, redevelopment, and other incidences resulting in homelessness.
	Target Date	6/30/2026
	Estimate the number and type of families that will benefit from the proposed activities	A total of 15-20 individuals will be assisted with emergency relocation assistance for persons displaced due to no fault of their own.
	Location Description	city-wide

	Planned Activities	Activities include emergency relocation assistance to low-income individuals displaced due to no fault of their own. Assistance to include rental assistance, deposits, and other related relocation expenses.
6	**Project Name**	NSP1 Abatement Program
	Target Area	
	Goals Supported	Stabilize existing residents and neighborhoods
	Needs Addressed	Need for safe, accessible homes and facilities
	Funding	NSP1: $292,000.00
	Description	Provides funding for the abatement of dangerous buildings that have been foreclosed, abandoned or are vacant. Activities funded with revolving loan fund.
	Target Date	6/30/2026
	Estimate the number and type of families that will benefit from the proposed activities	The City of Lakewood anticipates it will address a total of 5-10 blighted properties through the abatement of dangerous and nuisance conditions in various low-income block groups. Funding will be provided through NSP1 RLF funding and the City of Lakewood General Fund.
	Location Description	city-wide
	Planned Activities	Provides funding for the abatement of dangerous buildings that have been foreclosed, abandoned or are vacant. Funding for the program is provided through revolving loan funds generated from previous NSP1 abatement activities and the General Fund. Program funding includes a total of $292,000 in anticipated program income to be used for similar RLF activities and potentially $200,000 in General Fund.

AP-50 GEOGRAPHIC DISTRIBUTION - 91.420, 91.220(F)

Description of the geographic areas of the entitlement (including areas of low-income and minority concentration) where assistance will be directed.

The City will target CDBG and HOME funds expenditures in block groups with at least 51% low- and moderate-income populations, as many of Lakewood's minority and ethnic populations continue to be concentrated in these areas. Many of these block groups tend to have large concentrations of aging housing stock suffering from a lack of routine maintenance and infrastructure that is either inadequate or are outdated in accordance with current development standards.

In 2025, CDBG funding prioritization will focus on the prevention and reduction of homeless & housing instability through the rehabilitation and preservation of owner-occupied housing units, emergency assistance payments to low- and moderate-income households, with a focus on cost-burdened households, elderly, disabled, and minority populations, and through emergency relocation assistance for households displaced through no fault of their own; the support of diverse rental & homeowner opportunities through the construction of new rental and homeowner housing; and the stabilization of existing residents and neighborhoods through the removal of blighted properties, and fair housing services. HOME funding in FY 2025 will focus on the prevention and reduction of homeless & housing instability through the provision of tenant-based rental assistance; and the support of diverse rental & homeowner opportunities through the construction of new rental and homeowner housing.

For all other funding, the City has not identified specific targeted areas; programs are open to eligible low- and moderate-income individuals citywide.

Geographic Distribution

Target Area	Percentage of Funds

Table 53 - Geographic Distribution

Rationale for the priorities for allocating investments geographically.

N/A

Discussion

AFFORDABLE HOUSING
AP-55 AFFORDABLE HOUSING - 91.420, 91.220(G)

Introduction

One Year Goals for the Number of Households to be Supported	
Homeless	40
Non-Homeless	20
Special-Needs	
Total	60

Table 54 - One Year Goals for Affordable Housing by Support Requirement

One Year Goals for the Number of Households Supported Through	
Rental Assistance	
The Production of New Units	5
Rehab of Existing Units	8
Acquisition of Existing Units	
Total	13

Table 55 - One Year Goals for Affordable Housing by Support Type
Discussion

AP-60 PUBLIC HOUSING - 91.420, 91.220(H)

Introduction

Actions planned during the next year to address the needs for public

housing.

Actions to encourage public housing residents to become more involved in management and participate in homeownership. If the PHA is designated as troubled, describe the manner in which financial assistance will be provided or other assistance.

Discussion

Intentionally left blank.

AP-65 HOMELESS AND OTHER SPECIAL NEEDS ACTIVITIES - 91.420, 91.220(I)

Introduction

Describe the jurisdictions one-year goals and actions for reducing and ending homelessness including:

Reaching out to homeless persons (especially unsheltered persons) and assessing their individual needs:

Addressing the emergency shelter and transitional housing needs of homeless persons:

Helping homeless persons (especially chronically homeless individuals and families, families with children, veterans and their families, and unaccompanied youth) make the transition to permanent housing and independent living, including shortening the period of time that individuals and families experience homelessness, facilitating access for homeless individuals and families to affordable housing units, and preventing individuals and families who were recently homeless from becoming homeless again:

Helping low-income individuals and families avoid becoming homeless, especially extremely low-income individuals and families and those who are: being discharged from publicly funded institutions and systems of care (such as health care facilities, mental health facilities, foster care and other youth facilities, and corrections programs and institutions); or, receiving assistance from public or private agencies that address housing, health, social services, employment, education, or youth needs.

Discussion

AP-75 BARRIERS TO AFFORDABLE HOUSING - 91.420, 91.220(J)

Introduction

Actions it planned to remove or ameliorate the negative effects of public policies that serve as barriers to affordable housing such as land use controls, tax policies affecting land, zoning ordinances, building codes, fees and charges, growth limitations, and policies affecting the return on residential investment.

Discussion

AP-85 OTHER ACTIONS - 91.420, 91.220(K)

Introduction

Actions planned to address obstacles to meeting underserved needs

Actions planned to foster and maintain affordable housing
Actions planned to reduce lead-based paint hazards
Actions planned to reduce the number of poverty-level families
Actions planned to develop institutional structure
Actions planned to enhance coordination between public and private housing and social service agencies.
Discussion

Section 108

PROGRAM SPECIFIC REQUIREMENTS

AP-90 Program Specific Requirements - 91.420, 91.220(l) (1,2,4)

Introduction

Community Development Block Grant Program (CDBG)
Reference 24 CFR 91.220(l)(1)

Projects planned with all CDBG funds expected to be available during the year are identified in the Projects Table. The following identifies program income that is available for use that is included in projects to be carried out.

1. The total amount of program income that will have been received before the start of the next program year and that has not yet been reprogrammed	0
2. The amount of proceeds from section 108 loan guarantees that will be used during the year to address the priority needs and specific objectives identified in the grantee's strategic plan.	
3. The amount of surplus funds from urban renewal settlements	
4. The amount of any grant funds returned to the line of credit for which the planned use has not been included in a prior statement or plan	
5. The amount of income from float-funded activities	

Total Program Income:

Other CDBG Requirements

1. The amount of urgent need activities	
2. The estimated percentage of CDBG funds that will be used for activities that benefit persons of low and moderate income. Overall Benefit - A consecutive period of one, two or three years may be used to determine that a minimum overall benefit of 70% of CDBG funds is used to benefit persons of low and moderate income. Specify the years covered that include this Annual Action Plan.	100.00%

Appendix - Alternate/Local Data Sources

Return to Agenda

CDBG 2025-2029 Five-Year Consolidated Plan
COMMUNITY SERVICES ADVISORY BOARD
October 16, 2024 – 5:30 pm

Attendees – City staff- Martha Larkin & Jeff Gumm. CSAB members- Kyle Franklin, Michael Lacadie, Nicole Denise Franklin, Laurie Maus, and Shelby Taylor.

No comments provided

CDBG 2025-2029 Five-Year Consolidated Plan
PUBLIC HEARING – Human Services Community Collaboration Meeting
November 13, 2024 – 9:00 a.m.

Attendees – Alice Fong- Ethical Leadership Group, Daniel Burdsell- TPC Health Department, Marianne Haynes- Project Access, Becca Pilcher- Rebuilding Hope, Susanne Pak- Answers Counseling, Marcos Sauri- Lakewood's CHOICE, Neirssa Roberts- YWCA, Erica Bartlett- TPC Health Department, Jesse Black- Springbrook Connections, Chris Davis- City of Lakewood, Aron Myracle - Oasis Youth Center, Lisa Watt Banks- Lakewood's CHOICE

Question – What do you see as the top three housing needs for HUD-qualified populations in Lakewood?

- Lakewood needs more affordable rental housing for families.
- Add housing but also find ways for people to connect and communicate their needs.
- Help people have ways of getting to know each other and build a sense of community.
- Invest in the people so they will gain education, skills, confidence, dignity.
- Funding to help people who are trying to apply for new housing. (Application Fees).
- A tiny home village like the one in Tacoma.
- Safe parking for unhoused people with cars or RVs.
- More ways to disseminate information to those who need it. Currently landlords are a resource.
- A central location for people to get information they need.
- Rental Assistance (first, last, deposit).
- More resources for those who earn just over the Medicaid limit.
- It is important to take into consideration that Lakewood is a hub for families and individuals being pushed out of Seattle & Tacoma due to gentrification and the growth of the military families & community making the areas surrounding JBLM their home.
- Need more local organizational involvement and resource sharing for children, youth, and families.

Question – What are some un-met or under recognized needs impacting specific HUD-qualified populations?

- Immigrant needs.
- Housing for youth (especially LGBTQ).
- Subsidies for housing seniors and veterans.
- Create/refurbish spaces for young people to play/be in.
- Opportunities for fostering.

- Engage more with citizens to be part of solutions.

Question – What types of housing or supportive services are most in demand, but least available?

- Need more low barrier housing. Along with being on a fixed income, you have folks who cannot get into housing because of their credit, owing previous landlord, high income requirements, etc.
- Need places that work with folks who have more barriers to get into safe and stable housing.
- Need transitional and permanent supportive housing.
- More affordable rentals for families. Affordable 2- or 3-bedroom rentals near schools and affordable housing complexes with ECEAP early learning center onsite or nearby.
- Safe and healthy housing standards for existing housing. (The Health Department appreciates Lakewood's Proactive Rental Housing Inspection Program).
- Transportation.
- Transportation helps people get better jobs.
- Opportunities to engage.
- Programs to assist homeowners to build and ADU to be used for low-income housing in the first 5 years.
- Supportive Services – food bank.
- Food storage lockers (Amazon style for pickup).
- An online resource guide tailored to a specific area (Lakewood).
- Resource Guide for Community Colleges.
- Organization of agencies to communicate, chat, and collaborate with their services.
- Resource Guide with QR code to access in multiple languages.
- More ECEAP/Early Learning.

CDBG 2025-2029 Five-Year Consolidated Plan
NEIGHBORHOOD CONNECTIONS LEADERSHIP GROUP
November 20, 2024 – 5:30 p.m.

Attendees – Christopher Davis, Program Coordinator
Neighborhood Connections Members - Lisa Boyd, Vicky Stanich. Sue Hawkins, Anne Gradner, Jeanne Ehlers, Melissa Fritts-Dougherty, Sherry Ankel, and Larry Woods

Question – What types of programs or services/activities do you feel are the greatest need for Lakewood citizens – affordable housing, services, infrastructure/community facilities, or economic development?

- Assistance for repairs and rehabilitation for deferred maintenance for owner-occupied housing.
- Find ways for people to connect and communicate their needs. A central location for people to get information they need on programs offered by City.
- Educational programs.
- Affordable apartment rents.
- Development of sidewalks in neighborhoods to promote safety.
- Program to help with illegal trash dumping; especially important in low-income neighborhoods.

Question – What are some un-met or under recognized needs impacting specific HUD-qualified populations?

- Long-time homeowners in Lakewood are worried about affordable housing coming to their neighborhoods. They don't understand what affordable housing is. Need to better educate the community on what "affordable housing" entails and actually means.
- High School kids don't have a clear understanding of the costs of housing/rent. Need financial literacy programs for youth.
- Affordable housing and the cost of rent were important issues.

Question – What types of housing or supportive services are most in demand, but least available in Lakewood?

- Move-in costs. First, last, deposit assistance to help people get started. Large barrier to low-income families looking to rent a house or apartment or to relocate and come up with the first, last and deposit for the move. Other renter assistance programs.
- Housing education programs.

- Need to find more ways of getting the word out about housing assistance programs the City and County offers.

Question – What alternative solutions or innovative supportive services or housing programs have you seen elsewhere that you believe would benefit Lakewood?

- A central location to share information at City Hall or elsewhere regarding available resources and programs.
- Have an open house for City services.
- Partner with the community and host a booth at fairs and other gatherings to distribute information.
- Collaborate with the local school district to increase awareness of students and their families. Advertise programs and services in the CPSD newspaper.
- Work with legislators to encourage rent stabilization.
- Provide resources for landlords to defend against negligent tenants and those who do not pay rent. Do not enact local legislation like Tacoma restricting a landlords' ability to manage properties, including the eviction process.
- Develop affordable apartments. Not enough military housing on base, so service members rent in Lakewood lessening the number of affordable units available to Lakewood citizens.
- Fix potholes.
- No more traffic circles.

CDBG 2025-2029 Five-Year Consolidated Plan
YOUTH COUNCIL MEETING
December 2, 2024

Attendees – Alexandra Corona Hernandez, Alicia Stanford, Ava Qualls, Bridget Holbrook, Britany Robles, Chase Washington, Elija Sta Ana, Gabriel Flores, Irie Hinkle, Iymen Bahron, Jada Martin, Kasia King, Leslie Rosales Martinez, Lincoln Estrada Perez, Luci Asadi McLaughlin, Lui Owejan, Nathalye Lopez, Nathan Lewis, Reinida Benavente, Ruffaro Ghuzha, Salvador Cortes, Sophia Lana Castro, Violet Johnson, and Zoe Clifford.

Affordable Housing Needs:

1. Rental caps: Minimize landlord's ability to increase rents by obscene amounts.
2. Help college graduates against being priced out of rental housing.
3. Be harsher on landlords neglecting health and safety issues.
4. High homeownership prices are an issue. Sellers requiring higher prices than appraised value.

Community Development:

1. Continue fixing our sidewalks and increase streetlighting.
2. Find more homeless resources to get them off the street.
3. More spaces for youth to hang out.
4. Fix potholes.
5. Trash and debris pick-up.
6. Implement heightened neighborhood safety methods.

No comments were made regarding economic development or public services.

CDBG 2025-2029 Five-Year Consolidated Plan
PUBLIC HEARING- Housing & Services Providers, Fair Housing Center of Washington, TPCHD, PCHA, and other local quasi-governmental agencies.
December 3, 2024. 11:00 a.m.

Attendees – City Staff- Martha Larkin, Shannon Johnson and Jeff Gumm. JQUAD Planning Group staff- Robert Joiner & James Gilleylen. Attendees- Maureen Fife- Tacoma-Pierce County Habitat for Humanity, Hallie McCurdy- West Pierce Fire & Rescue, Adria Buchanan- Fair Housing Center of Washington, Jim Stretz- Pierce County Housing Authority, Victoria O'Banion- Northwest Cooperative Development Center, Erika Bartlett- Tacoma-Pierce County Health Department, Angela Del Grosso-Thompson- Pierce County Aging & Long Term Care, Adam Reichenberger- Tacoma-Pierce County Health Department, Marshall Meyer- Lakewood Water District, Shukri Sharabi.

Question- What do you see as the top three housing needs for low-and moderate-income populations in Lakewood? Other non-housing needs such as infrastructure, economic development or services?

- Affordable homeownership options. Maintenance of owner-occupied housing. Homeownership builds a sense of community.
- Stabilize seniors in their current housing. As costs continue to rise, seniors on fixed incomes are becoming more and more at risk of losing their housing.
- Maintaining existing rental housing. Rental Housing Safety Program is a good way for the City to ensure housing is safe.
- Preservation of ALL types of affordable housing – MF and SF rental, single-family owner occupied, and manufactured housing.
- Rehabilitation programs and funding for maintaining existing rental housing.
- Tenant-based rental assistance or other rental assistance program would be a positive. Jim Stretz (PCHA) cautioned that a full TBRA program providing monthly rental assistance is difficult to end once started.
- Need programs that fund maintenance and acquisition of affordable housing options.
- Infrastructure funding programs to assist with the costs of acquiring, developing or maintaining affordable housing. Many areas where affordable housing is located have outdated/aging infrastructure and some lack sewer. Federal funding may not be best option for funding infrastructure; City should pursue non-federal funding sources.

Question- What are some unmet or under-recognized housing needs impacting specific HUD-qualified "presumed" populations (i.e. youth, homelessness, veterans, domestic violence, disabled, elderly)?

- Rents are too high for seniors.
- Need more housing options at different income levels, not just 80% AMI and below. Need more options for households with incomes less than 30% AMI.

- Allow or provide for rental s by the room or other types of shared housing to lower rental costs for those with very low incomes or those who are just getting started out.
- Universal design and accessible housing is in very short supply. Need more housing options for disabled households. It is difficult to purchase a home and coordinate for accessible upgrades in time to complete the home purchase as others are also bidding on the same home and don't require such upgrades. Difficult for homebuyers to get bids and do work in a timely manner.
- Difficulty in financing expensive accessible upgrades to homes when purchasing; need funding assistance program to assist with this expense.

Question- What types of housing impediments are you aware of that are currently impacting low-income, minority, or other disadvantaged Lakewood populations? What steps does the City need to take to address them?

- No housing vouchers are currently available in Tacoma or Lakewood.
- Renter's insurance is something that is needed for all renters to ensure large expenses are not incurred in times of disaster, etc. Often renters who are forced to move temporarily or permanently are taxed by additional expenses that could have been covered by insurance (i.e. motel expenses, moving expenses, food, replacing household/personal goods, etc.).
- Older manufactured homes are not allowed in parks and many low-income households cannot afford new manufactured homes.
- Rents are too high for elderly and veteran households.
- Homeowner insurance rates continue to rise.

Question- What alternative solutions or innovative housing programs have you seen elsewhere that you believe would benefit Lakewood?

- Lakewood should consider designating Neighborhood Revitalization Strategy Areas (NRSA) as allowed by HUD to focus development and assistance and lessen some of the CDBG regulations.
- Manufactured housing zoning overlays that protect existing manufactured housing (Tacoma and Tumwater).
- Allow ADUs in manufactured home parks. The city should research top better understand the impact it would have before initiating such a program.
- Allow for changes to change title of manufactured homes in parks to consider such housing as real property rather than personal property. This change would allow for homeowners to gain access to conventional financing with longer terms and better interest rates, thus reducing housing costs to these low-income households. Real property status would allow better access to conventional financing for cooperatives and owners to finance repairs at a better rate and payment.
- Programs funding infrastructure upgrades and pre-development expenses such as earnest money, inspections, design, etc.

CDBG 2025-2029 Five-Year Consolidated Plan
PUBLIC HEARING- Housing & Services Providers, Fair Housing Center of Washington, TPCHD, PCHA, and other local quasi-governmental agencies.
December 4, 2024. 6:30 p.m.

Attendees – City Staff- Tiffany Speir and Jeff Gumm. Planning Commission- Robert Estrada, Chair; Phillip Combs; Mark Herr; Phillip Lindholm; Ellen Talbo; Sharon Wallace.

Question- What do you see as the top needs for low-and moderate-income populations in Lakewood? (Can be specific housing, infrastructure, economic development, or service-related need.)

- Support of various parks in Lakewood, including American Lake Park, Harry Todd Park, and Seeley Lake Park.
- Funding to assist the Tillicum Community Center with various deferred maintenance issues related to the building.
- Operational funds to assist the Tillicum Community Center.
- Childcare deserts are still an issue. Use CDBG funding to assist with growing the number of daycares or the number of children that can be assisted by a specific daycare facility.
- CDBG to support economic development to provide low-income persons with a solid financial base.
- Lakewood's Multi Family Tax Exemption Program is good incentivization to develop affordable housing. Partnerships with CDBG/HOME funding with for-profit or non-profit organizations to develop more affordable housing and redevelop neighborhoods.
- Development of affordable housing should be in mixed income developments so as not to overconcentrate low-income housing in one area or development.

FHCW
FAIR HOUSING CENTER OF WA

12/3/2024

RE: Lakewood Consolidated Plan

Dear Jeff Gumm,

Thank you for engaging the Fair Housing Center of Washington (FHCW) to discuss housing needs in Lakewood. To re-iterate some of the comments we shared in the public meeting, the following are points we would like the City of Lakewood to consider:

- **NRSA** – The Neighborhood Revitalization Strategic Area designation could be very useful for the city as it determines how best to use CDBG funds. An NRSA designation allows for greater flexibility in spending and in targeting various AMI levels. The FHCW would love to see the City of Lakewood adopt an NRSA to further leverage federal funds.

- **Accessibility** – Homeownership is an important wealth-building tool and can hedge against rising rental costs, however, for individuals who are disabled, there is not enough ready built housing that they can physically get into. Most cannot get through the front door. Because they are not able to confidently get in and around these houses as-is, they are very hesitant to purchase, even if they are financially capable. This is also an issue for those using FHA, which requires a number of bids before an offer can be made. The FHCW encourages the City of Lakewood to explore programs that assist disabled homeowners in getting accessible modifications completed post-close.

- **Housing in various types** – The City of Lakewood has done a lot of work in this area with increasing housing opportunities. Going forward, developments that allow folks to rent by the room or share common amenities and options that optimize shared space over individual living space (smaller bedrooms and larger kitchens or bathrooms for example) would allow seniors, transitioning homeless youth and others on lower or fixed incomes to be in adequate housing that meets their needs.

- **Manufactured Homes** – Currently, there are some manufactured home/ mobile home parks that do not accept older trailers. As a result, clients with older trailers are left with no hookups or are living in their car instead. The FHCW encourages the City of Lakewood to work with RV trailer owners to purchase newer used trailers.

- **Rental Assistance** – Renter insurance is currently not mandatory (a housing provider can require it in the lease) but there are many tenants who incur unnecessary costs, for example staying in a

hotel when repairs aren't made, or other things happen that may temporarily displace them. Renters insurance can help off-set these costs and "Renters' readiness" courses and resource materials should stress the importance of renter's insurance to put less financial strain on the city when these needs arise.

These are just a few options to consider as the City of Lakewood continues the Consolidated Plan process and meeting housing needs.

Thank you for your work and please keep us engaged.

Sincerely,

Adria Buchanan
Executive Director
Fair Housing Center of Washington

The Fair Housing Center of Washington is a nonprofit agency mandated by the Department of Housing and Urban Development (HUD) to assist in the enforcement of Title VIII, The Fair Housing Act, as amended in 1988. Our enforcement activities include education, outreach, advocacy, and filing complaints with HUD and other enforcement agencies.

Return to Agenda

THE 2024-OCT-29

TO → Jeff Gunn, Housing Division Mgr

FROM → The Hon. Mr. Robert Hill
former candidate for State Senate
Bus. # 2024-245-001, c/o "P.C.J."
910 TACOMA AVE S
TACOMA WA 98402-9998
(U.S. of A.)

There are three mechanisms I think the Council can adopt to increase housing — including "affordable" housing →

① Eliminate maximum heights for three years. (Impose a "moratorium")

If some developer wanted to build a "Burj Khalifa" in the middle of the Lakewood Mall, why shouldn't they? Consider the incredible property tax revenue this would provide: a deflect off residential individuals. Or how about a set of 20-story condominiums, containing 400, 500, 600 people? It's time for cities and counties to build UP not OUT, horizontally.

② Eliminate Parking Restrictions

The first one is "requiring" parking stalls, or spaces, per new inhabitant → what are the City's current numbers?

(OVER →)

There are too many square feet, or acres, devoted to cars, instead of pedestrians & bicycles & buses, which reduces density. Our car-culture inhibits and blocks socialization and cheaper access to grocery stores and restaurants and community centers and libraries.

The second one is "prohibitive" parking, which is restriction — but less important to me. → How much of this do you have

-3- <u>Reduce or Eliminate "Setback"</u>

This is an anachronism from 100 years ago, when everybody was combustible wood and the firefighters came up with a workable solution to preventing spread of fire. Today, there's significant improvement in material technology.

→ How much does the City still require setback?

Thank you for your attention to this matter.

How much would it cost to get a 3x4-foot color poster of the maximin heights by parcel/zone?

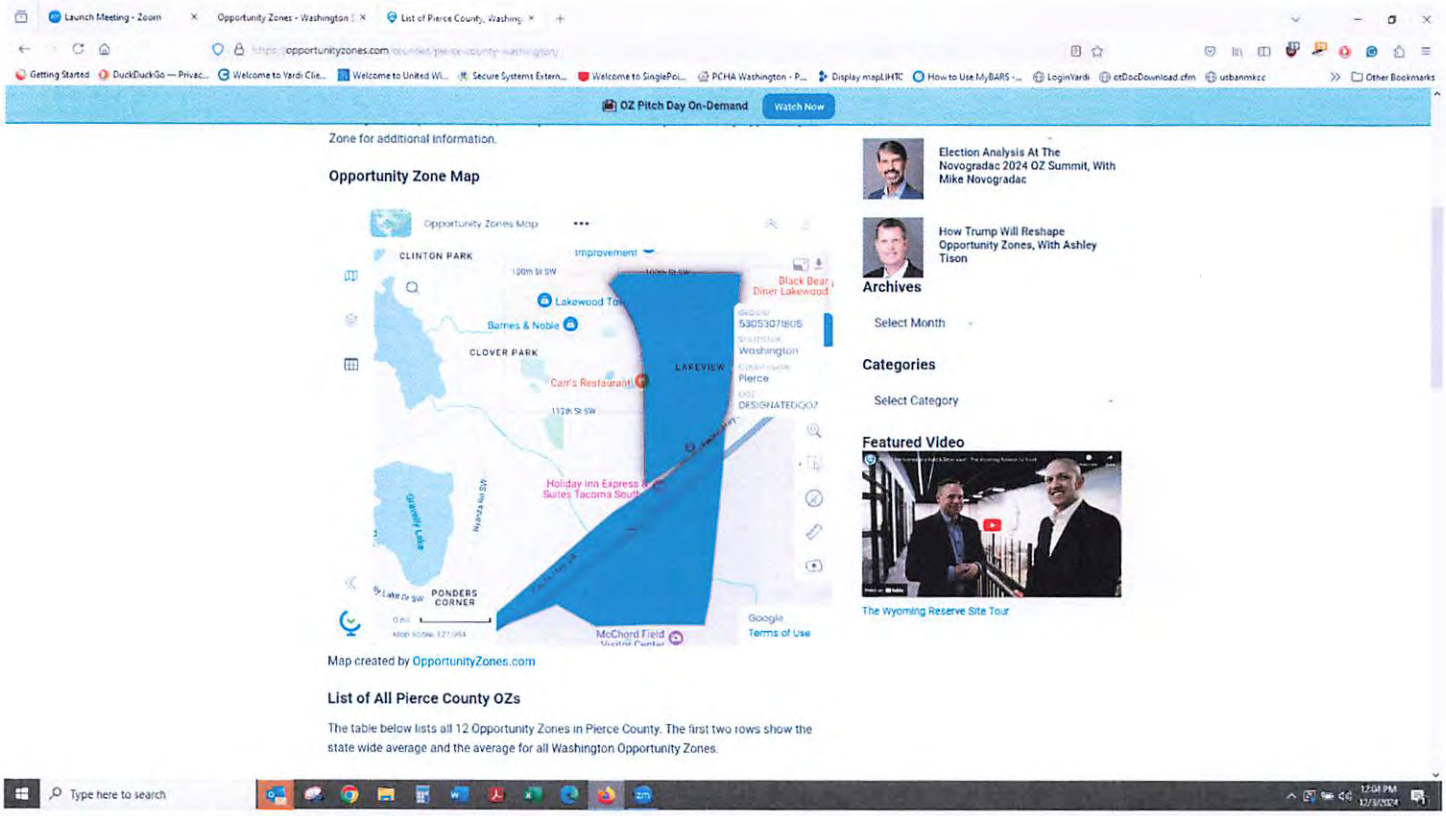
Jeff Gumm

From: Jim Stretz <JStretz@pchawa.org>
Sent: Tuesday, December 3, 2024 12:54 PM
To: Jeff Gumm
Subject: Opportunity Zones and the 5 year Plan
Attachments: Screenshot (510).png; Screenshot (512).png

Hi Jeff,
Thanks for including us. Your consultant highlighted a factor that could be very important in the next four years. Lakewood has two Opportunity Zones, and according to James, the new HUD Secretary was part of putting in place Opportunity Zones in Trump's first term. Perhaps these areas will be stressed in other subsidy programs during the next four years. We will be looking for opportunities in Lakewood's designated Zones 05 and 06—screenshots of the two OZs are attached. Our two older communities are just outside of them.
Thanks again,
Jim

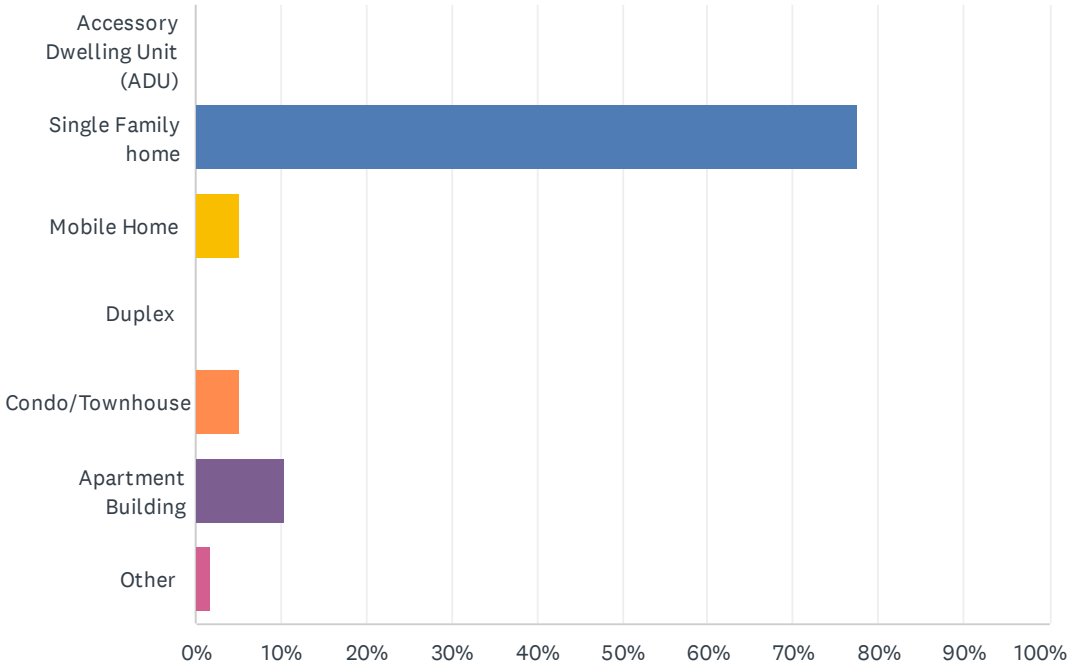
Jim Stretz
Executive Director
Pierce County Housing Authority
253.620.5406 Direct
WE MOVED!
11515 Canyon Canyon Rd E
Puyallup, WA 98373
jstretz@pchawa.org

Pierce County Housing Authority
www.pchawa.org.


OZ Pitch Day On-Demand
Watch Now
Zone for additional information.
Opportunity Zone Map
Opportunity Zones Map
CLINTON PARK
CLOVER PARK
LAKEVIEW
PONDERS CORNER
Barnes & Noble
Carl's Restaurant
Black Bear Diner Lakewood
Holiday Inn Express & Suites Tacoma South
McChord Field
Google
Terms of Use
Map created by OpportunityZones.com
List of All Pierce County OZs
The table below lists all 12 Opportunity Zones in Pierce County. The first two rows show the state wide average and the average for all Washington Opportunity Zones.
Election Analysis At The Novogradac 2024 OZ Summit, With Mike Novogradac
How Trump Will Reshape Opportunity Zones, With Ashley Tison
Archives
Select Month
Categories
Select Category
Featured Video
The Wyoming Reserve Site Tour
Type here to search

Q1 Which of the following best describes the type of housing you currently live in? (Choose only one)

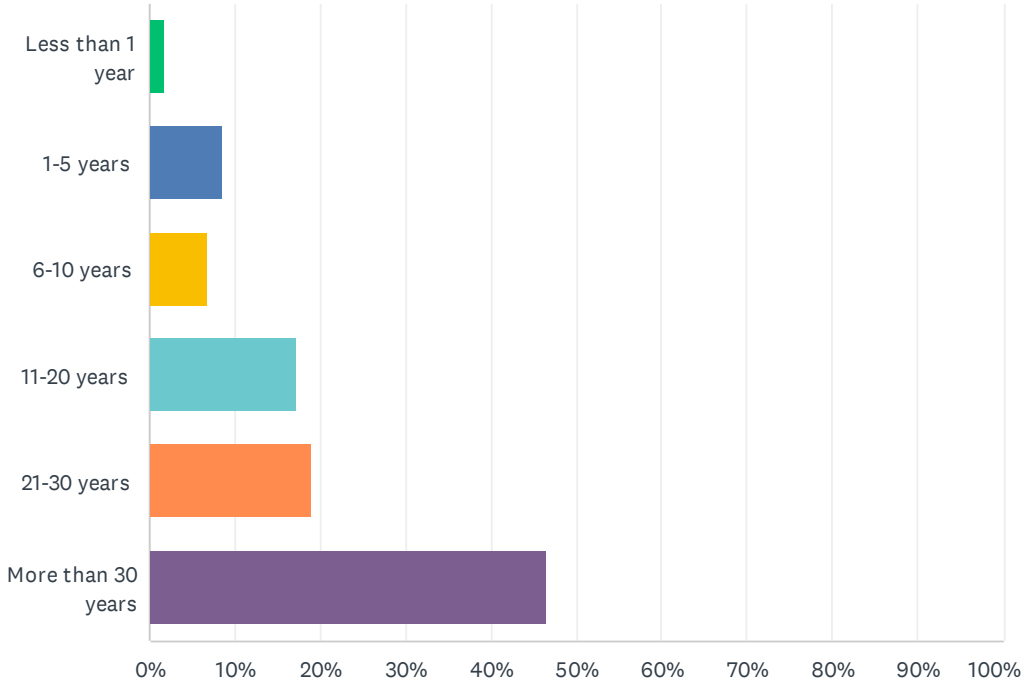
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Accessory Dwelling Unit (ADU)	0.00%	0
Single Family home	77.59%	45
Mobile Home	5.17%	3
Duplex	0.00%	0
Condo/Townhouse	5.17%	3
Apartment Building	10.34%	6
Other	1.72%	1
TOTAL		58

Q2 How long have you lived in Lakewood

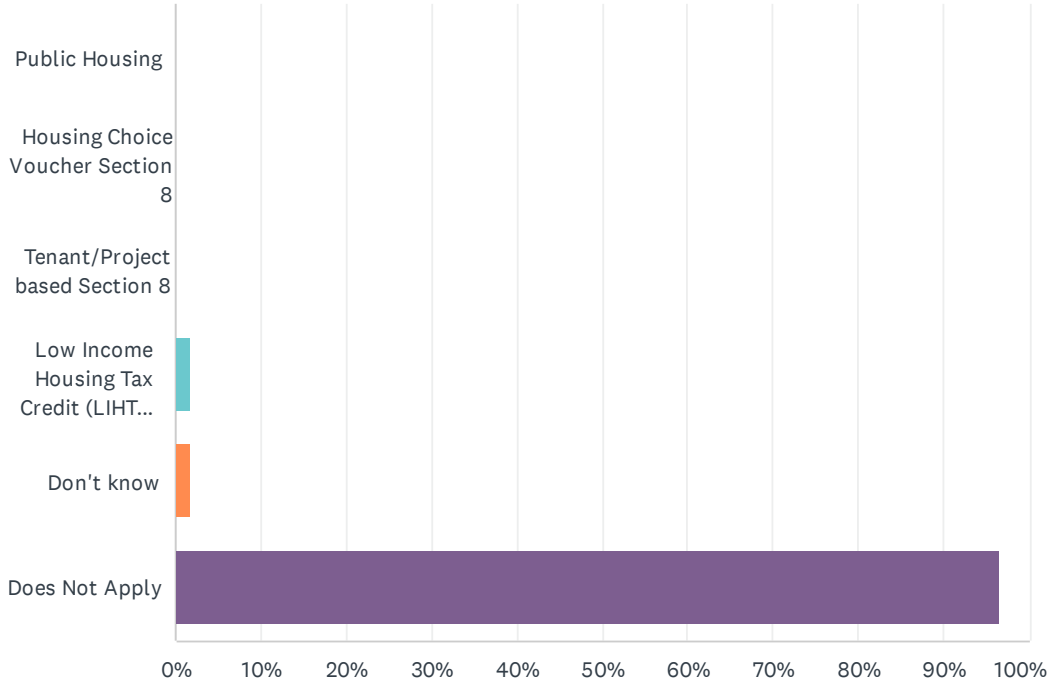
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Less than 1 year	1.72%	1
1-5 years	8.62%	5
6-10 years	6.90%	4
11-20 years	17.24%	10
21-30 years	18.97%	11
More than 30 years	46.55%	27
TOTAL		58

Q3 If you live in subsidized or assisted housing, please indicate what type?

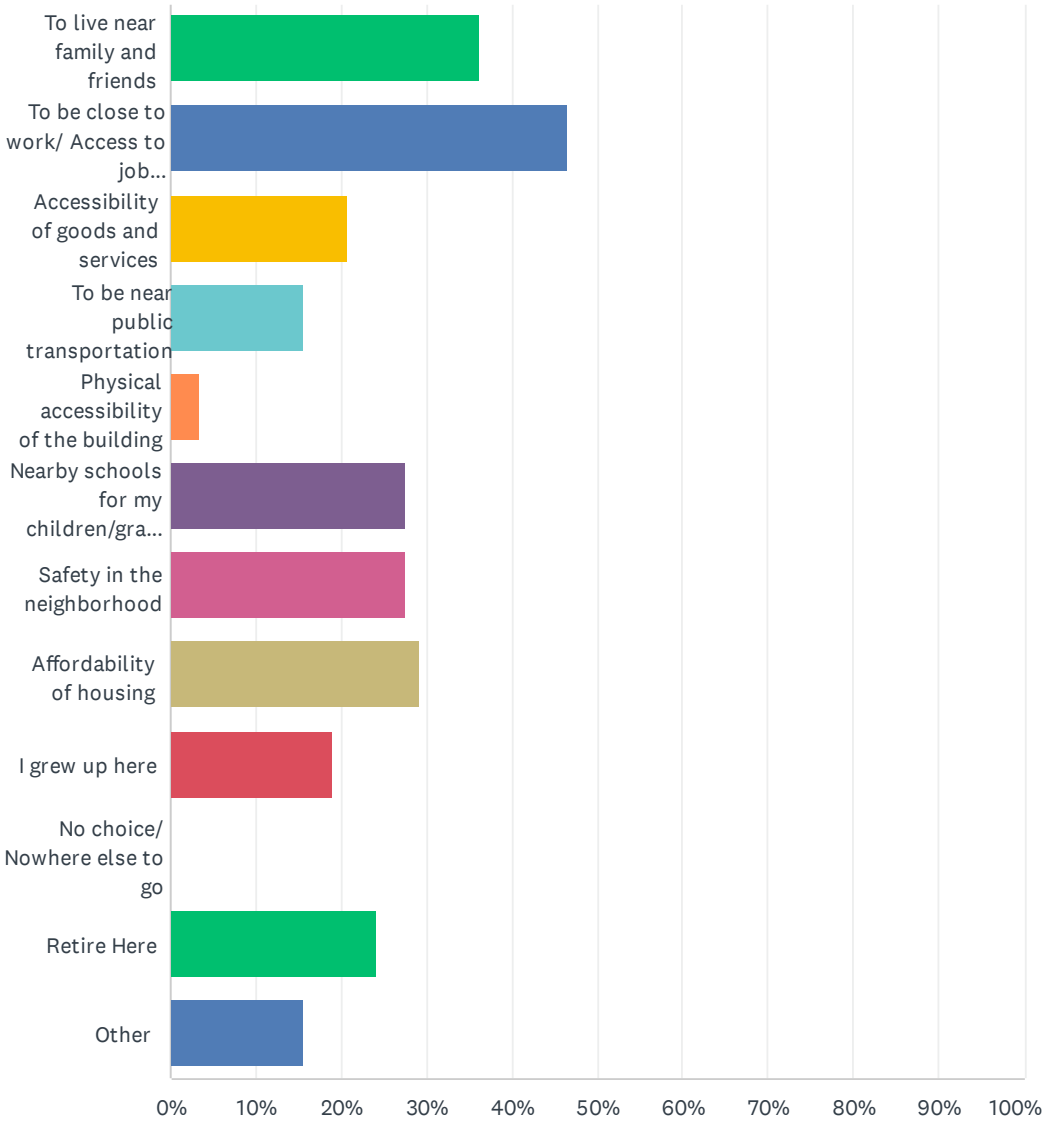
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Public Housing	0.00%	0
Housing Choice Voucher Section 8	0.00%	0
Tenant/Project based Section 8	0.00%	0
Low Income Housing Tax Credit (LIHTC) or other Federal Assisted Housing	1.72%	1
Don't know	1.72%	1
Does Not Apply	96.55%	56
TOTAL		58

Q4 Which of the following were the most important reasons you decided to live in Lakewood? (Check all that apply)

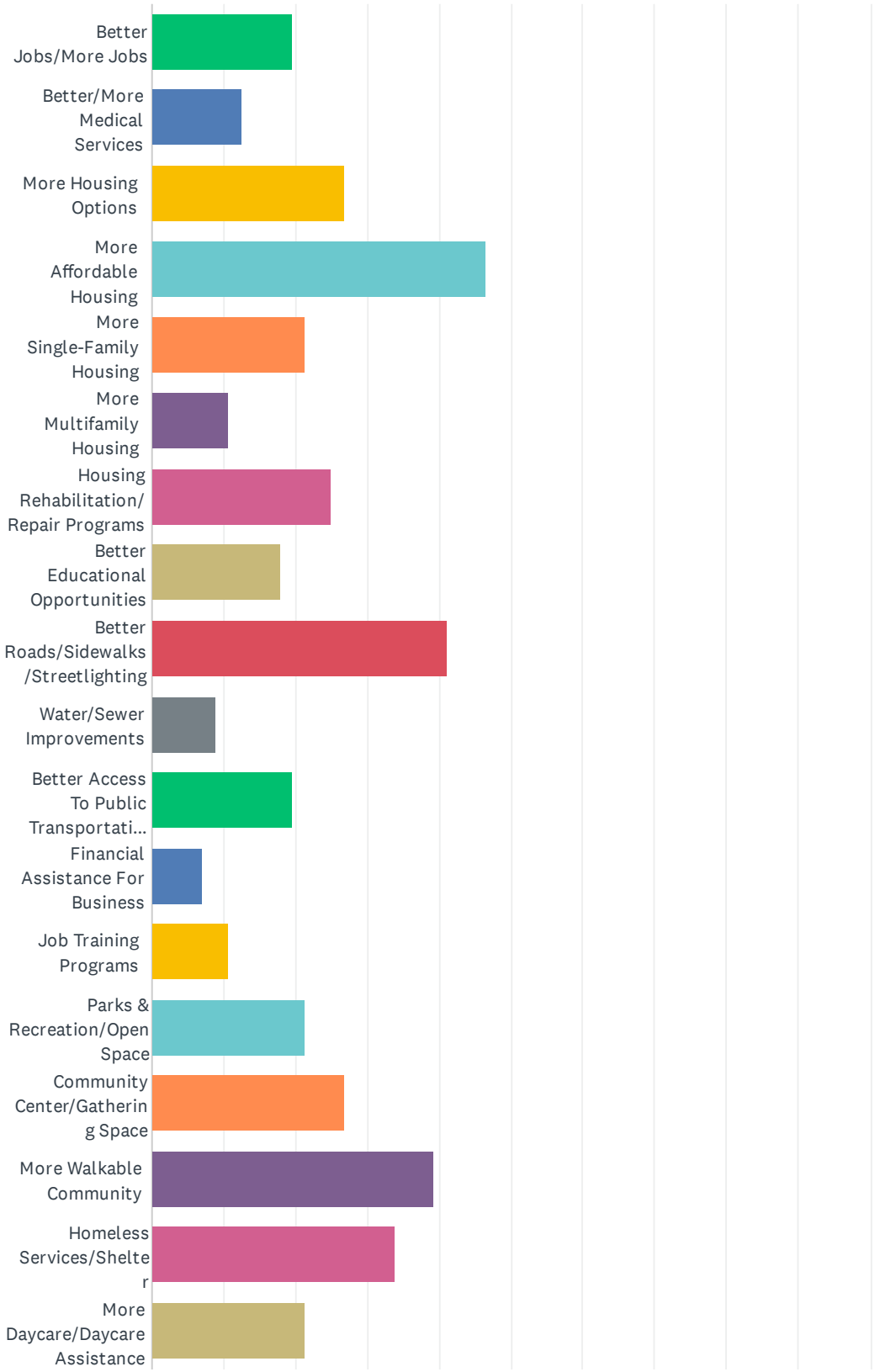
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
To live near family and friends	36.21%	21
To be close to work/ Access to job opportunities	46.55%	27
Accessibility of goods and services	20.69%	12
To be near public transportation	15.52%	9
Physical accessibility of the building	3.45%	2
Nearby schools for my children/grandchildren	27.59%	16
Safety in the neighborhood	27.59%	16
Affordability of housing	29.31%	17
I grew up here	18.97%	11
No choice/ Nowhere else to go	0.00%	0
Retire Here	24.14%	14
Other	15.52%	9
Total Respondents: 58		

Q5 What improvements does your community need most (Please check up to 5)

Answered: 56 Skipped: 2



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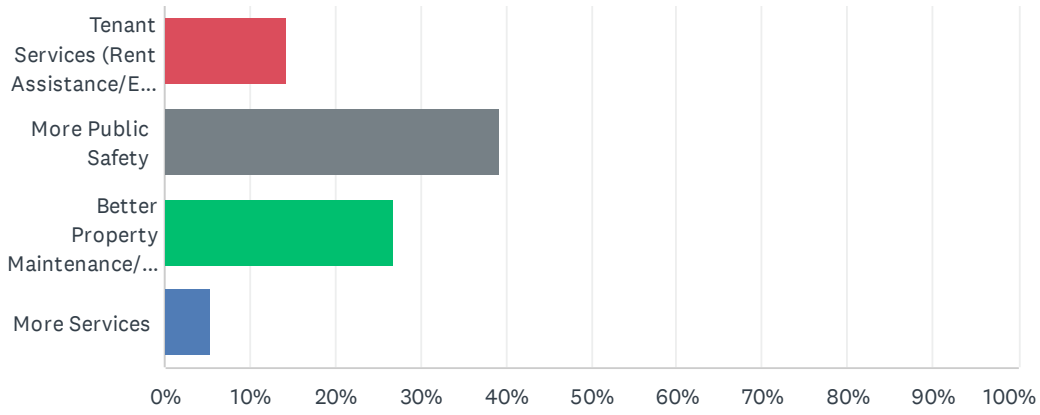
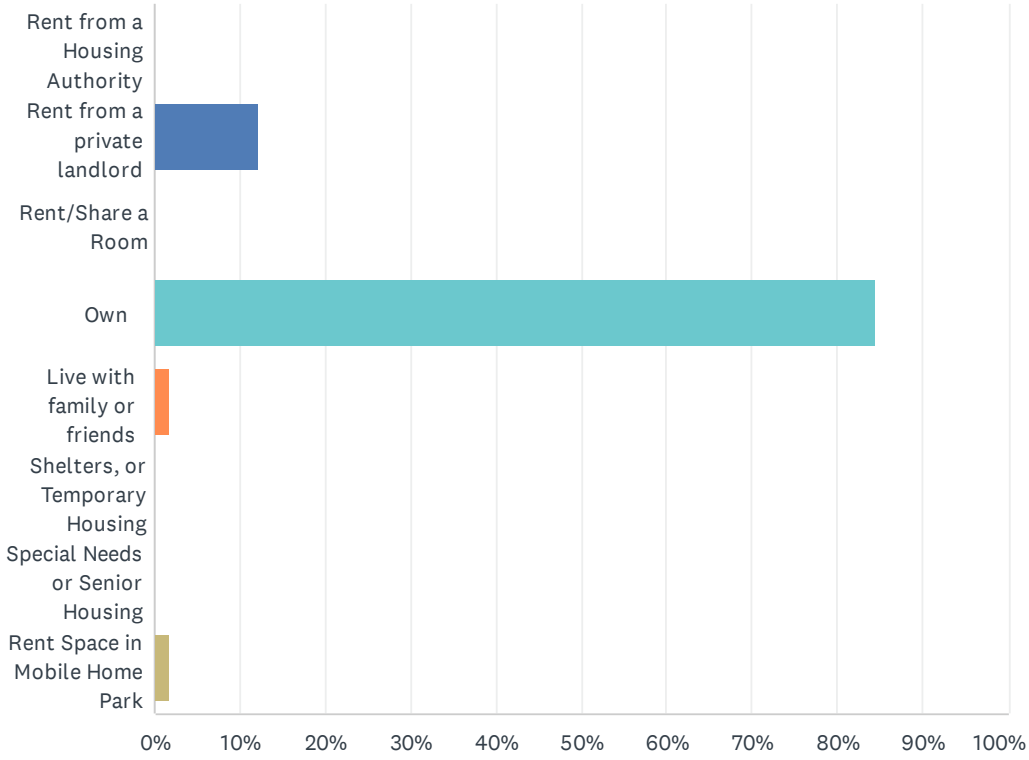


ANSWER CHOICES	RESPONSES	
Better Jobs/More Jobs	19.64%	11
Better/More Medical Services	12.50%	7
More Housing Options	26.79%	15
More Affordable Housing	46.43%	26
More Single-Family Housing	21.43%	12
More Multifamily Housing	10.71%	6
Housing Rehabilitation/Repair Programs	25.00%	14
Better Educational Opportunities	17.86%	10
Better Roads/Sidewalks/Streetlighting	41.07%	23
Water/Sewer Improvements	8.93%	5
Better Access To Public Transportation (Light Rail/Bus)	19.64%	11
Financial Assistance For Business	7.14%	4
Job Training Programs	10.71%	6
Parks & Recreation/Open Space	21.43%	12
Community Center/Gathering Space	26.79%	15
More Walkable Community	39.29%	22
Homeless Services/Shelter	33.93%	19
More Daycare/Daycare Assistance	21.43%	12
Tenant Services (Rent Assistance/Eviction Prevention)	14.29%	8
More Public Safety	39.29%	22
Better Property Maintenance/Code Enforcement	26.79%	15
More Services	5.36%	3
Total Respondents: 56		

Q6 Do you currently rent your home, own your home, or something else?

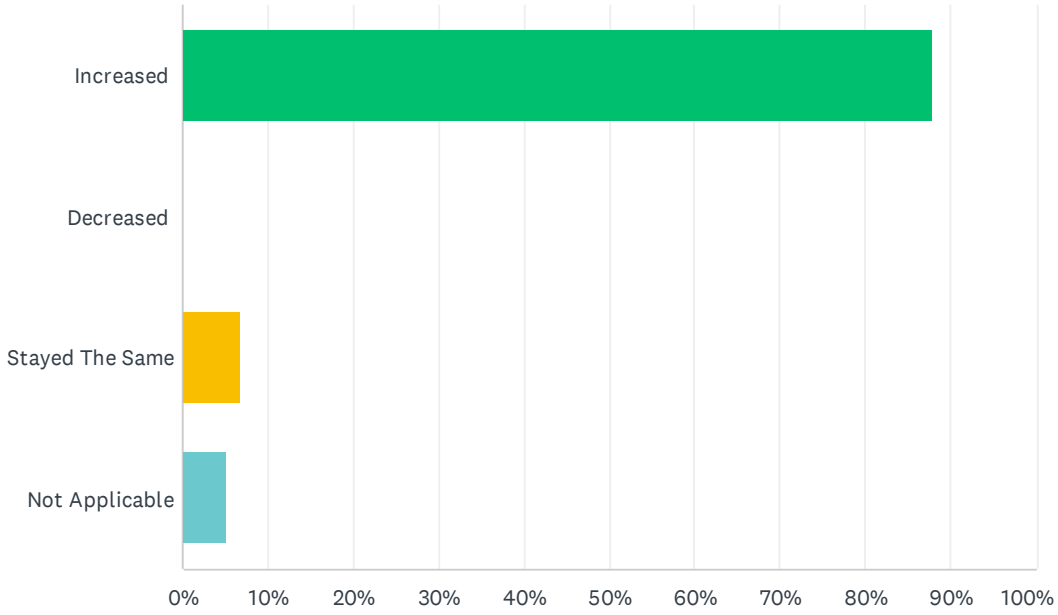
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Rent from a Housing Authority	0.00%	0
Rent from a private landlord	12.07%	7
Rent/Share a Room	0.00%	0
Own	84.48%	49
Live with family or friends	1.72%	1
Shelters, or Temporary Housing	0.00%	0
Special Needs or Senior Housing	0.00%	0
Rent Space in Mobile Home Park	1.72%	1
TOTAL		58

Q7 During the past three (3) years, how have the overall housing costs for your current home changed?

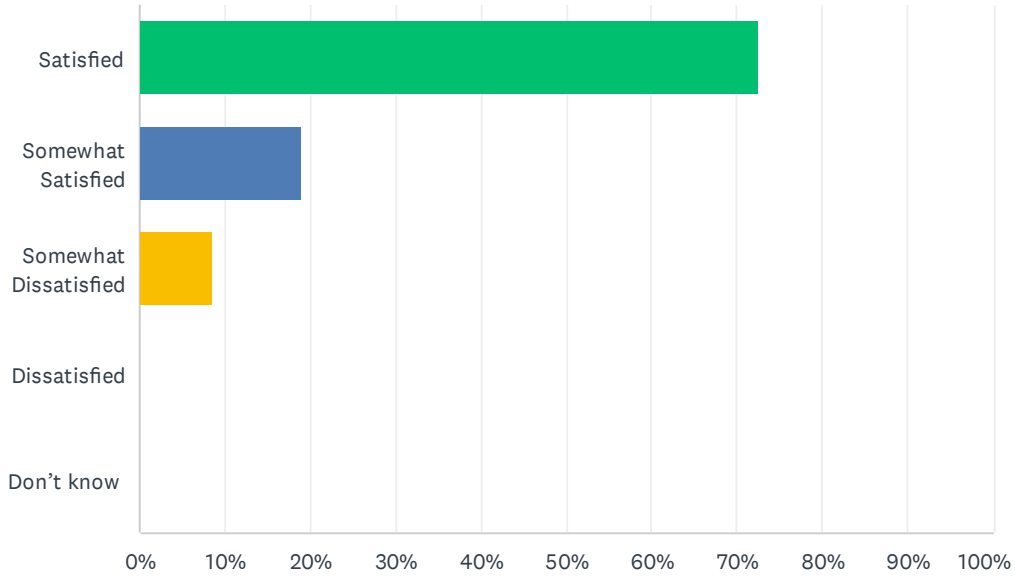
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Increased	87.93%	51
Decreased	0.00%	0
Stayed The Same	6.90%	4
Not Applicable	5.17%	3
TOTAL		58

Q8 How satisfied would you say you are with the quality of the housing you currently live in?

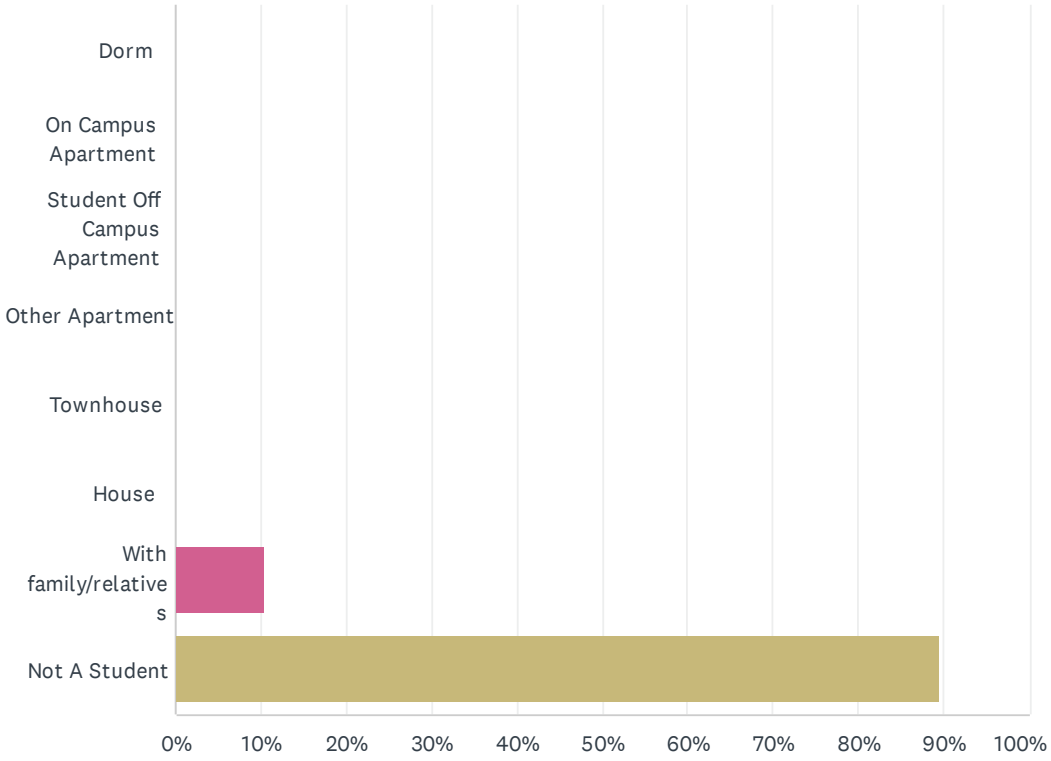
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Satisfied	72.41%	42
Somewhat Satisfied	18.97%	11
Somewhat Dissatisfied	8.62%	5
Dissatisfied	0.00%	0
Don't know	0.00%	0
TOTAL		58

Q9 Are you a Student? If so, which of the following best describes where you live?

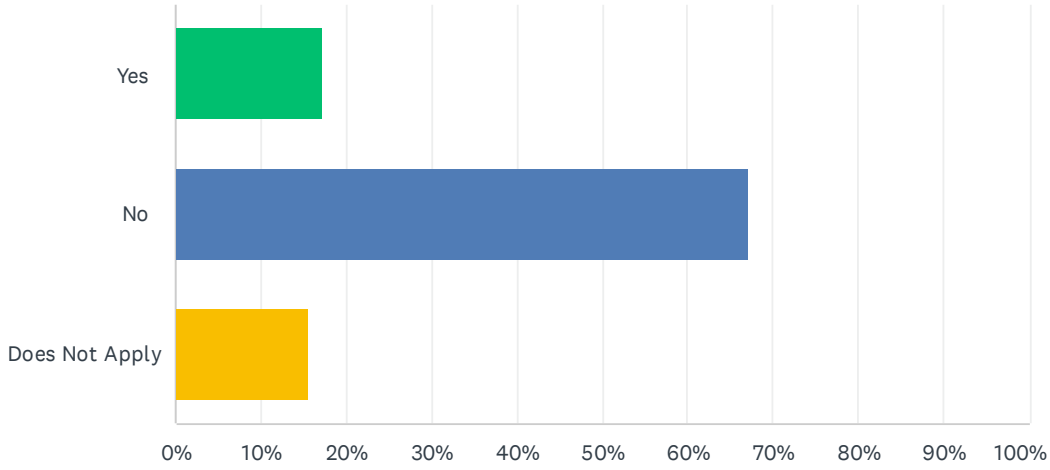
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Dorm	0.00%	0
On Campus Apartment	0.00%	0
Student Off Campus Apartment	0.00%	0
Other Apartment	0.00%	0
Townhouse	0.00%	0
House	0.00%	0
With family/relatives	10.34%	6
Not A Student	89.66%	52
TOTAL		58

Q10 During the past five years, have you applied for a loan to purchase a home, to refinance your mortgage, or to take equity out of your home?

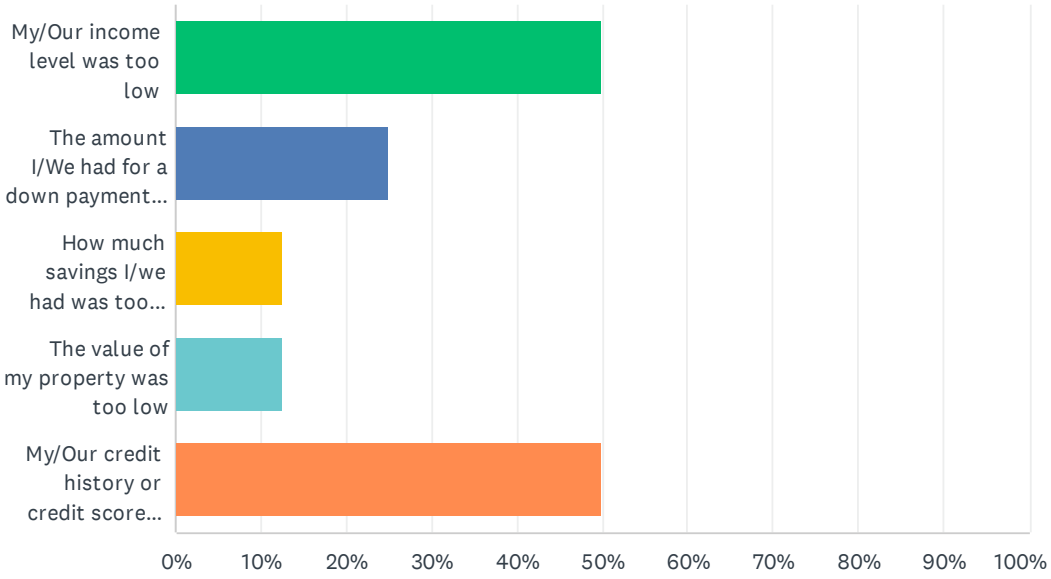
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	17.24%	10
No	67.24%	39
Does Not Apply	15.52%	9
TOTAL		58

Q11 If you have ever applied for a home loan and your application was NOT approved, which of the following reasons were you given? (Check all that apply)

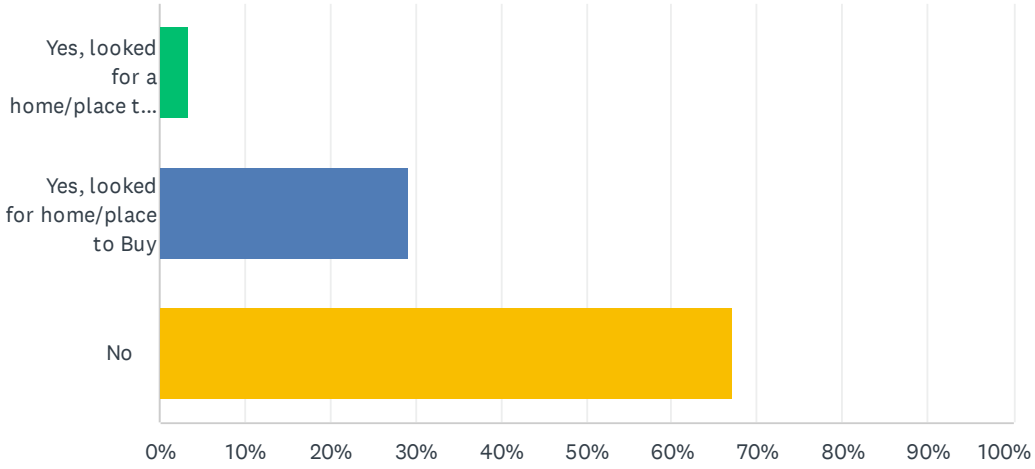
Answered: 8 Skipped: 50



ANSWER CHOICES	RESPONSES	
My/Our income level was too low	50.00%	4
The amount I/We had for a down payment was too low	25.00%	2
How much savings I/we had was too little	12.50%	1
The value of my property was too low	12.50%	1
My/Our credit history or credit score(s) was too low	50.00%	4
Total Respondents: 8		

Q12 During the past five years, have you looked for a new place to live?

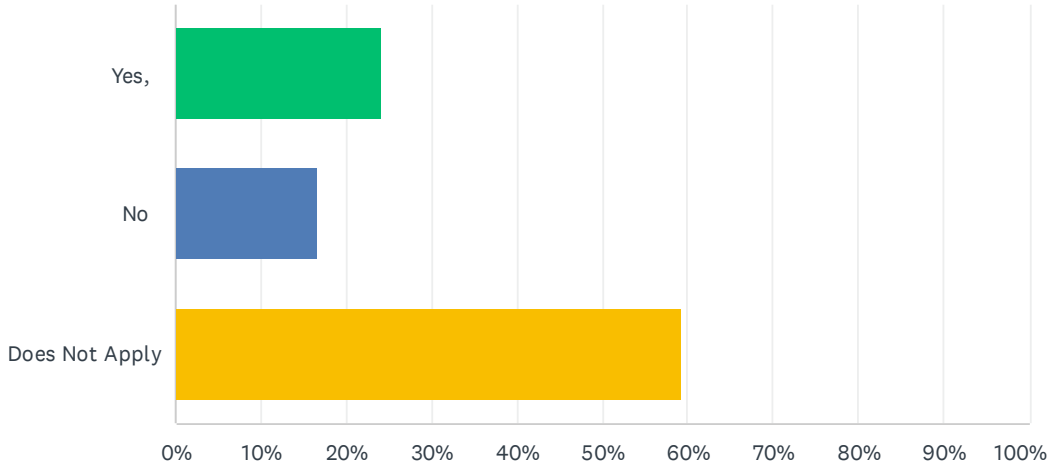
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes, looked for a home/place to Rent	3.45%	2
Yes, looked for home/place to Buy	29.31%	17
No	67.24%	39
TOTAL		58

Q13 If you answered Yes to Question 13, did you have trouble finding safe, quality housing that you could afford in a neighborhood you would like to live in?

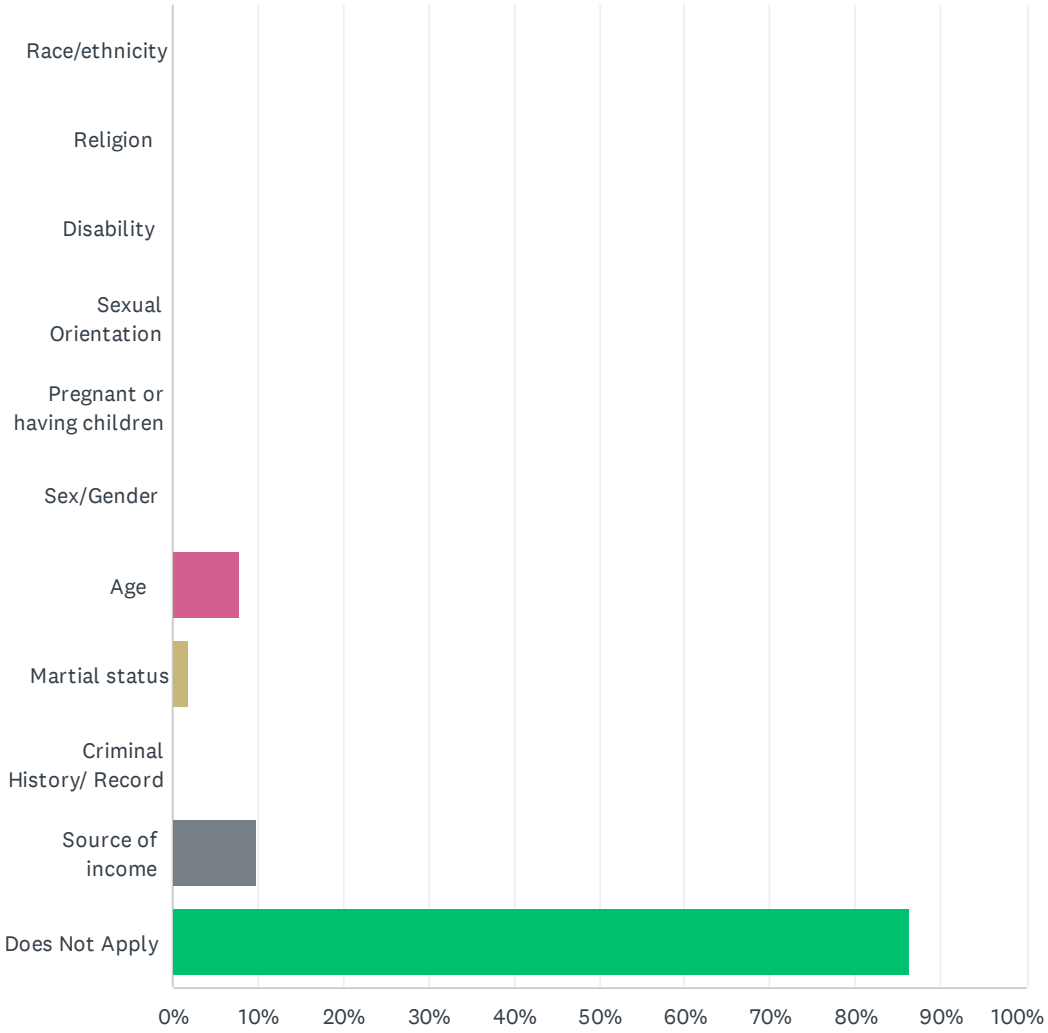
Answered: 54 Skipped: 4



ANSWER CHOICES	RESPONSES	
Yes,	24.07%	13
No	16.67%	9
Does Not Apply	59.26%	32
TOTAL		54

Q14 If you answered Yes to Question 14, do you think it was because of any of the following: (Check all that apply)

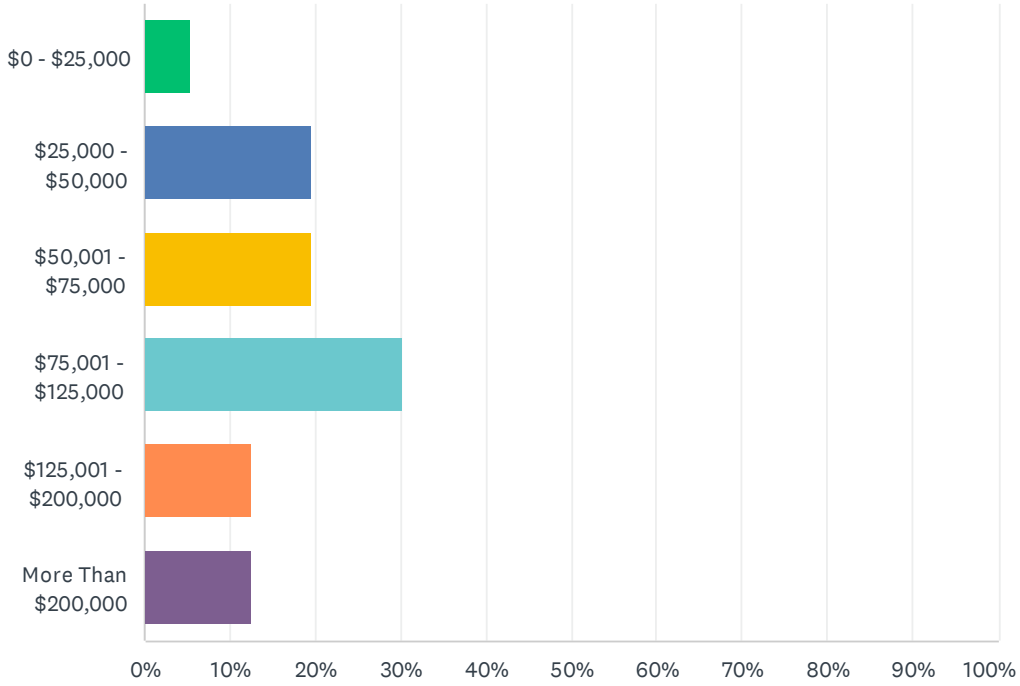
Answered: 51 Skipped: 7



ANSWER CHOICES	RESPONSES	
Race/ethnicity	0.00%	0
Religion	0.00%	0
Disability	0.00%	0
Sexual Orientation	0.00%	0
Pregnant or having children	0.00%	0
Sex/Gender	0.00%	0
Age	7.84%	4
Martial status	1.96%	1
Criminal History/ Record	0.00%	0
Source of income	9.80%	5
Does Not Apply	86.27%	44
Total Respondents: 51		

Q15 What is your income range?

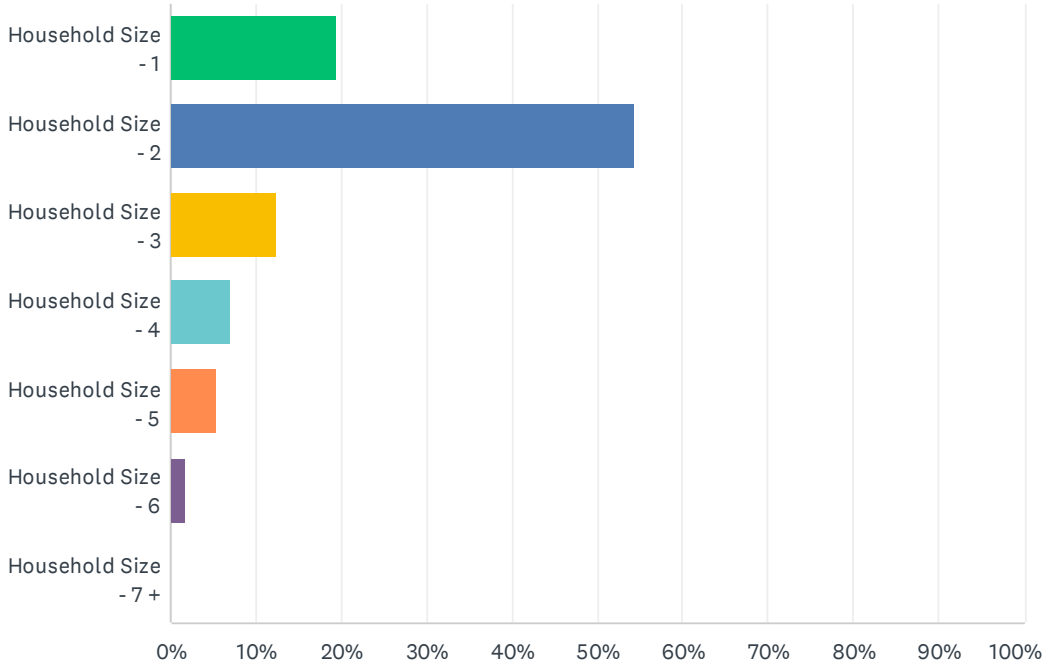
Answered: 56 Skipped: 2



ANSWER CHOICES	RESPONSES	
$0 - $25,000	5.36%	3
$25,000 - $50,000	19.64%	11
$50,001 - $75,000	19.64%	11
$75,001 - $125,000	30.36%	17
$125,001 - $200,000	12.50%	7
More Than $200,000	12.50%	7
TOTAL		56

Q16 What is your Household Size?

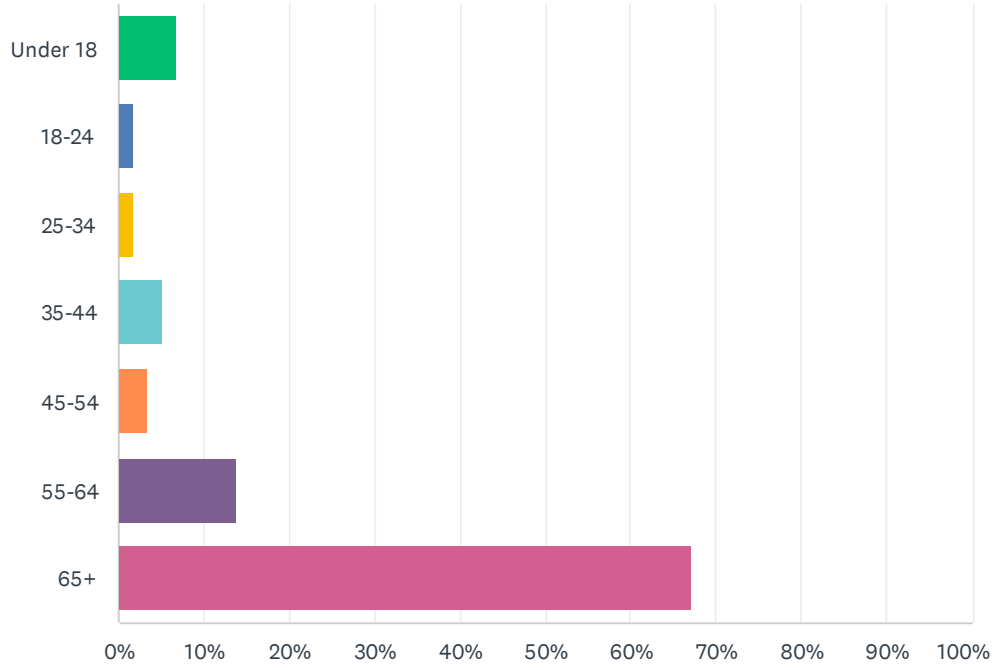
Answered: 57 Skipped: 1



ANSWER CHOICES	RESPONSES	
Household Size - 1	19.30%	11
Household Size - 2	54.39%	31
Household Size - 3	12.28%	7
Household Size - 4	7.02%	4
Household Size - 5	5.26%	3
Household Size - 6	1.75%	1
Household Size - 7 +	0.00%	0
TOTAL		57

Q17 What is your age?

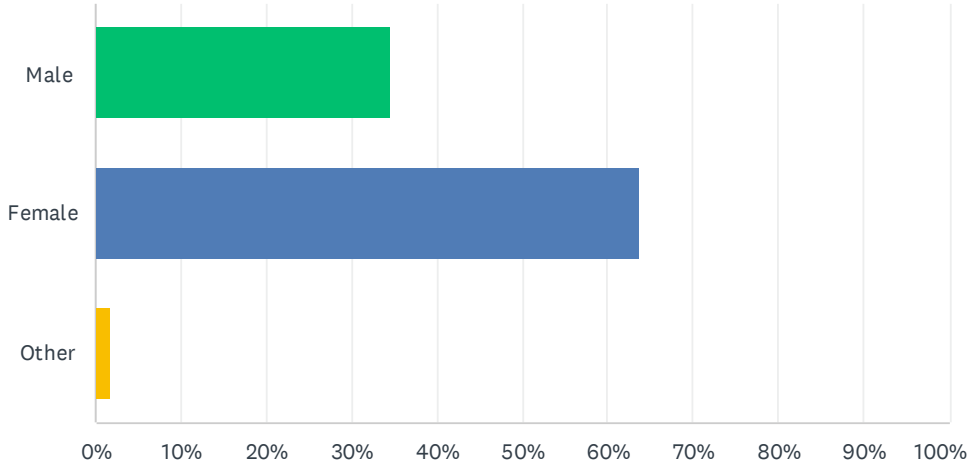
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Under 18	6.90%	4
18-24	1.72%	1
25-34	1.72%	1
35-44	5.17%	3
45-54	3.45%	2
55-64	13.79%	8
65+	67.24%	39
TOTAL		58

Q18 What is your gender?

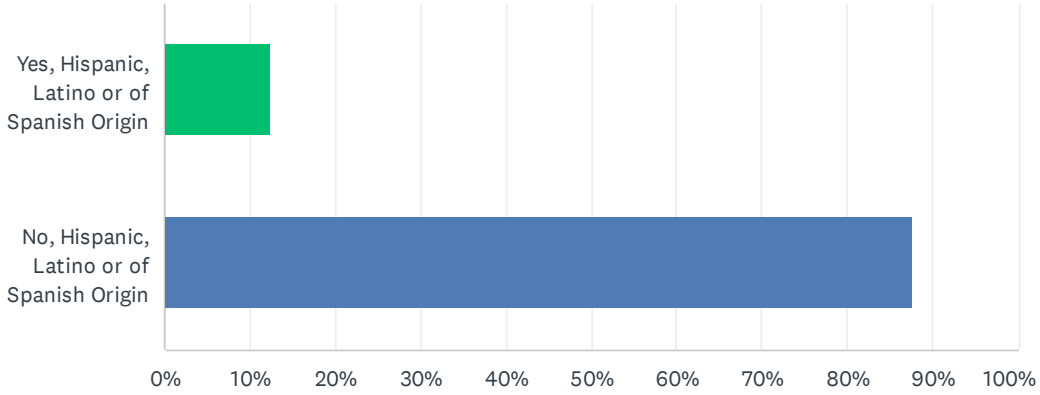
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Male	34.48%	20
Female	63.79%	37
Other	1.72%	1
TOTAL		58

Q19 Do you consider yourself Hispanic, Latino or of Spanish Origin?

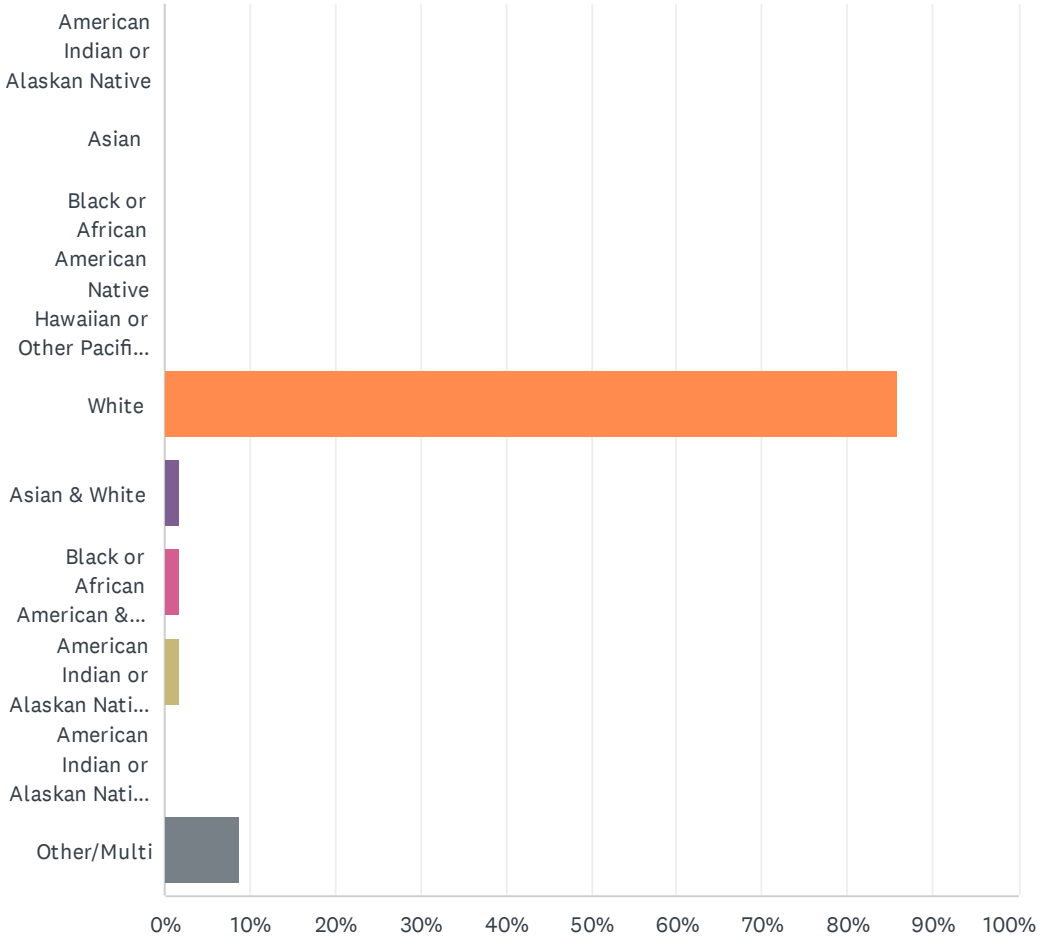
Answered: 57 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes, Hispanic, Latino or of Spanish Origin	12.28%	7
No, Hispanic, Latino or of Spanish Origin	87.72%	50
TOTAL		57

Q20 What is your race?

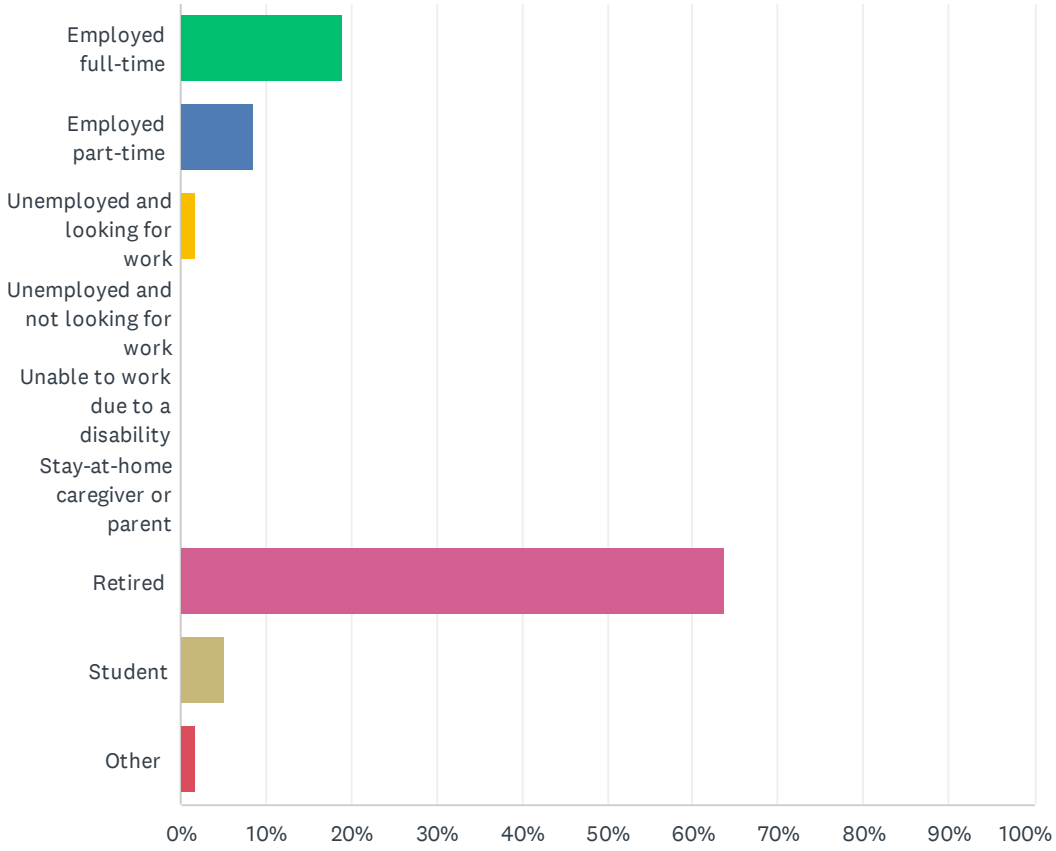
Answered: 57 Skipped: 1



ANSWER CHOICES	RESPONSES	
American Indian or Alaskan Native	0.00%	0
Asian	0.00%	0
Black or African American	0.00%	0
Native Hawaiian or Other Pacific Islander	0.00%	0
White	85.96%	49
Asian & White	1.75%	1
Black or African American & White	1.75%	1
American Indian or Alaskan Native & White	1.75%	1
American Indian or Alaskan Native & Black or African American	0.00%	0
Other/Multi	8.77%	5
TOTAL		57

Q21 Which of the following describes your current status?

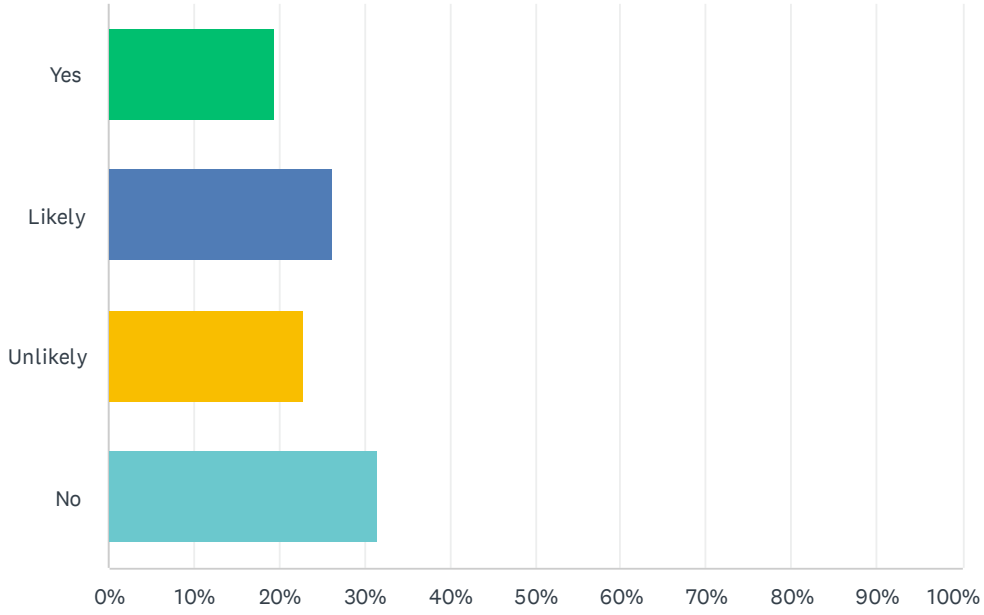
Answered: 58 Skipped: 0



ANSWER CHOICES	RESPONSES	
Employed full-time	18.97%	11
Employed part-time	8.62%	5
Unemployed and looking for work	1.72%	1
Unemployed and not looking for work	0.00%	0
Unable to work due to a disability	0.00%	0
Stay-at-home caregiver or parent	0.00%	0
Retired	63.79%	37
Student	5.17%	3
Other	1.72%	1
TOTAL		58

Q22 Do you believe housing discrimination occurs in your local area?

Answered: 57 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	19.30%	11
Likely	26.32%	15
Unlikely	22.81%	13
No	31.58%	18
TOTAL		57

Return to Agenda

TO: Mayor and City Council

FROM: Jeff Rimack, Director, Planning and Public Works (PPW)
Angie Silva, Assistant Director, PPW

THROUGH: John J. Caulfield, City Manager

DATE: March 17, 2025

SUBJECT: Introduction to Chapter 1.44 General Penalties Code Amendments

ATTACHMENTS: Attachment 1: Draft Ordinance

EXECUTIVE SUMMARY

The purpose of the proposed code amendments is to provide a holistic approach for code enforcement activities that are applicable to the entirety of the Lakewood Municipal Code (LMC).

The proposed amendments are intended to set standardized procedures for notices, stop work orders and penalties for continued violations.

BACKGROUND

The intent of local municipal enforcement and noncompliance code provisions is to ensure the public's health, safety and welfare. Within the city, code compliance and enforcement occur largely in two city programs:

- **Police Department Community Safety Resource Team (CSRT).** This includes violations without permits, nuisance properties, dangerous buildings, homelessness issues and much more
- **PPW Inspections.** Focused on construction permits issued but activities inconsistent with approved conditions of approval, etc.

Under the current LMC, enforcement mechanisms are sprinkled throughout and include:

- LMC Chapter 1.44 general penalties
- LMC 8.16.010 Nuisances affecting public health
- LMC 18A.20.105 Violations and enforcement
- LMC 15.05.060(N) Dangerous buildings
- LMC Chapter 12.02 Organization and enforcement

The challenge is current code is not structured as a coordinated, consistent approach, nor does it give the City a transparent enforcement path for all provisions of LMC. For example, Title 14 is critical area protections or Title 16 Shoreline Master Plan do not clearly have enforcement language.

On March 17, 2025, City Council will be provided an overview of the proposed amendments. The proposed Ordinance is tentatively scheduled for public hearing on April 7, 2025 then followed by final action.

ORDINANCE NO. XXX

AN ORDINANCE of the City Council of the City of Lakewood, Washington amending Lakewood Municipal Code Chapter 1.44 General Penalties.

WHEREAS, the intent of local municipal enforcement and noncompliance code provisions is to ensure the public's health, safety and welfare.

NOW, THEREFORE, the City Council of the City of Lakewood do ordain as follows:

Section 1. Amending Lakewood Municipal Code Chapter 1.44 entitled General Penalties to read as follows:

- 1.44.010 Code violation and enforcement.
- 1.44.020 Notice of violation.
- 1.44.030 Stop work order.
- 1.44.0~~1~~40 General civil penalty.
- 1.44.0~~2~~50 General criminal penalty.
- 1.44.0~~3~~60 Failure to respond to a civil infraction.
- 1.44.0~~4~~70 Public nuisances.

1.44.000 Code violation and enforcement.

Violation of any ordinance adopted in the City Code shall be unlawful. The City Manager or designee may enforce the Code by taking any or all of the following actions:

- issuing a notice of violation to those responsible for the violation;

- issuing a stop work order to those responsible for the violation;

- issuing a civil citation to those responsible for the violation;

- filing criminal charges against those responsible for the violation.

1.44.002 Notice of violation.

The City Manager or designee may issue a notice of violation to those responsible for Code violations.

When the City determines that any work, use, activity, or conduct is a violation of the City Code, the City Manager or designee may attempt to secure the voluntary correction of a violation by attempting to contact the person responsible for the violation, explaining the violation, and requesting correction. This may be done orally and/or in writing.

1.44.004 Stop work/cease and desist order.

The City Manager or designee may issue a stop work/cease and desist order to those responsible for Code violations.

(1) Issuance. When the City determines that any work, use, activity, or conduct is a violation of the City Code and creates an imminent threat of injury to public health, safety, or welfare or will damage, or exacerbate damage already caused to, any property, the City Manager or designee may issue a stop work/cease and desist order o directing any person causing, allowing, or participating in the offending conduct to cease such use, activity or conduct immediately with the exception of erosion and sedimentation control activities as authorized by the City.

(2) Service of Order. Service of the stop work/cease and desist order shall be accomplished as set forth in LMC 8.16.060.

(3) Content. A stop work/cease and desist order shall contain the following:

(A) The name and address of the property owner;

(B) The street address, when available, or a legal description sufficient to identify the building, structure, premises or land upon or within which the violation occurred;

(C) A statement of the nature of such violation(s) including code citation;

(D) A statement detailing the action that is required to be taken within twenty-one days from the date of service of the notice of violation, unless

(1) the City has determined the violation to be hazardous at which point, the violation must be corrected immediately; or

(2) the corrective action constitutes a temporary erosion control measure at which point, such measure shall be completed as required by the City;

(E) A statement that violation of a stop work/cease and desist order may be punishable as (1) a gross misdemeanor; 2) a misdemeanor; and/or (3) a civil infraction to be assessed each and every day following the date set for correction if the violation continues; and

(F) A statement that the stop work/cease and desist order shall take effect immediately upon service and may be appealed under the procedures set forth in Chapter 1.36 LMC. During any such appeal, the stop work order shall remain in effect.

(4) Effect of a stop work/cease and desist order. When a stop work/cease and desist order has been issued, posted and/or served pursuant to this section, it is unlawful for any person to whom the order is directed or any person with actual or constructive knowledge of the order to conduct the activity or perform the work covered by the order, even if the order has been appealed, until the City has removed the copy of the order, if posted, and issued written authorization for the activity or work to be resumed.

(5) Removal of a stop work/cease and desist order. When a stop work/cease and desist order has been posted in conformity with the requirements of this chapter, removal of such order without the authorization of the City, or the hearing examiner if the matter has been heard by the hearing examiner, is unlawful and may be enforced as a separate violation of the City Code.

1.44.01~~4~~0 General civil penalty.

Unless specific penalties other than as set forth in this section are established in an ordinance of the City for a violation of that ordinance, a violation of a City ordinance is punishable by a fine of up to $500.00 for each day that a violation occurs. In any court or administrative hearing to determine whether a violation has occurred the City shall have the burden of proving by a preponderance of the evidence that a violation occurred. This section does not preempt the specific penalties set forth in ordinances of the City setting forth other penalties for violations of those ordinances. [Ord. 25 § 1, 1995.]

1.44.02~~5~~0 General criminal penalty.

For all ordinances of the City which set forth that a violation of the ordinance shall constitute a misdemeanor, upon conviction an offender shall be punished by imprisonment in the County or City Jail for a period up to 90 days and a fine of up to $1,000, or by both such fine and imprisonment. For all ordinances of the City which set forth that a violation of the ordinance shall constitute a gross misdemeanor, upon conviction an offender shall be punished by imprisonment in the County or City Jail for a period up to one year and a fine of up to $5,000, or by both such fine and imprisonment. In addition, a defendant may be assessed court costs, jury fees and such other

fees or costs as may be authorized in statute or Court Rules. In any court proceeding to enforce this section, the City shall have the burden of proving by evidence beyond a reasonable doubt that a violation occurred. In a proceeding under this section a defendant shall be accorded each and every right protected under the Constitutions of the United States of America and the state of Washington, all applicable federal, state and local laws, and applicable Court Rules promulgated by the Washington Supreme Court and the inferior courts under the authority of the Washington Supreme Court. [Ord. 25 § 2, 1995.]

1.44.0360 Failure to respond to a civil infraction.

It shall be a misdemeanor to fail to respond to a notice of civil infraction issued by a police officer or such other officers of the City as may be authorized to issue civil infractions. In any court proceeding to enforce this section, the City shall have the burden of proving beyond a reasonable doubt both that the violator was personally served with the notice of civil infraction and that the violator willfully failed to respond to the infraction by either appearing in court as directed or by paying the fine for the infraction. [Ord. 25 § 3, 1995.]

1.44.0470 Public nuisances.

A. Any condition which constitutes a public nuisance, as defined by the statutes of the state of Washington, or which has been declared a public nuisance or a health and/or safety hazard under any section of the LMC, may be abated by the City, as provided in Chapter 7.48 RCW.

B. Any person who causes, maintains, or allows the continuation of any nuisance shall be deemed guilty of a misdemeanor, which shall be punishable as provided in Chapter 9.66 RCW. [Ord. 264 § 2, 2001.]

Section 2. Corrections. The City Clerk and the codifiers of this Ordinance are authorized to make necessary clerical corrections to this Ordinance including, but not limited to, the correction of scrivener's/clerical errors, references, ordinance numbering, section or subsection numbers and any references thereto.

Section 3. Severability. If any portion of this Ordinance or its application to any person or circumstances is held invalid, the remainder of the Ordinance or the application of the provision to other persons or circumstances shall not be affected.

Section 4. Effective Date. Effective Date. That this Ordinance shall be in

full force and effect thirty (30) days after publication of the Ordinance Summary.

ADOPTED by the City Council this 7th day of April, 2025.

CITY OF LAKEWOOD

Attest: _____
Jason Whalen, Mayor

_____
Briana Schumacher, City Clerk

Approved as to Form:

_____
Heidi Ann Wachter, City Attorney

Return to Agenda

TO: Mayor and City Council

FROM: Jeff Rimack, Planning and Public Works Director
Weston Ott, P.E. City Engineer

THROUGH: John Caulfield, City Manager

DATE: March 17, 2025

SUBJECT: Review of Waughop Lake Treatment Status

ATTACHMENTS: Final Data Report for Waughop Lake and Power Point Presentation

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Summary: Waughop Lake was treated in 2020 and 2023 with drinking water treatment grade Alum to reduce phosphorus concentrations and mitigate toxic algal blooms. The Washington Department of Ecology permit required monitoring and testing of the lake. This work has been completed, and a summary report of the testing data has been compiled. Following the alum treatments, Waughop Lake has not experienced a toxic algae bloom for the first time in over a decade. Additionally, minimal detections of cyanotoxins since treatment have been well below the state recreation guidelines.

Background: Waughop Lake is a small shallow lake located in the City of Lakewood, in Fort Steilacoom Park and is used for fishing, bird watching, and model boat racing. The mile long asphalt walking path around the lake is heavily used by hikers, joggers and dog walkers. Waughop Lake has a long history of toxic cyanobacteria blooms, also referred to as harmful algae blooms (HABs), and deteriorated water quality due to decades of poor waste management practices. These practices included manure and other agricultural wastes being discharged into the lake during 1900 – 1965. These discharges lead to the buildup of loose, nutrient rich sediments that have fueled nuisance algae growth and toxic cyanobacteria blooms. Health advisories issued by the Tacoma-Pierce County Health Department were common for Waughop Lake between 2008 and 2018.

In 2014, the City received a grant from the Washington State Department of Ecology (Ecology) to develop a lake management plan. The goal of the management plan was to develop strategies to improve and protect the beneficial lake uses impaired by excess nutrients and toxic cyanobacteria. The lake management plan included a phased approach for implementation of management activities including:

- Phase 1 - Conduct a whole-lake aluminum sulfate (alum) treatment to remove phosphorus from the water column and inactivate phosphorus in the sediments; and

- Phase 2 - Dredge the lake to remove phosphorus-rich bottom sediments. The City explored the feasibility of dredging the lake, and briefly evaluated aeration and vertical-mixing systems to reduce phosphorus release from bottom sediments and disrupt toxic cyanobacteria growth. The City decided to move forward with the implementation of a whole-lake alum treatment due to its proven success in WA (i.e. Green Lake, Lake Ketchum, Lake Stevens), cost-effectiveness, and adaptability.

In early 2019, Tetra Tech calculated the alum treatment dose for Waughop Lake based on sediment data obtained from the University of Puget Sound and water column phosphorus data available for the lake. Working with the City, Tetra Tech developed a range of alum dosing alternatives and application strategies to be considered given the relative risks of obtaining the water quality goals for the lake relative to the reduction of harmful algae bloom events and maintaining public safety. The aluminum application dose and application strategy that was recommended was a treatment dose of 120 mg Al/L applied over the course of three separate application events. This strategy of phased application was to allow the lake sediments to consolidate from their very fluid state and maximize the effectiveness of the treatment. This strategy also allowed for adaptive management based on results from on-going water quality monitoring efforts.

In 2020, two whole-lake alum treatments, buffered with sodium aluminate, were conducted – an early-season treatment from March 24th to March 25th, and a second application from July 14th to July 16th. A third whole-lake alum treatment, also buffered with sodium aluminate, was conducted on June 28th and 29th, 2023. The alum treatment in June 2023 had a dose of 20 mg Al/L applied to the whole lake.

The 2020 and 2023 alum treatments dramatically reduced phosphorus availability in Waughop Lake and prevented the occurrence of a toxic algae bloom in 2020, 2021, 2023 and 2024, even with elevated chlorophyll concentrations (the amount of algae in the lake) in late 2023 and throughout 2024. Following the alum treatments, Waughop Lake has not experienced a toxic algae bloom for the first time in over a decade and detections of cyanotoxins have been below the state recreation guidelines.

The alum treatments have been effective in reducing phosphorus concentrations and subsequent cyanobacteria blooms, providing a safer lake environment for the community.

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Waughop Lake Update

Treatment and testing status

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Background and Goal

- 33 acres, shallow glacial kettle lake
- Mean depth = 2.1 m (7 ft)
- No natural surface water inflows or outflows
- Connected to shallow groundwater system
- **Council goal**
  - **Prevention of toxic algal blooms**

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Water Quality History

- Water quality problems likely began more than 100 years ago, Manure and Agriculture waste discharged to lake 1900 – 1965.
- First recorded algal bloom was in 1973
- In 1978, Pierce County Parks Department commissioned study to evaluate treatment options
- In 2014, City received Ecology grant to develop lake management plan (LMP)
- Recommended phased approach for implementing LMP
  - Alum treatment
  - Evaluate feasibility of dredging

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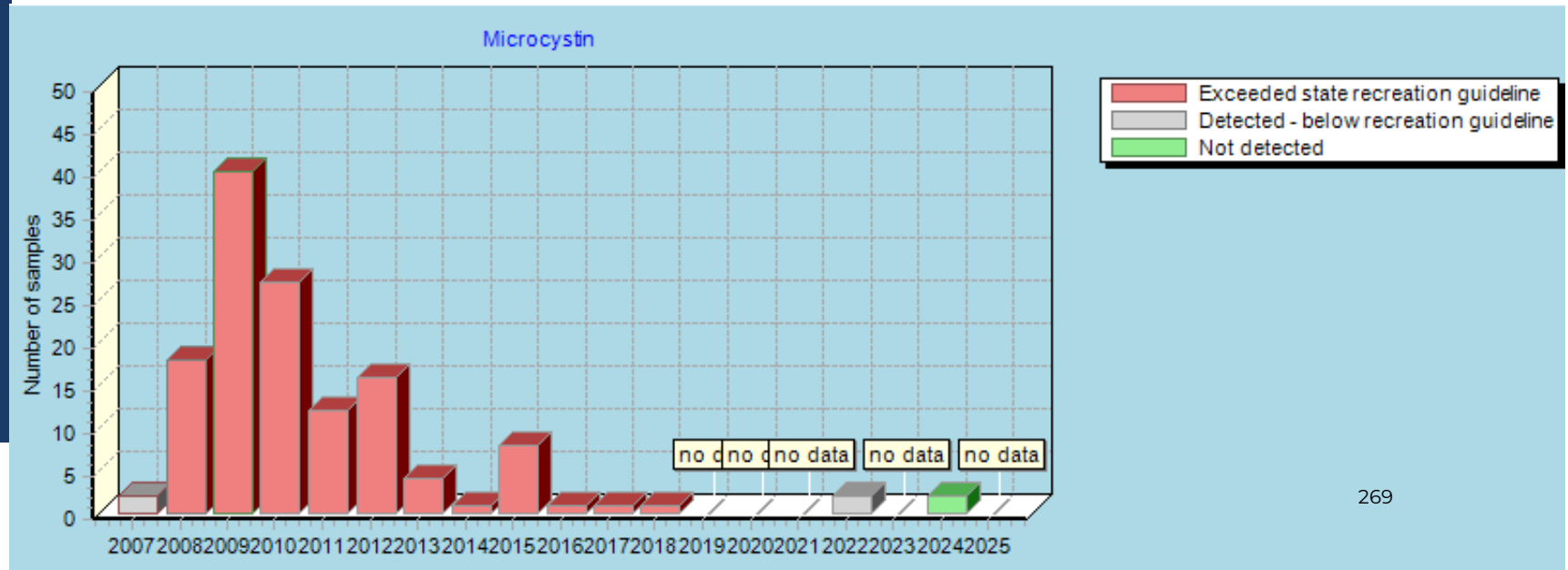
History of Toxic Algal Blooms

- 141 of 195 samples from July 2007 to September 2018 exceeded state recreation guidelines for microcystin
- Health advisories common during 10 years before treatment
  - June 2010 – advisory not to eat fish
  - 2011 – toxins so high that lake was closed to all uses



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Treatment Selection

- Dredging evaluated as potential management method
  - Major concerns over costs, estimated cost up to $35 million, sediment disposal, dewatering location, elevated levels of metals.
- Alum treatment design
  - Based on sediment data from the University of Puget Sound and confirmed with an additional core sample.
  - Calculated a 320 mg Al/L dose.
  - Recommended an adaptive phosphorous inactivation program that would rely on additional data collected post treatment.
- Recommended treatment strategies and doses
  - 40% of full dose – 120 mg Al/L, split into 3 treatments over 1.5 to 2 years (40 mg Al/L per treatment).

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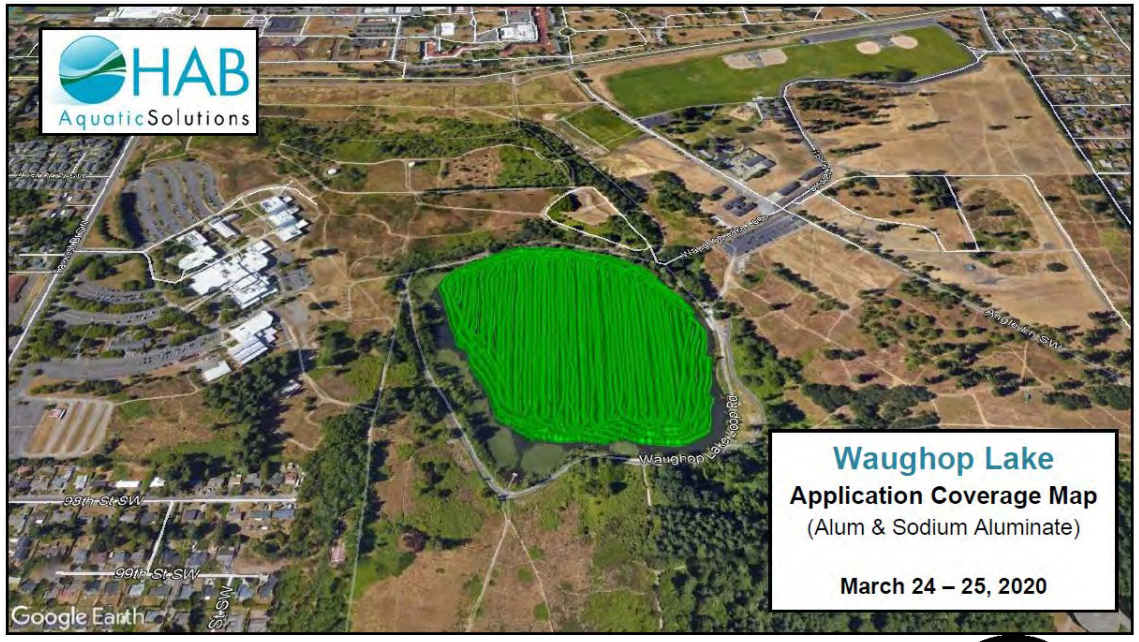
March 2020 Treatment – 40 mg Al/L



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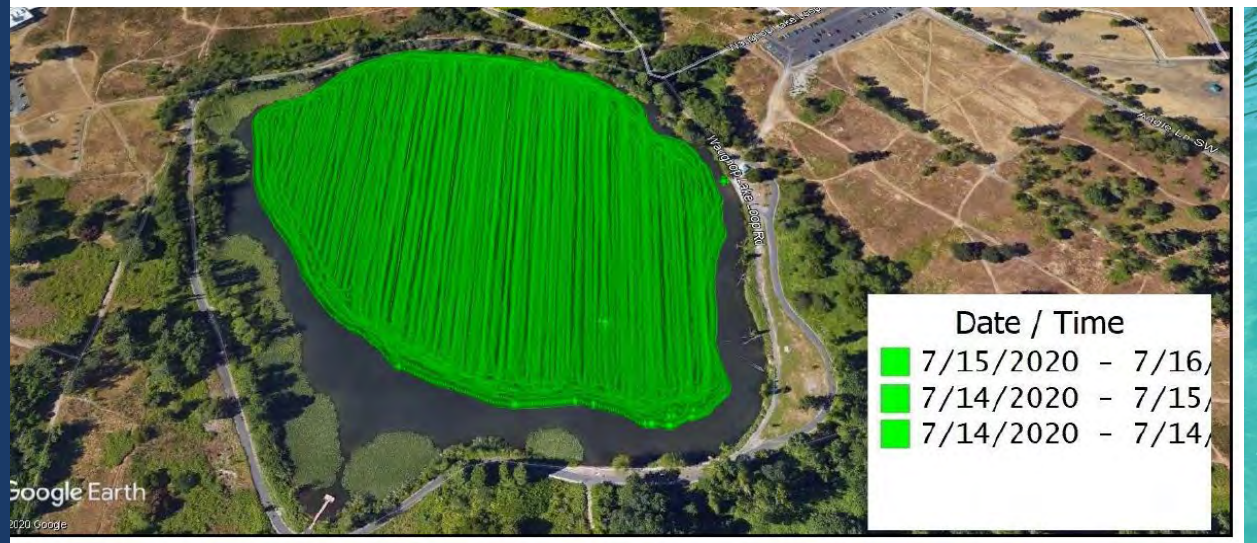
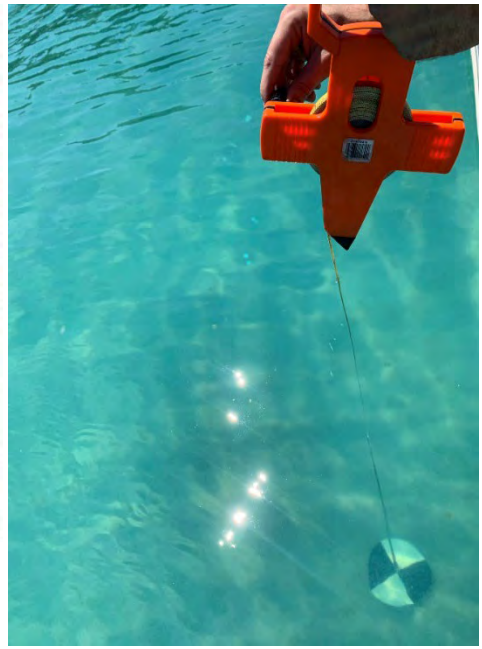
July 2020 Treatment – 40 mg Al/L





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June 2023 Treatment – 20 mg Al/L

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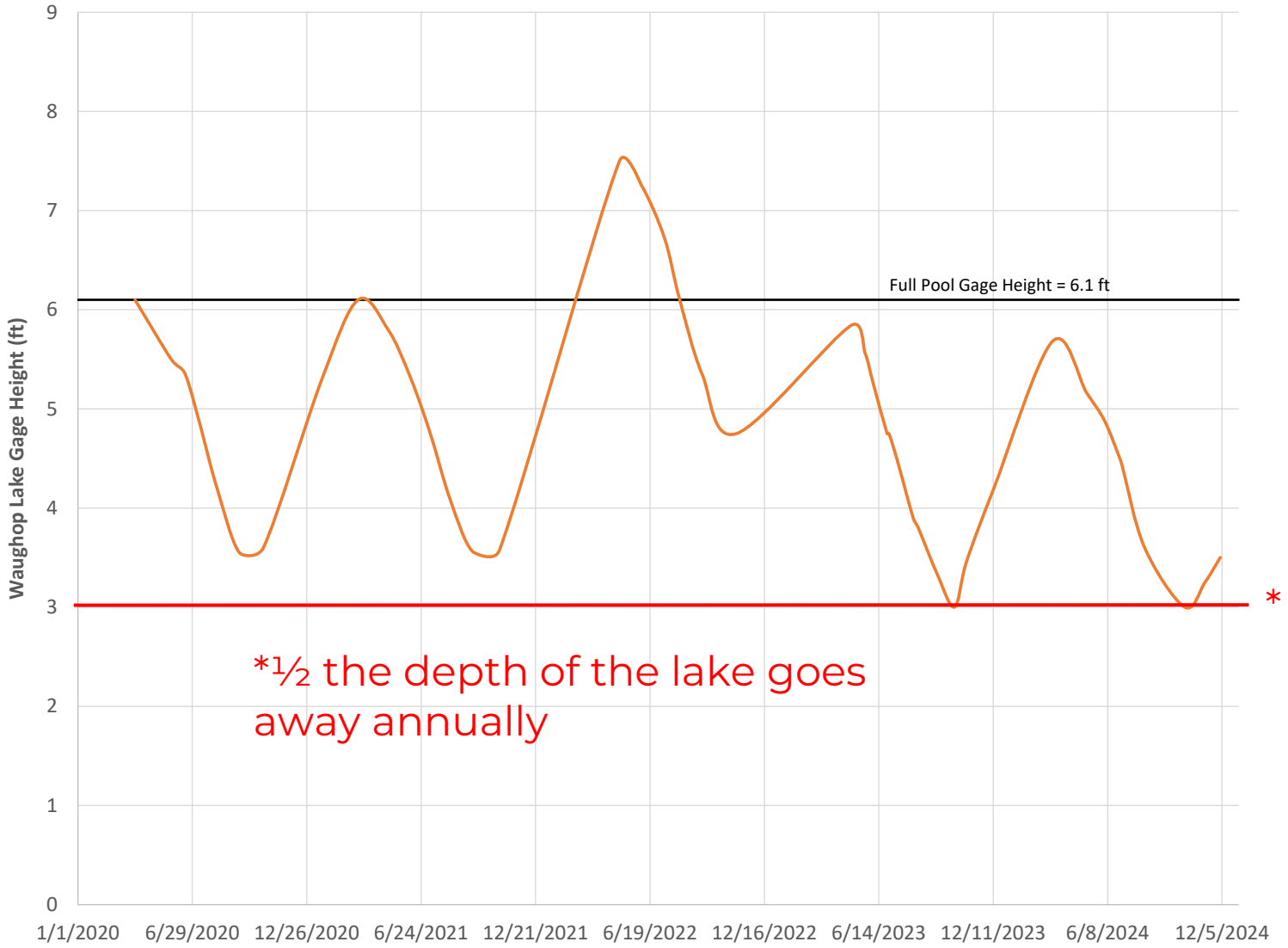
Lake Level (2020 to 2024)



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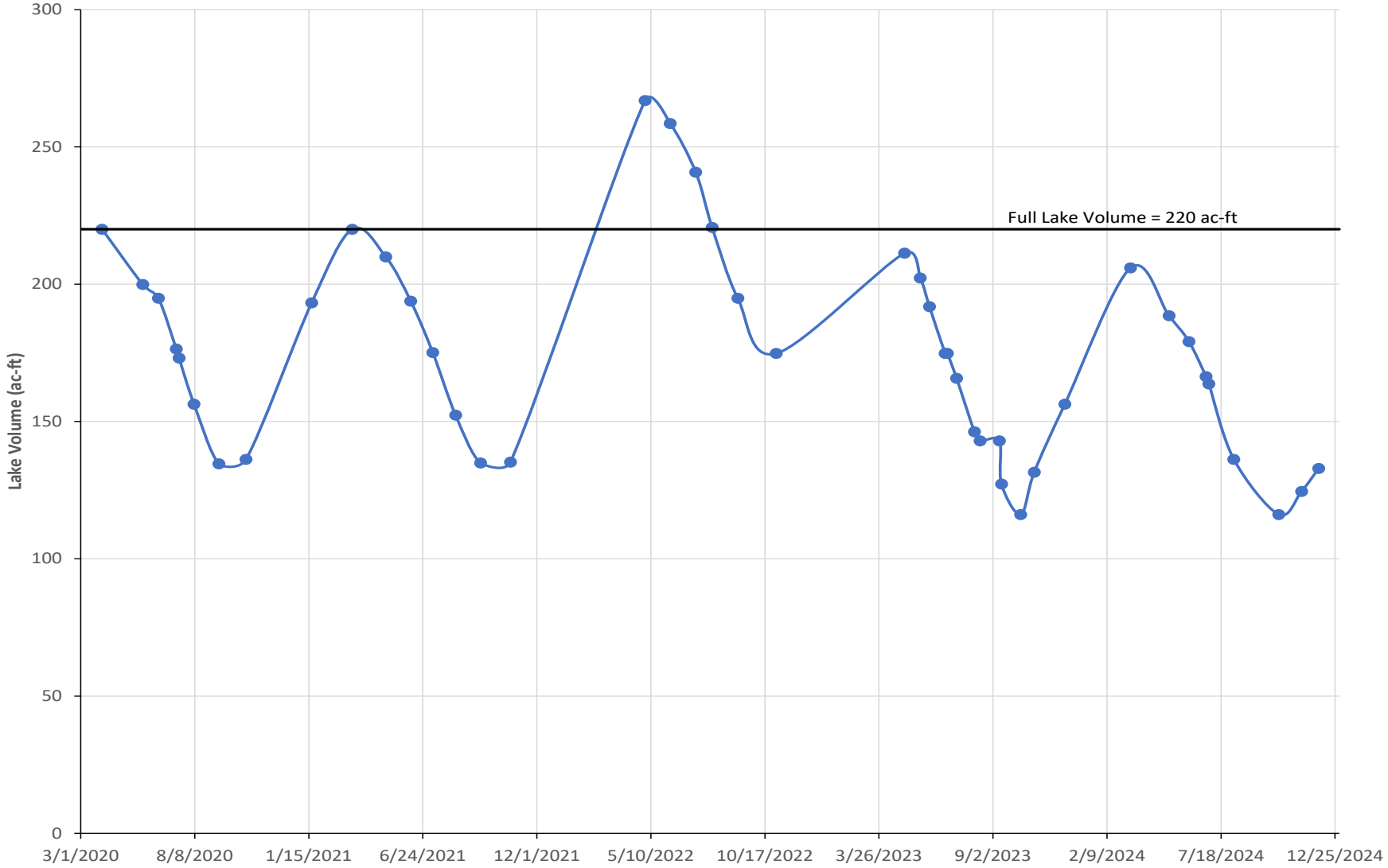
Lake Volume (2020 to 2024)



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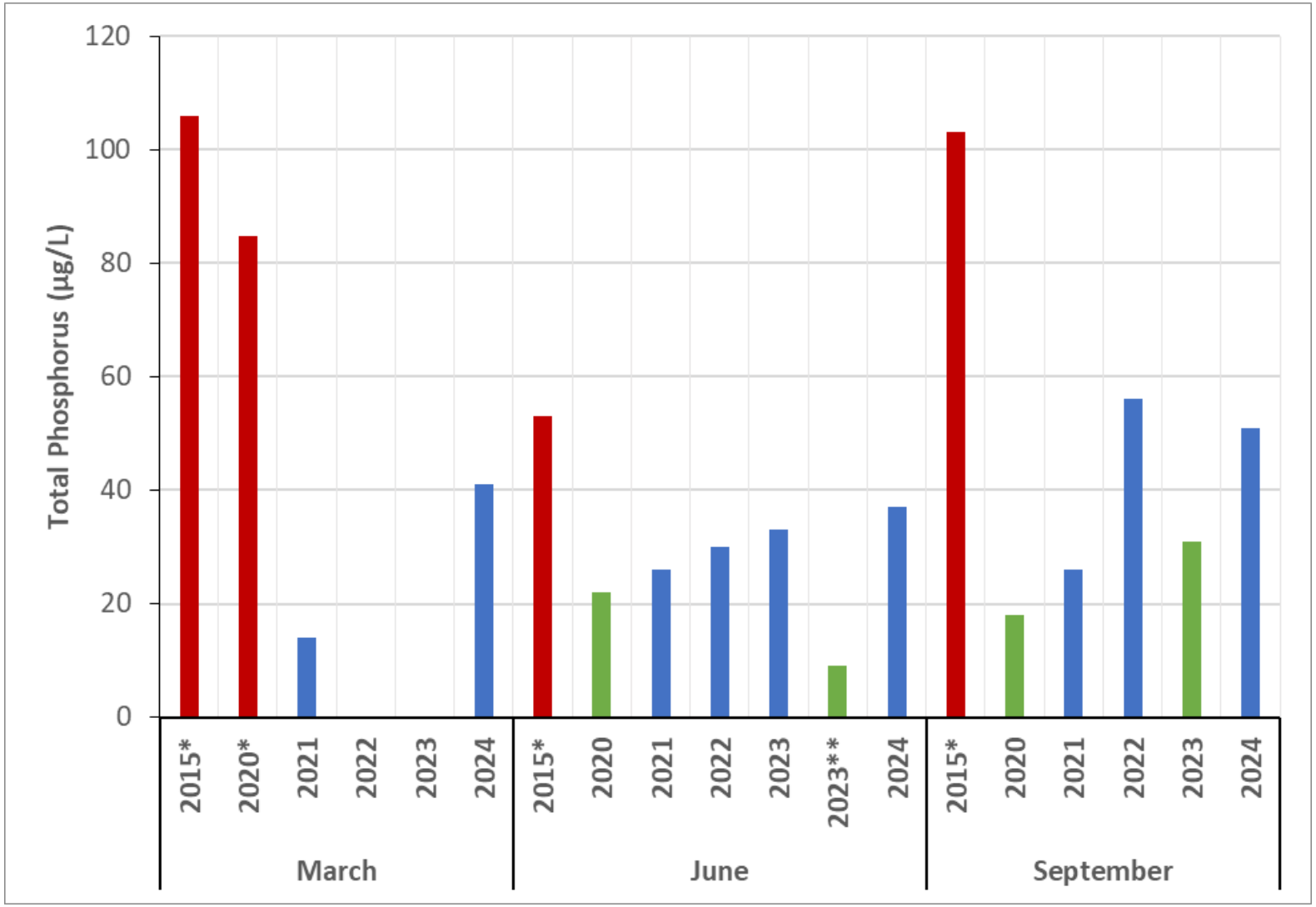
Total Phosphorus



Toxic algal blooms can occur when phosphorus concentrations reach 35 ug/l and greater.

* Data Before 2020 Alum (red)
** Data Right After Alum Treatment(green)

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Overall Treatment Results

- Alum treatments successfully completed in March and July 2020 and June 2023.
  - No application issues or short-term adverse impacts to aquatic life.
- Significant improvements in water clarity immediately following treatments.
- Dramatic reduction in phosphorus and chlorophyll following treatments.
- Increasing trend in nutrients and chlorophyll in fall/winter 2023 and summer 2024.

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Overall Treatment Results

- No toxic algal blooms since treatment initiated in 2020
- No advisories posted by health department, however permanent signs in place along the lake warning of potential for algal blooms.
- City complied with all WA Ecology permit requirements, monitoring, and testing.
- Final Data Summary Report
  - All data from 2020-2024

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Summary

- Council goal to prevent toxic algal blooms was met.
- Prior to treatment, Waughop Lake nutrients were high including the limiting nutrient phosphorus.
- Selected a treatment method within the means of the City that could be implemented.
- Three alum treatments were successfully completed.
- **No toxic blooms since treatment.**

End of Waughop Lake Update Presentation

Return to Agenda

City of Lakewood

Waughop Lake Data Summary Report

2020 – 2024

February 2025

FINAL

TETRA TECH

Waughop Lake Data Summary Report

2020 – 2024

February 2025

PRESENTED TO

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TETRA TECH

EXECUTIVE SUMMARY

Location & Background:

Waughop Lake is a small lake in Lakewood, Washington, within the popular Fort Steilacoom Park. It is used for recreational activities such as fishing, bird watching, walking and jogging. Waughop Lake has a long history of harmful algae blooms (HABs) due to nutrient-rich sediments from past agricultural waste discharges (1900-1965), leading to poor water quality and frequent health advisories.

Lake Management Plan:

In 2014, the City of Lakewood, with funding from the Washington State Department of Ecology investigated the poor water quality condition of Waughop Lake and subsequently developed a lake management plan to address the lake's water quality issues. The plan proposed two main management action for consideration that would be implemented in two phases:

1. **Aluminum Sulfate (Alum) Treatment** – To remove phosphorus from the water and inactivate phosphorus in the sediments which fuel excess algae growth and HABs.
2. **Dredging** – Dredge the lake to remove phosphorus-rich sediments. This option was considered but ultimately not pursued due to cost and feasibility concerns.

Implementation of Alum Treatments:

The City established a policy to move forward with the implementation of alum treatments aimed at reducing phosphorus and HABs, thereby improving the lake's water quality. No additional actions were included in this policy besides the alum treatments.

- In 2019, Tetra Tech designed an alum treatment strategy to remove phosphorus from the lake's water column and inactivate phosphorus in the lake sediments, thereby reducing the potential for HABs and limiting the occurrence and severity of blooms.
- Three alum treatments were conducted:
    - **2020 (March & July):** Two high-dose applications (40 mg Al/L each, total 80 mg Al/L)
    - **2023 (June):** A third treatment at a lower dose (20 mg Al/L) based on water quality monitoring data.

Results & Findings:

Execution of the plan has led to effective management of HABs in Waughop Lake as the City's policy intended. The following area a summary of the results of the alum treatments that were implemented.

- **Effective Phosphorus Reduction:** The alum treatments significantly lowered phosphorus levels in the lake and subsequently reduced toxic algae blooms.
- **Harmful Algae Bloom Control:** No toxic algae blooms occurred in 2020, 2021, 2023 or 2024, a first in over a decade.
- **Cyanotoxin Reduction:** Only one low-level microcystin detection occurred in Waughop Lake, in 2022, and the concentration of microcystin was well below state recreational guidelines.
- **Challenges:** Despite improvements, external phosphorus loading (from groundwater or stormwater) and drastic lake level fluctuations during the summers contribute to additional nutrient issues.

- **Sustainability:** Water quality benefits from the 2020 treatments lasted into early 2022, but the 2023 treatment had shorter-lived effects.

Future Recommendations:

- Continue **long-term water quality monitoring** to adapt management strategies in the future.
- Further **phosphorus stripping or sediment inactivation treatments** may be necessary.
- Investigate **external phosphorus sources** (groundwater/stormwater) to guide future lake management.

Overall, the alum treatments have, in accordance with City policy, successfully improved control of toxic algae blooms in Waughop Lake. Ongoing management and monitoring, however, will be needed to maintain progress.

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
Alum	Aluminum sulfate
APAM	Aquatic plant and algae management
Chl	Chlorophyll *a*
City	City of Lakewood
DA	Dissolved aluminum
DO	Dissolved oxygen
Ecology	Washington Department of Ecology
ft	feet
HABs	Harmful algal blooms
kg	kilograms
m	meter
mg/L	Milligrams per liter
mg $CaCO_3$/L	Milligrams of calcium carbonate per liter
PCD	Pierce Conservation District
SRP	Soluble reactive phosphorus
TA	Total aluminum
TN	Total nitrogen
TP	Total phosphorus
µg/L	Micrograms per liter

1.0 INTRODUCTION

This report summarizes the water quality and sediment data collected from Waughop Lake from March 2020, prior to the application of aluminum sulfate (alum), through December 2024. Data summarized in this report was collected before, during, and after the 2020 and 2023 alum applications. The water quality and sediment data summarized in this report was collected by personnel from Tetra Tech, Inc., hired by the City of Lakewood (City), as well as staff from SOLitude Lake Management (alum applicator, formerly known as HAB Aquatics) and volunteer monitors organized by the Pierce Conservation District (PCD).

2.0 BACKGROUND

Waughop Lake is a small lake (33 acres) located in the City of Lakewood, Washington, approximately 42 miles south of Seattle, WA (Figure 1). Waughop Lake is the centerpiece of the popular Fort Steilacoom Park and is used for fishing, model boat racing, kayaking, canoeing, and bird watching. The shoreline area is heavily used by hikers, joggers, and dog walkers. There is a mile long asphalt perimeter walking path around the lake.

Waughop Lake has a mean depth of 7 feet (ft) (2.1 meters [m]) and an approximate volume of 271,365 m^3. Waughop Lake sits in a basin surrounded by slopes to the north, south, and west, with open flat meadows to the east. The lake's catchment area is approximately 497 acres with contributing surface drainage area of about 217 acres. The Pierce College campus covers about 66 acres. Residential properties covering approximately 130 acres lies southwest of the lake and are served by septic systems.

No creeks or other natural surface water channels flow into the lake. Stormwater runoff from a portion of Pierce College campus is conveyed through a pipeline to the lake. There are no natural or man-made outlets to the lake and water leaves the lake via seepage and evaporation. Waughop Lake is a glacial kettle lake that appears to be in direct contact with the shallow groundwater-flow system.

Waughop Lake has a long history of toxic cyanobacteria blooms, also referred to as harmful algae blooms (HABs). Health advisories issued by the Tacoma-Pierce County Health Department have been common for Waughop Lake during the past 15 years. In June 2010, the health department issued an advisory not to eat fish from the lake and for a short period of time in 2011, cyanobacteria toxin concentrations were so high that the lake was closed to all uses. Since 2007, toxicity data have been collected and maintained by Ecology on its Washington State Toxic Algae website. Of the 195 water samples collected from Waughop Lake from July 2007 to September 2018, 141 exceeded the state recreation guideline value for microcystin (6 µg/L, recently updated to 8 µg/L).

In 2014, the City received a grant from Ecology to develop a lake management plan for Waughop Lake. The City hired the consulting firm Brown and Caldwell, as well as the University of Washington Tacoma to conduct a monitoring program and develop a lake management plan. The goal of the management plan was to develop strategies to improve and protect the beneficial lake uses impaired by excess nutrients and cyanobacteria (Brown and Caldwell, 2017). Nuisance algae growth and cyanobacteria blooms in lakes are caused by excessive nutrient loading, particularly phosphorus. Phosphorus is typically the limiting nutrient for algae growth in western Washington lakes.

Waughop Lake's water quality problems likely began well over 100 years ago when the surrounding area was first used to raise livestock and grow crops for the nearby state mental hospital (Brown and Caldwell, 2017). Manure and other agricultural wastes were discharged into the lake from about 1900-1965 and likely contributed to the buildup of nutrient rich sediments (City of Lakewood, 2012; LaFontaine, 2012).

A monitoring program was conducted by University of Washington Tacoma from October 2014 – October 2015 and confirmed that phosphorus was the limiting nutrient for cyanobacteria blooms in Waughop Lake and that internal cycling of phosphorus from the enriched lake sediments to the water column was the largest source fueling cyanobacteria blooms (Brown and Caldwell, 2017). The lake management plan evaluated several potential lake management measures to reduce phosphorus and control cyanobacteria blooms. The lake management plan included a proposed phased approach for implementing the management measures outlined in the plan (Brown and Caldwell, 2017). This phased implementation approach included:

- Phase 1 which would consist of a whole-lake aluminum sulfate (alum) treatment to remove phosphorus from the water column and inactivate phosphorus in the sediments, thereby reducing the potential for cyanobacteria blooms. Phase 1 also included monitoring by the City to evaluate the effectiveness and longevity of the alum treatment and the collection of sediment data to refine construction cost estimates and support permit applications for dredging.
- Phase 2 would involve dredging of the lake to remove phosphorus-rich bottom sediment, provided that the City can secure the necessary funds and permits. Dredging was expected to be the most effective long-term measure for reducing phosphorus and subsequent cyanobacteria blooms but also by far the most expensive and challenging to implement.

The lake management plan also included a recommendation that the City evaluate whether a bottom aeration and vertical-mixing system would reduce phosphorus release from the bottom sediments and disrupt cyanobacteria growth in the water column.

The City explored the feasibility of dredging the lake and hired Tetra Tech, Inc. to review the information presented in the lake management plan and evaluate the feasibility of dredging to remove phosphorus-rich sediments from the lake. Tetra Tech, Inc. reviewed 4 dredging alternatives – 2 shallow dredging options and 2 deep dredging options. It was estimated that the dredging alternatives 50-year life cycle costs ranged from $7.9 to $34.5 million (in 2018 dollars) with a probability of success (phosphorus removal and HABs reduction) ranging from 20% to 90% over the 50-year period. The dredging alternative would also result in no direct use of the lake for a year or more and have significant impacts to recreation at Fort Steilacoom Park. Difficulties obtaining necessary permits for the dredging alternatives and adverse impacts to existing aquatic life were also anticipated.

Aeration and vertical-mixing systems to reduce phosphorus release from the bottom sediments and disrupt cyanobacteria growth were briefly evaluated. However, due to the shallowness of the lake, the decreasing water levels during the summer season, and the very loose bottom sediments, these systems would not have been appropriate. Waughop Lake is a shallow waterbody that mixes frequently, almost consistently, throughout the year, so aeration and/or a vertical-mixing system would not have significant changes on the current conditions in the lake.

The City decided to move forward with the implementation of a whole-lake alum treatment to inactivate sediment phosphorus and reduce phosphorus concentrations in the water column, and in 2018 hired Tetra Tech, Inc. to assist with the planning, design, and implementation of the treatment. An alum treatment was chosen due to its proven record of removing phosphorus from the lake water column and inactivating mobile phosphorus in lake sediments. A alum treatment was also determined to be cost effective and easily be adaptive based on changing lake water quality conditions. Other management alternatives, such as the dredging options, were orders of magnitude more expensive and more invasive to park visitors. While dredging was expected to be the most effective long-term measure for reducing phosphorus and HABs and may have provided a pathway to complete restoration, the City manages the lake from a public safety perspective and primary goal was to reduce the occurrence and intensity of toxic cyanobacteria blooms.

Figure 1. Map of Waughop Lake and Surrounding Area.

3.0 ALUM TREATMENT PLANNING AND DESIGN

3.1 ALUM OVERVIEW

Alum is a widely used chemical in wastewater and drinking water treatment facilities to clarify and remove impurities from water. In lakes, alum has been one of the most successfully implemented and effective in-lake treatments to reduce internal loading of phosphorus and remove phosphorus from the water column. Alum has been applied to well over 250 lakes worldwide and has been used for 50 years (Cooke et al., 2005, Brattebo et al., 2015, Huser et al., 2016).

Alum works by binding phosphorus from the water column and the sediment to aluminum. Alum is typically applied to the surface of a lake from a boat or barge equipped with nozzles or small hoses. In low-alkalinity lakes, like Waughop Lake, a buffer (sodium aluminate) is also used and simultaneously applied to the lake surface from separate nozzles or hoses. Alum and sodium aluminate are applied at a ratio that prevents major changes in lake pH during the application.

Alum hydrolyzes when it mixes with lake water and forms a white hydroxide floc that quickly settles to the lake bottom. The alum floc typically settles at a rate of 1.0 m per 6.5 minutes (Holz, James, and Barrow, 2021). As the

alum floc settles it removes soluble and particulate phosphorus from the water column through chemical binding of aluminum with phosphorus (also referred to as water column stripping). There is an immediate increase in water clarity following a properly dosed alum treatment due to the removal of algae and other particulate matter from the water column. The alum floc settles to the lake bottom and binds with sediment phosphorus in a form that is insensitive to anoxic conditions. That is, the phosphorus remains bound with aluminum even in low or zero dissolved oxygen, contrary to iron bound phosphorus. The floc condenses and settles into the lake sediments over time. As the floc settles it continues to bind phosphorus so long as binding sites are available.

Alum has been shown to be highly effective at reducing internal loading in both shallow (unstratified), as well as deep (stratified) lakes (Welch and Cooke, 1999; Cooke et al., 2005; Huser et al., 2016). The effectiveness at reducing whole-lake total phosphorus (TP) and sediment phosphorus release rate following an alum treatment averaged between 51 and 73% in six unstratified lakes and was maintained near that level to 5 to 11 years (Cooke et al., 2005). The 2004 treatment of Green Lake was still effective after 11 years (Welch et al., 2017).

Alum was used in Lake Ketchum (Snohomish County, WA) to successfully inactivate sediment phosphorus and eliminate internal phosphorus loading from lake sediments that were enriched by a legacy of inputs and runoff from a former dairy farm (Brattebo et al., 2017; Brattebo et al., 2024). The elimination of internal phosphorus loading lead to a reduction in toxic algae blooms, improved lake water quality, and restoration of both habitat and recreational activities. Small annual alum treatments began in 2016 at Lake Ketchum and have continued each year since, with the latest treatment occurring in March 2024. The goal of the small annual treatments is to neutralize the large inflow of phosphorus from the lake inlet that enters the lake each year with winter precipitation. The small annual alum treatments have consistently removed phosphorus from the Lake Ketchum water column each spring and prevented the occurrence of toxic cyanobacteria blooms (Figure 2). Alum is also used annually at Lake Oswego, Oregon, both to intercept and remove phosphorus from the inflow and to reduce phosphorus within the water column and reduce internal phosphorus loading (Rosenkranz, 2024).

Figure 2. Lake Ketchum Photographs Before and After Restoration.

3.2 ALUM TREAMENT DOSE DETERMINATION AND APPLICATION STRATEGY

In early 2019, Tetra Tech calculated the alum treatment dose for Waughop Lake based on sediment data obtained from the University of Puget Sound (Peterson, 2016) and the limited water column phosphorus data available for the lake. Working with the City, Tetra Tech developed a range of alum dosing alternatives and application strategies to be considered given the relative risks of obtaining the water quality goals for the lake

relative to the reduction of HAB events. The uncertainties at the time were based on a number of unknowns and uncontrollable conditions, such as groundwater phosphorus loading, lake recharge, and the reliability of the data collected to date.

Based on the limited sediment and lake data available at the time, the estimated phosphorus inactivation and water column stripping dose for Waughop Lake was 320 mg Al/L. That estimated dose was 8 to 16 times greater than the common dose used with the Puget Sound lakes region. The dose was based on the concentration of mobile phosphorus (loosely sorbed phosphorus and iron bound phosphorus) and one third of the concentration of biogenic phosphorus in the top 50 cm of the sediments. According to the sediment data from the University of Puget Sound, the average mobile phosphorus concentration in the top 50 cm was 735 mg/kg and the average biogenic phosphorus concentration was 379 mg/kg. These sediment concentrations varied slightly from results obtained from a core collected right before treatment in March 2020. The average mobile phosphorus concentration in the top 30 cm of the core collected in March 2020 was lower at 410 mg/kg however the average biogenic concentration was much higher at 1,373 mg/kg (Appendix A). The calculated alum dose based on the sediment data collected in March 2020 was lower, 230 mg Al/L, compared to the original calculated dose but still much greater than common doses used in the region. The lake TP concentration was assumed to be 69 µg/L for purposes of calculating the amount of aluminum needed to strip the phosphorus from the water column. It was determined based on cost, the uncertainty of the groundwater phosphorus loading dynamics, unknowns associated with lake recharge, and the variable matrix of the sediment, that the dose calculated may be more than was needed or may still require periodic maintenance doses to inactivate future phosphorus loading. Hence the large, 320 mg Al/L or 230 mg Al/L, dose was not recommended for Waughop Lake at that time.

The application dose and application strategy that was recommended was to proceed with a treatment dose of 120 mg Al/L applied over the course of three separate application events. The recommended dose was still 3 to 6 times greater than the average lake dose for the Puget Sound region, but it was based on the high sediment phosphorus concentrations and predicted to change the dynamics of the sediments and inactivate a significant amount of sediment phosphorus. Mobile sediment phosphorus concentrations in the lake are relatively high due to past practices of discharging manure and other agricultural wastes into the lake (Brown and Caldwell, 2017). Given lake and sediment conditions prior to treatment, it was recommended that the total alum dose (120 mg Al/L) be applied to the lake in three separate applications, at a dose of 40 mg Al/L, over the course of a year. The multiple applications were recommended to allow the sediment physical characteristics to change, become slightly denser, resulting in a more stable, less fluid lake bottom.

However, given the data variability and unknowns at the time, it was also recommended that the phosphorus inactivation program at Waughop Lake be adaptive and rely on additional data collected one and two years after the initiation of alum treatments. An adaptive program would enable an informed understanding of the degree to which the physical and chemical characteristics of the lake changed due to the alum treatments and allow for modifications to treatments based on actual lake responses. Ultimately, the adaptive program resulted in only two applications being completed in 2020 with a third, smaller application occurring in 2023.

4.0 ALUM TREATMENT IMPLEMENTATION

4.1 2020 ALUM TREATMENTS

Two whole-lake alum treatments, buffered with sodium aluminate, were conducted in 2020 to remove phosphorus from the water column and to inactivate the release of phosphorus from the lake sediments to reduce algal production. An early-season treatment was conducted from March 24th to March 25th, and a second application was conducted from July 14th to July 16th. Maps of treatment coverage from the March 2020 and the July 2020 applications are provided in Figure 3 and photos during treatment are shown in Figure 4. Photos of increased

clarity in the water column following the July treatment are shown in Figure 5. Samples for water quality analysis were collected by Tetra Tech staff before and after each treatment, and in-situ monitoring of dissolved oxygen (DO), conductivity, temperature, and pH were conducted prior to, during, and after treatment.

The alum treatments in March and July of 2020 had relatively high doses of 40 mg Al/L applied to the whole lake, for a total dose of 80 mg Al/L. As stated earlier, the targeted dose was determined based on available phosphorus loading and sediment phosphorus data and was designed to inactivate sediment phosphorus and strip the water column of phosphorus. Two of the planned 40 mg Al/L doses were applied in 2020. This strategy of phased application was recommended to allow the lake sediments to consolidate from their very fluid state and maximize the effectiveness of the treatment. This strategy also allows for adaptive management based on results from on-going water quality monitoring efforts.

Immediately following each alum treatment, there was a significant increase in water clarity due to the stripping of algae and particulate matter from the water column (Figure 5). Water clarity remained clear throughout the summer of 2020 due to the dramatic reduction in phosphorus concentrations and subsequent algal production. Waughop Lake did not experience a cyanobacteria bloom in 2020. The Washington State Toxic Algae monitoring program indicates that reoccurring toxic algae blooms were observed every year on record from 2007-2018 (King County, 2018).

Figure 3. Phosphorus inactivation application coverage map for 2020 alum treatments in March (upper) and July (lower) at Waughop Lake. Both treatments in 2020 covered the whole lake within the depth capabilities of the application vessel. The difference in the green shaded area between March and July was due to much lower lake levels in July and decreased water volume.

Figure 4. Chemical distribution systems for 2020 alum treatments in March (left) and July (right) at Waughop Lake.

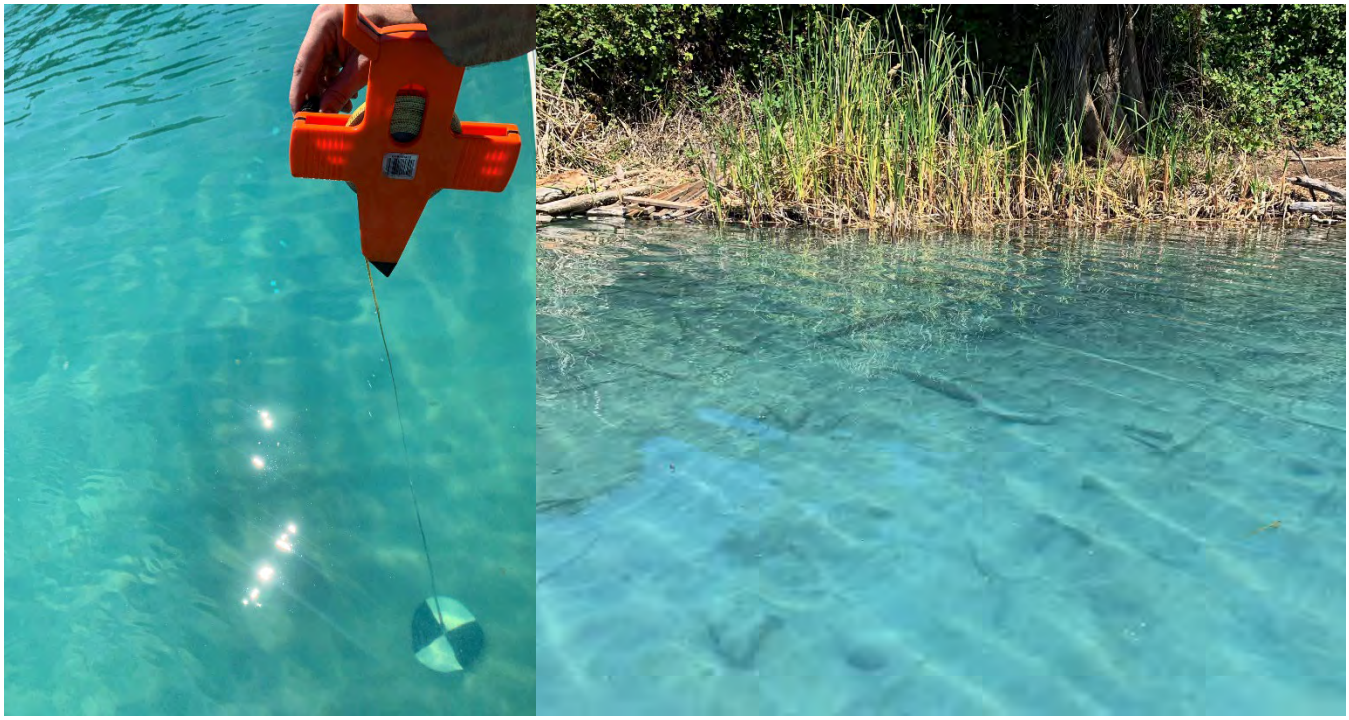

Figure 5. Water clarity to the lake bottom on July 15th, 2020 during alum treatment at Waughop Lake.

4.2 2023 ALUM TREAMENT

One whole-lake alum treatment, buffered with sodium aluminate, was conducted in 2023 to remove phosphorus from the water column and to continue to inactivate the release of phosphorus from the lake sediment to reduce algal production. The treatment was conducted on June 28th and 29th, 2023. Photos of the chemical distribution during the 2023 treatment are shown in Figures 6 and 7. A photo of increased water clarity in the water column immediately after treatment is shown in Figure 8. Samples for water quality analysis were collected by Tetra Tech staff before and after the treatment, and in-situ monitoring of dissolved oxygen (DO), conductivity, temperature, and pH were conducted prior to, during, and after treatment.

The alum treatment in June 2023 had a dose of 20 mg Al/L applied to the whole lake. The alum treatments in March and July of 2020 had relatively high doses of 40 mg Al/L each, for a total dose of 80 mg Al/L. The dose for the 2023 treatment was based on water quality data collected in 2021 and 2022. The original plan was to apply alum at a dose of 40 mg Al/L three times over the course of a year. However, based on the lake's positive response to the 2020 alum treatments, the City decided to postpone the third treatment until water quality conditions warranted an application. Total phosphorus and chlorophyll concentrations in Waughop Lake remained relatively low following the 2020 alum treatments and had begun to increase starting in the winter of 2021 and summer of 2022. Based on the increased TP, chlorophyll, and algal production the City decided to treat the lake with alum in June 2023 to reduce water column phosphorus concentrations and reduce the potential for HAB event occurrences and intensity during the summer of 2023.

A similar increase in water clarity was observed immediately following the June 2023 alum treatment. Similar to the applications in 2020, the increase in water clarity was due to the stripping of algae and particulate matter from the water column. Water clarity remained high through the summer (September 2023) before decreasing with increased algae production in October 2023. The effectiveness of the 2023 alum treatment was expected to be similar to that observed following the 2020 treatments, however, treatment effectiveness in 2023 was hindered by extreme low water levels and climatic conditions. These conditions enhanced water column mixing and phosphorus migration from lake sediments making both the phosphorus concentration and bio-availability greater, as seen with increased phosphorus concentrations in the fall and winter of 2023 (See Section 6.4).

Figure 6. Chemical distribution system for 2023 alum treatment in June at Waughop Lake.

Figure 7. Alum barge during application on second day of alum treatment in June 2023 at Waughop Lake.

Figure 8. Water clarity to the lake bottom on June 29th during alum treatment at Waughop Lake.

5.0 LAKE MONITORING

A water quality monitoring program was implemented to evaluate the short-term and long-term effects of the Waughop Lake alum treatments conducted in 2020 and 2023. The data obtained from the monitoring program was used to assess management progress relative to the reduction of HABs in Waughop Lake and to plan future lake management actions.

Tetra Tech staff conducted monthly monitoring from March through October 2020 and from May through October 2023. Additional monitoring was conducted by Tetra Tech in January and March 2021. Tetra Tech conducted quarterly monitoring following the June 2023 alum treatment in December 2023, March 2024, and June 2024. Additional in-situ monitoring was conducted before, during, and after the alum treatments in March 2020, July 2020, and June 2023. All in-situ monitoring included measurements of DO, conductivity, temperature, and pH at either one or two established monitoring station(s) (Figure 9). At the lake sites, these parameters were measured at 0.5-meter (m) intervals within the water column. Tetra Tech also recorded Secchi disk depth, or transparency, and lake water level during each monitoring event, and made observations on the weather and water conditions, as well as waterfowl and aquatic life observed at the time of sampling. Tables summarizing in-situ monitoring data collected by Tetra Tech are included in Appendix B.

In 2023, the City was also required to measure lake pH continuously during the alum treatment. Prior to the start of the alum treatment, on June 27th, Tetra Tech staff deployed a HOBO pH and temperature data logger from an old set of dock pilings near the northeast shoreline. The logger was deployed such that pH measurements were from about 0.5 m below the water surface. The logger remained in the lake and recorded pH and temperature measurements every 15 mins from shortly after noon on June 27th through 12:30 pm on June 30th.

In 2020, water samples were collected for laboratory analysis before and after each alum treatment at depths of 1 m and 1.5 m. Monthly water quality samples were collected from March through October 2020 at a depth of 1 m.

Samples collected in January and March 2021 were collected at a depth of 1 m. Samples were initially collected at two stations, but due to the small size of the lake, data did not vary significantly between the stations and the second station was eventually excluded from sampling activities. All water samples collected in 2020 were analyzed to determine total phosphorus (TP), total nitrogen (TN(), alkalinity, sulfate, and chlorophyll *a* concentrations. Select samples were also analyzed for soluble reactive phosphorus (SRP), ammonia, total aluminum (TA), dissolved aluminum, total organic carbon (TOC) and dissolved organic carbon (DOC). All laboratory data reports are included in Appendix C.

In 2023, water samples were typically collected for laboratory analysis at 1 m depth below the water surface at the mid-lake station. Samples were collected for laboratory analysis at a depth of 0.5 m above the lake bottom during the sampling events immediately before and after the June 2023 alum treatment. Water samples were analyzed to determine TP, SPR, TN, nitrate+nitrite as nitrogen (NO3+NO2), alkalinity, sulfate, TA, DOC, hardness and chlorophyll concentrations. Select samples were also analyzed for dissolved aluminum. The Washington State Department of Ecology required additional analyses for chloride, calcium, magnesium, potassium, sodium, bicarbonate, carbonate, and total sulfides before and after the June 2023 alum treatment. All laboratory data reports are included in Appendix C.

Table 1 summarizes the monitoring events conducted by Tetra Tech in 2020, 2021, 2023, and 2024.

The PCD through volunteer lake monitors also conducted monthly monitoring events at Waughop Lake from May through October 2021 – 2024. The PCD measured water column temperature, DO, shallow pH, and Secchi disk depth each month and collected water samples at 1 m depth for analysis of TP, SRP, TN, chlorophyll, and occasionally sulfate, alkalinity, and total aluminum. The laboratory data from PCD's monitoring events are included within the data analysis for this report. The annual data summary reports prepared by PCD for 2021, 2022, and 2023, as well as the laboratory data reports for 2024, are included in Appendix D.

Figure 9. Waughop Lake Monitoring Locations.

Table 1. Tetra Tech Sampling Schedule at Waughop Lake, 2020 – 2024.

Date	Sample Depth(s)	Sampling Station(s)	Notes
3/23/2020	1 m, 1.5 m	Mid-Lake, Station #2	Pre-treatment
3/26/2020	1 m, 1.5 m	Mid-Lake, Station #2	Post-treatment
4/10/2020	1 m, 1.5 m	Mid-Lake, Station #2	Monthly
5/27/2020	1 m	Mid-Lake	Monthly
6/18/2020	1 m	Mid-Lake	Monthly
7/13/2020	1 m, 1.5 m	Mid-Lake, Station #2	Pre-Treatment
7/17/2020	1 m, 1.5 m	Mid-Lake	Post-Treatment
8/7/2020	1 m	Mid-Lake	Monthly
9/11/2020	1 m	Mid-Lake	Monthly
10/19/2020	1 m	Mid-Lake	Monthly
1/19/2021	1 m	Mid-Lake	Supplemental Monthly
3/17/2021	1 m	Mid-Lake	Supplemental Monthly
5/23/2023	0.5 m	Mid-Lake	Monthly
6/27/2023	1 m, 1.8 m	Mid-Lake	Pre-Treatment
6/29/2023	0.5 m, 1 m, 1.8 m	Mid-Lake, West Shore	Post-Treatment (aluminum only)
6/30/2023	1 m, 1.8 m	Mid-Lake	Post-Treatment
7/13/2023	1 m, 1.8 m	Mid-Lake	Post-Treatment & Monthly
8/15/2023	1 m, 1.5 m (sulfides only)	Mid-Lake	Monthly
9/14/2023	1 m, 1.5 m (sulfides only)	Mid-Lake	Monthly
10/11/2023	1 m	Mid-Lake	Monthly
12/12/2023	1 m, 1.8 m (sulfides only)	Mid-Lake	Quarterly
3/13/2024	1 m, 2 m (sulfides only)	Mid-Lake	Quarterly
6/27/2024	1 m, 2 m (sulfides only)	Mid-Lake	Quarterly (one year post treatment)

6.0 LAKE MONITORING RESULTS

6.1 WATER LEVEL & LAKE VOLUME

Water level in Waughop Lake was recorded during each monitoring event based on the installed gage. The lake gage measurements showed a steady decline of water level during the summer months for all years (Figure 10). In 2020, the lake level decreased from 6.1 feet (ft) in late March to a low of 3.55 ft in September. Similarly in 2021, the lake level decreased from 6.1 ft in mid-March to a low of 3.56 ft in September.

In 2022 water levels at the lake were much higher than in 2020 and 2021 but still showed a steady decrease throughout the summer months, decreasing from a high of 7.5 ft in May 2022 to a low of 4.75 ft in November. Water levels in 2023 also decreased from a high of 5.57 ft in May to a low of 3.0 ft in mid-October. The first monitoring event in 2023 was not until May so water level during early spring of 2023 is unknown. In 2024, the lake level decreased from 5.68 ft in March to 3.0 ft in October.

The water level in Waughop Lake usually increases steadily during the winter months before declining during the summer months. However, during the summers of 2023 and 2024 water level was much lower than recorded in previous years (Figure 10). Minimum water levels in 2020, 2021, and 2022 were 3.55 ft, 3.56 ft, and 4.75 ft, respectively, 0.5 to 1.75 ft higher than in 2023 and 2024. Maximum water levels typically observed in the spring were also lower in 2023 and 2024 compared to previous years. March water level in 2024 was a half-foot lower than water levels observed in March 2020 and 2021.

A USGS groundwater monitoring test hole (site 471032122292701) is located approximately 4 miles east of Waughop Lake and has a record of field measurements of groundwater level in 2020 – 2024. A comparison of lake level in Waughop Lake and groundwater level at the USGS monitoring site indicates that there is a strong correlation between water level in Waughop Lake and local groundwater levels, as shown in Figure 10. The ground elevation at the USGS groundwater monitoring test hole is 272.76 ft NAVD88. Groundwater measurements at the test hole ranged from about 32.8 ft to 48.7 ft below ground surface during 2020 through 2024, or approximately 224.1 to 240 ft NAVD88. The elevation of the gage at Waughop Lake is unknown; however, based on LiDAR, the shoreline elevation is approximately 228 ft NAVD88. The difference in water level elevation at the two locations reflects the local groundwater flow patterns, with higher ground surface and groundwater elevations at the test hole site to the east (USGS, 2010). Unfortunately, there were only two field measurements of groundwater level at the test hole in 2023, during April and December, and only one measurement in 2024 in March, so we do not know how low the groundwater level in the test hole could have been during the summers of 2023 and 2024. Based on measurements collected in 2021, we can expect that groundwater levels during the summers of 2023 and 2024 were low.

Lake volume, which changes with decreasing and increasing water levels, was estimated using information on lake stage and corresponding change in lake storage that was included in the lake water budget summary in the lake management plan (Brown and Caldwell, 2017). The average change in lake storage, in ac-ft, per change in lake stage (ft) was estimated to be 33.5 ac-ft. It was assumed that lake volume at “full pool” was 220 ac-ft (271,365 m^3) and that “full pool” corresponded to a gage height of 6.1 ft. Using the gage height data collected by Tetra Tech personnel, as well as PCD volunteer monitors, lake volume was estimated for each sampling date (Figure 11).

Lake volume in the spring of 2020 and 2021 was at or near “full pool”, the assumed full volume of 220 ac-ft. In the spring of 2022, lake volume was well above “full poll” at about 260 ac-ft (Figure 11). Lake volume decreased over the summers of both 2020 and 2021 by about 38%. The decrease in lake volume during the summer of 2022 was slightly smaller than in previous years, decreasing by about 34% from the maximum volume observed in May of 267 ac-ft. In 2023 and 2024, lake volume did not reach “full pool” of 220 ac-ft according to the available data. In 2023, the earliest the lake level was observed was in May so the lake could have been higher earlier during the spring. Nevertheless, lake volume during the summer of 2023 decreased by 45%. In 2024, maximum lake volume occurred in March at 206 ac-ft and decreased by 44% over the summer (Figure 11). Lake volume in May 2024 was quite a bit less than lake volume in May 2023; 189 ac-ft vs. 211 ac-ft. Based on the lake level data and estimated lake volumes from 2020 through 2024, an overall trend in decreasing lake volume is apparent.

Major changes in lake volume significantly impact water quality. When lake volume decreases, nutrients, metals, salts, and other pollutants become more concentrated as there is less water to dilute them. Lower water levels and volume can also lead to increased sediment resuspension which causes turbidity, increased nutrient concentrations, and general disruption to the water column. Increased sediment resuspension can affect light penetration and in turn aquatic plant growth. Aquatic plant growth is also negatively impacted by fluctuating water levels and the resulting unstable littoral environment. Dramatic fluctuations in water level as observed in Waughop Lake can disrupt aquatic habitats and the littoral zone, affecting the distribution and abundance of plant and animal species.

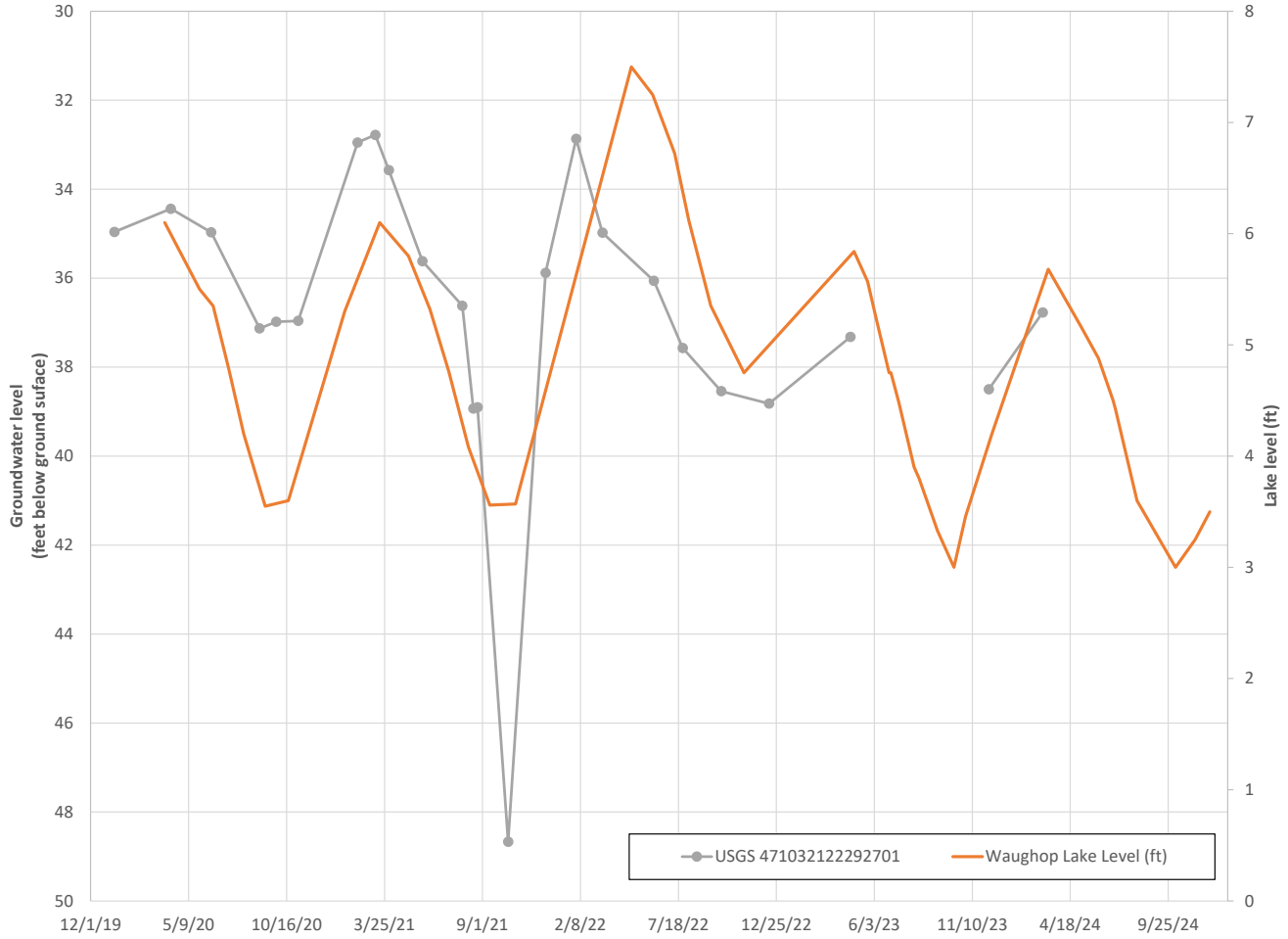

Figure 10. Water level in Waughop Lake and local groundwater level in 2020 – 2024.

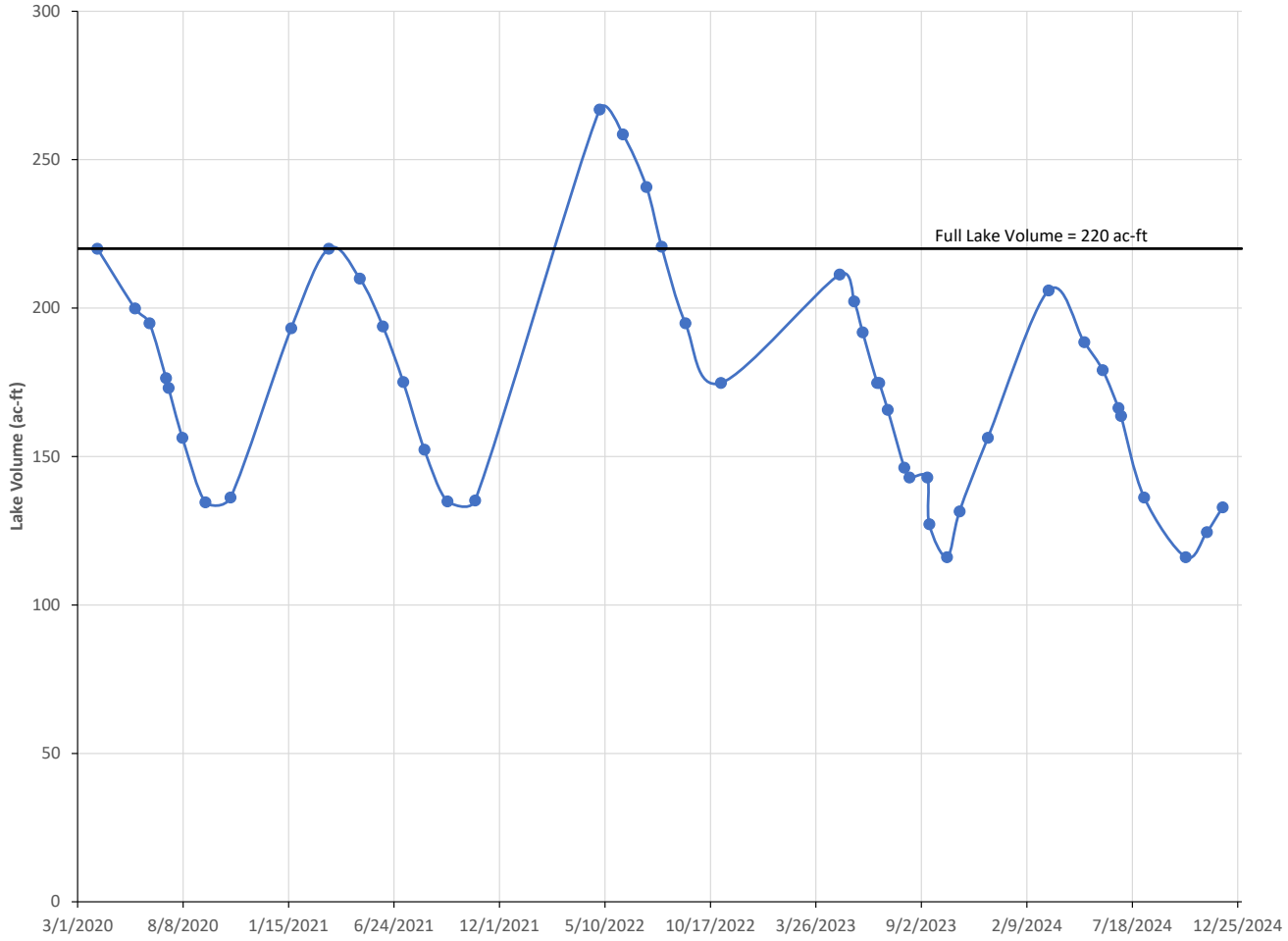

Figure 11. Estimated Waughop Lake volume in 2020 through 2024.

6.2 WATER TEMPERATURE, DISSOLVED OXYGEN, CONDUCTIVITY, AND PH

Tetra Tech collected profiles of water temperature, DO, conductivity, and pH. Measurements were recorded at 0.5-meter intervals at each station during their monitoring events in 2020, 2021, 2023, and 2024. In 2020 and January/March 2021, profiles started at the surface and ended 0.5 m above the bottom. In 2023 and 2024 profile measurements started at 0.5 m below the water surface and ending at 0.5 m above the bottom. Profile depths ranged from 1.45 to 2.5 meters deep at the mid-lake station depending on water level conditions. Due to the similarity in data across stations, profiles at the mid-lake station are considered representative of conditions at Waughop Lake and are discussed in detail below.

6.2.1 Water Temperature

Water temperatures at Waughop Lake in 2020 ranged from 9°C to 25.6°C at the mid-lake station. The warmest temperatures were observed in July while the coldest temperatures were observed in March. During the summer months (June through September), temperatures ranged from 20.1°C to 25.6°C. Temperature did not vary significantly throughout the water column, as Waughop Lake is a shallow lake that mixes frequently throughout the year (Figure 12). Water temperatures at the mid-lake station were colder in January 2021 (average 6.9°C

throughout the water column) than observed in March-October 2020. Temperatures in March 2021 were similar to those measured in March 2020, with average water temperature throughout the water column of 9.7°C versus 10.0°C, which was the average in March 2020. There was no stratification observed within the lake during the monitoring events in 2020 and 2021.

Water temperatures in May through December 2023 ranged from 7.2°C to 25.7°C at the mid-lake station. A similar range to temperatures observed in 2020. The warmest temperatures in 2023 were observed in August while the coldest temperatures were observed in December (Figure 13). During the summer months (June through September), temperatures ranged from 20.3°C to 25.7°C.

Water temperature at the mid-lake station in March 2024 averaged 7.6°C, which was colder than the average water column temperatures measured in March 2020 (10.0°C) and March 2021 (9.7°C). June 2024 water temperatures were also slightly cooler than temperatures in June 2023 (Figure 13). The average water column temperature in June 2024 was 21.4°C compared to 22.3°C in 2023. Water temperatures June 2020 however were cooler than both 2023 and 2024 with a water column average of 20.5°C.

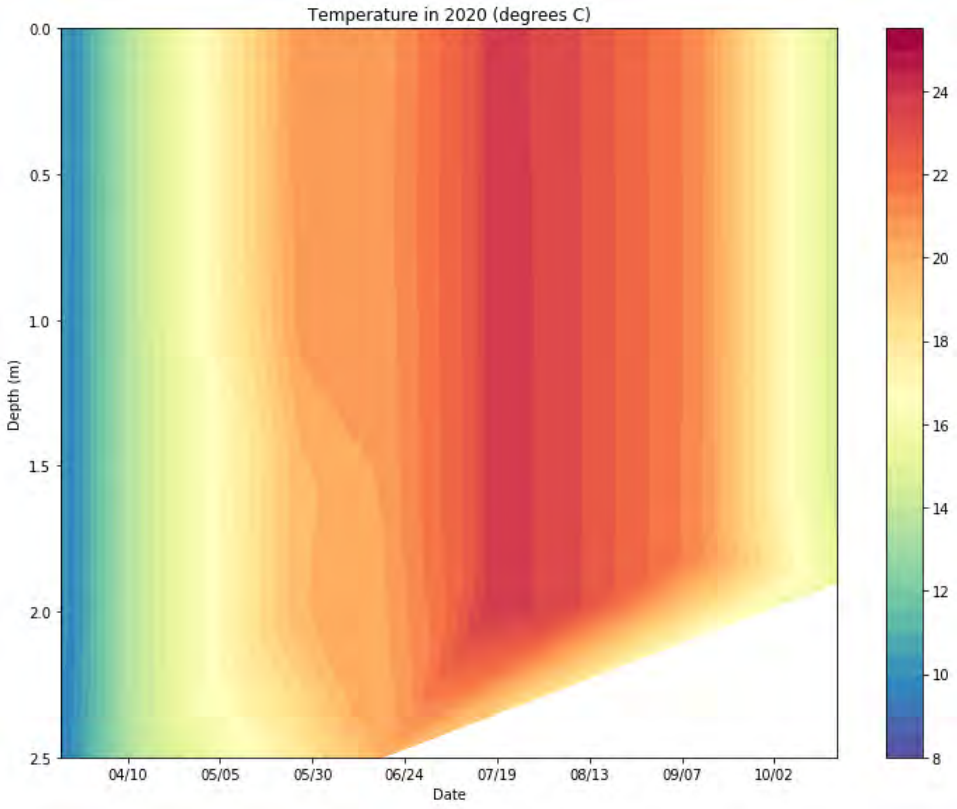

Figure 12. Water temperatures at Waughop Lake in 2020.

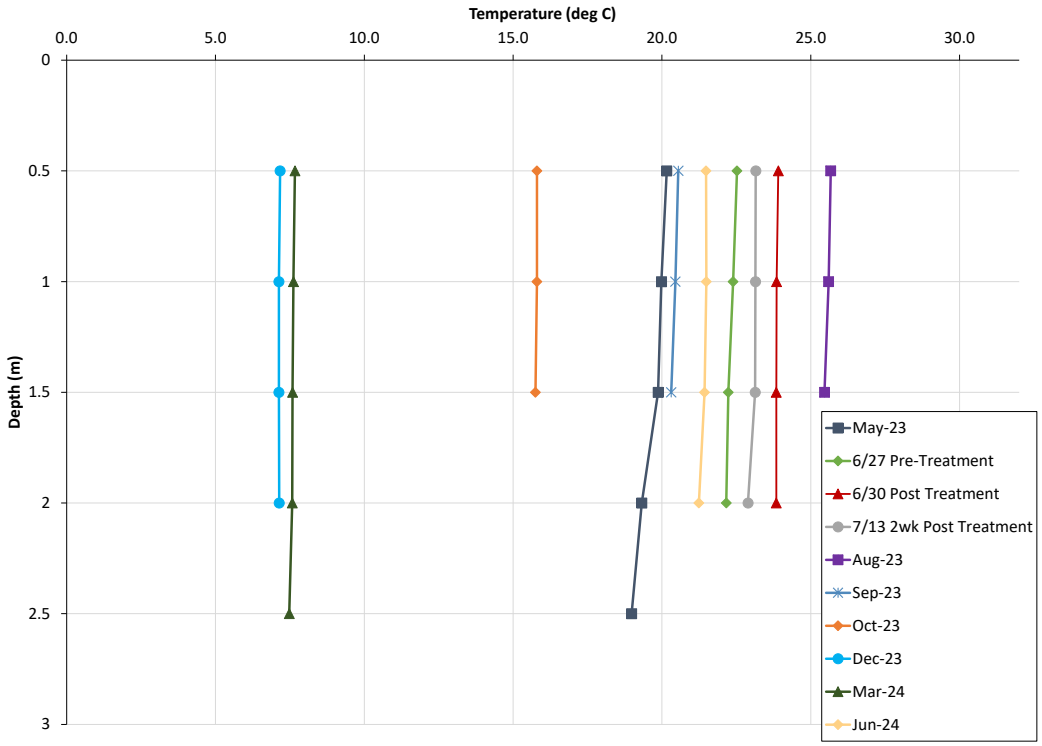

Figure 13. Water temperature profiles at Waughop Lake in 2023 and March/June 2024.

6.2.2 Dissolved Oxygen

Dissolved oxygen concentrations in 2020 and January/March 2021 ranged from 1.1 (near the bottom sediment) to 14 mg/L at the mid-lake station. Minimum DO occurred near the bottom of each profile, when the Hydrolab multi-parameter sonde was near the lake bottom. Excluding the bottom measurements, DO ranged from 7.4 to 14 mg/L, with an average of 10.7 mg/L, and did not vary significantly throughout the water column. The highest DO concentrations were observed prior to the first alum treatment in March and corresponded to maximum chlorophyll concentrations and high productivity. A decrease in DO was observed following each alum treatment. Higher DO concentrations in March and October 2020 are likely due to colder water temperatures, which increases the DO saturation level. DO concentrations in Waughop Lake during 2020 and January/March 2021 are shown in Figure 14.

Dissolved oxygen concentrations measured in 2023 and March/June 2024 ranged from 7.8 (0.5 m from the bottom) to 13.3 mg/L at the mid-lake station. Field crews did not collect DO concentrations near or within the sediment at the lake bottom in order to protect the monitoring equipment and calibration. Dissolved oxygen averaged 10.1 mg/L and did not vary significantly throughout the water column in 2023 (Figure 15). The highest DO concentrations were observed in December 2023 and March 2024 and corresponded to maximum chlorophyll concentrations and high productivity. Higher DO concentrations in December and March could also be due to colder water temperatures, which increases the DO saturation level. A decrease in DO was observed immediately following the June 2023 alum treatment but rebounded back to pre-treatment concentrations within 2 weeks post treatment.

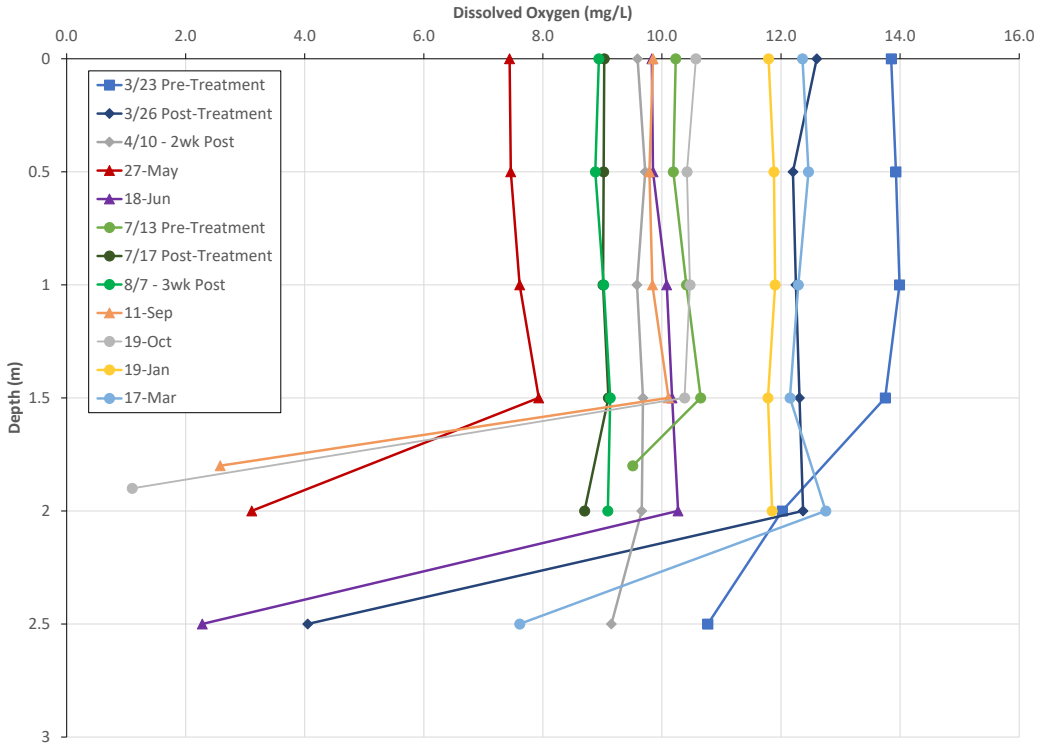

Figure 14. Dissolved oxygen profiles in Waughop Lake in 2020 and January/March 2021.

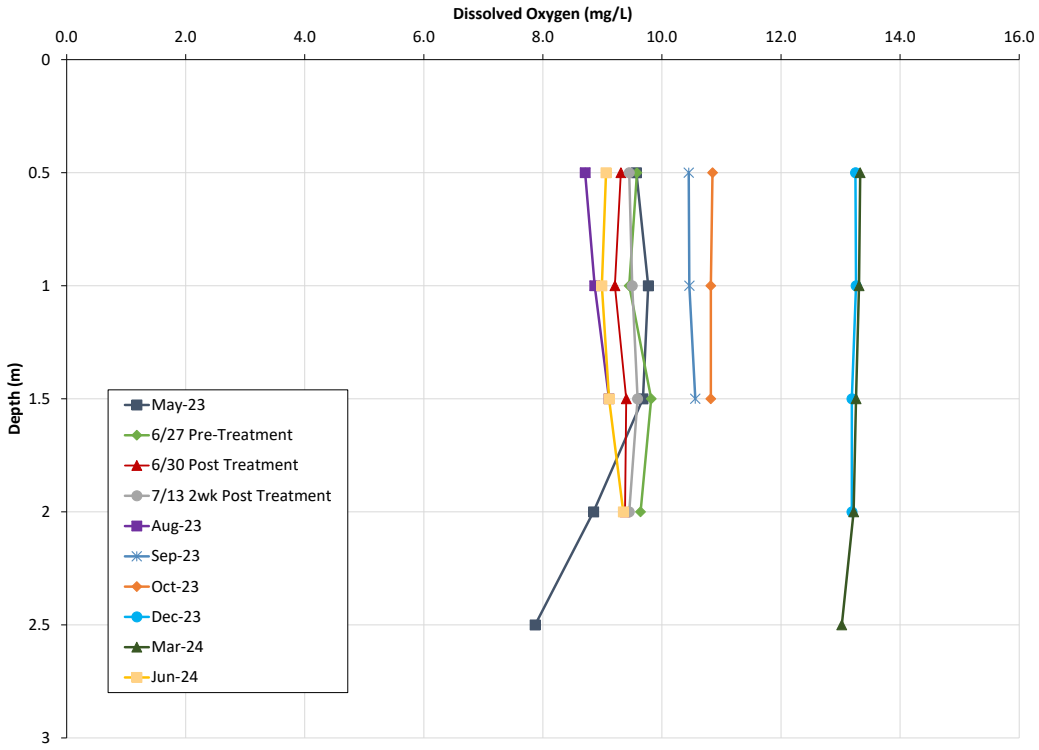

Figure 15. Dissolved oxygen profiles in Waughop Lake in 2023 and March/June 2024.

6.2.3 pH

In 2020, pH varied throughout the water column and was generally higher at the surface and lower at deeper locations. At the mid-lake station, pH ranged from 6.7 to 9.2 across all 2020 monitoring dates and January/March 2021 (Figure 16). The highest pH values were observed prior to the July alum treatment and near the surface in January 2021. There was a decrease in pH following both the March and July 2020 alum treatments, however pH values never fell below 7.0 following treatment. The higher pH values in July and January were most likely influenced by photosynthesis.

In 2023, pH also varied slightly throughout the water column and was generally higher at the surface and lower at deeper locations. At the mid-lake station, pH ranged from 7.2 to 8.8 across all 2023 and March/June 2024 monitoring dates (Figure 17). The highest pH values were observed in March 2024 and were similar to pH values measured in October 2023. The high pH values in March 2024 were likely influenced by photosynthesis as chlorophyll concentrations were at their highest measured concentration. A decrease in pH throughout the water column was observed following the June 2023 alum treatment.

pH in the lake was also monitored continuously during the June 2024 alum treatment and for 24 hours post treatment (Figure 18). pH prior to the start of the treatment was high, around 8.5. pH decreased initially after the alum treatment started the morning of June 28th, then stabilized overnight. There was another slight decrease in pH after the start of the treatment the second morning on June 29th, but then pH stabilized at around 7.1 and continued to remain stable for 24 hours following treatment (Figure 18).

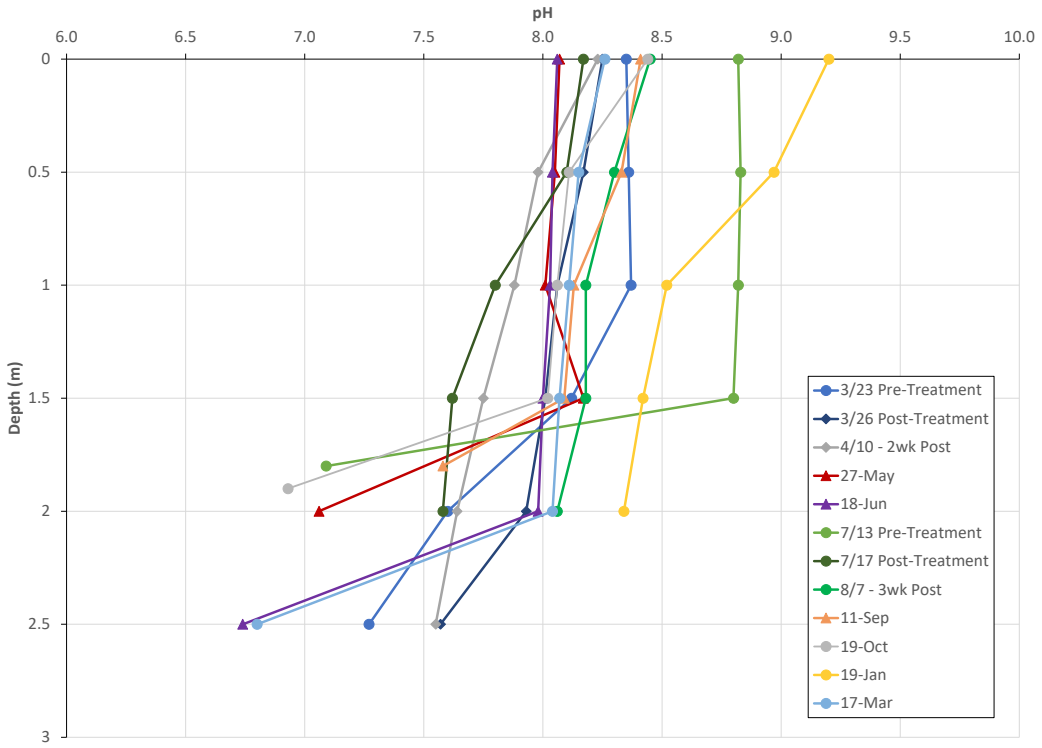

Figure 16. pH profiles in Waughop Lake in 2020 and January/March 2021.

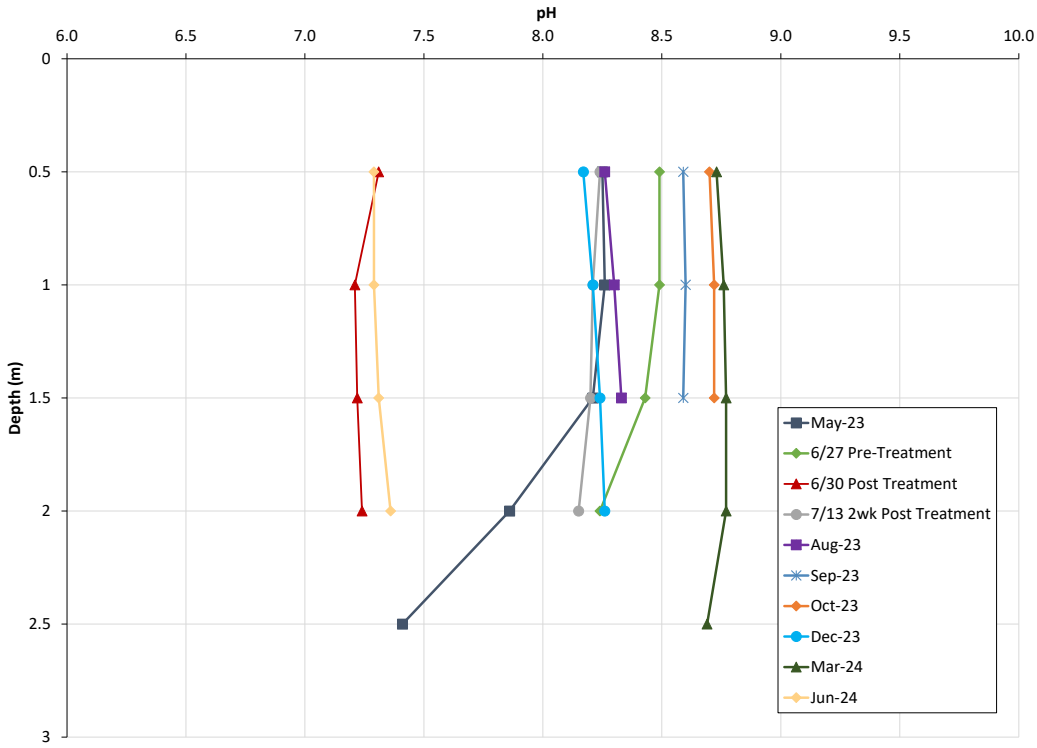

Figure 17. pH profiles in Waughop Lake in 2023 and March/June 2024.

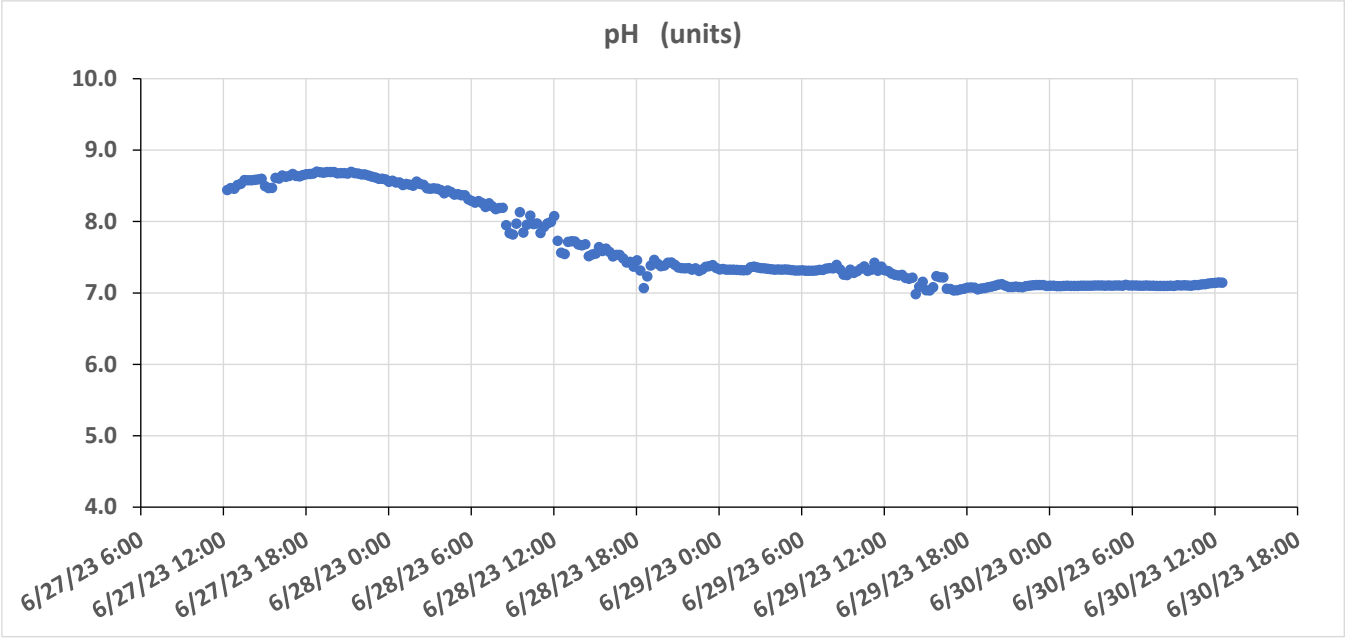

Figure 18. Continuous pH measurements in Waughop Lake during the June 2023 Alum Treatment.

6.2.4 Conductivity

In 2020 and early 2021, specific conductivity was generally uniform throughout the water column, varying only at the bottom of the profile, likely due to interaction with lake-bottom sediments. Specific conductivity varied over the course of the monitoring period and generally increased as a result of alum treatments (Figure 19).

Prior to the first 2020 alum treatment, conductivity in Waughop Lake had an average value of 46 µS/cm. One day after treatment, the average conductivity had increased to an average of 218 µS/cm and stayed in that range until the July alum treatment. After the July treatment, the average conductivity increased to an average of 494 µS/cm and reached a maximum average of 556 µS/cm in September before decreasing somewhat in October. Conductivity continued to decrease in January and March 2021 with water column averages of 317 and 307 µS/cm (Figure 19). Freshwater rivers and lakes generally have conductivity values between 50 and 1,500 µS/cm (Huron River Watershed Council, 2013).

In 2023 and 2024 specific conductivity profiles were uniform throughout the water column. Similar to conditions observed in 2020, specific conductivity varied over the course of the monitoring period and generally increased as a result of the 2023 alum treatment (Figure 20). Prior to the June 2023 alum treatment, conductivity in Waughop Lake had an average value of 153 µS/cm. This is a substantial decreased from average conductivities measured in January and March 2021. One day after the June 2023 treatment, the average conductivity had increased to an average of 286 µS/cm, similar to observed conductivities following that 2020 alum treatments. Conductivity remained higher than pre-treatment levels through June 2024, although conductivity measurements in March and June 2024 were lower than those measured in 2023. Maximum conductivity was measured in August 2023 (Figure 20).

An increase in specific conductivity was anticipated as a direct result of the alum treatments. However, the effect was prolonged due to the lack of flushing in Waughop Lake and the lowering of the water level during the summer months. The drastic water level decreases in Waughop Lake have a concentrating effect throughout the summer as lake volume decreases. Water level and lake volume decreases during the summer due to evaporation which leaves behind dissolved minerals, salts, nutrients, etc. in the water column. Therefore, the amount of minerals and salts in the lake become more concentrated within a smaller volume of water leading to higher measurements of specific conductivity. As groundwater flow increases over the winter, a reduction of specific conductivity is expected. This reduction has already been observed in the winters following the alum treatments.

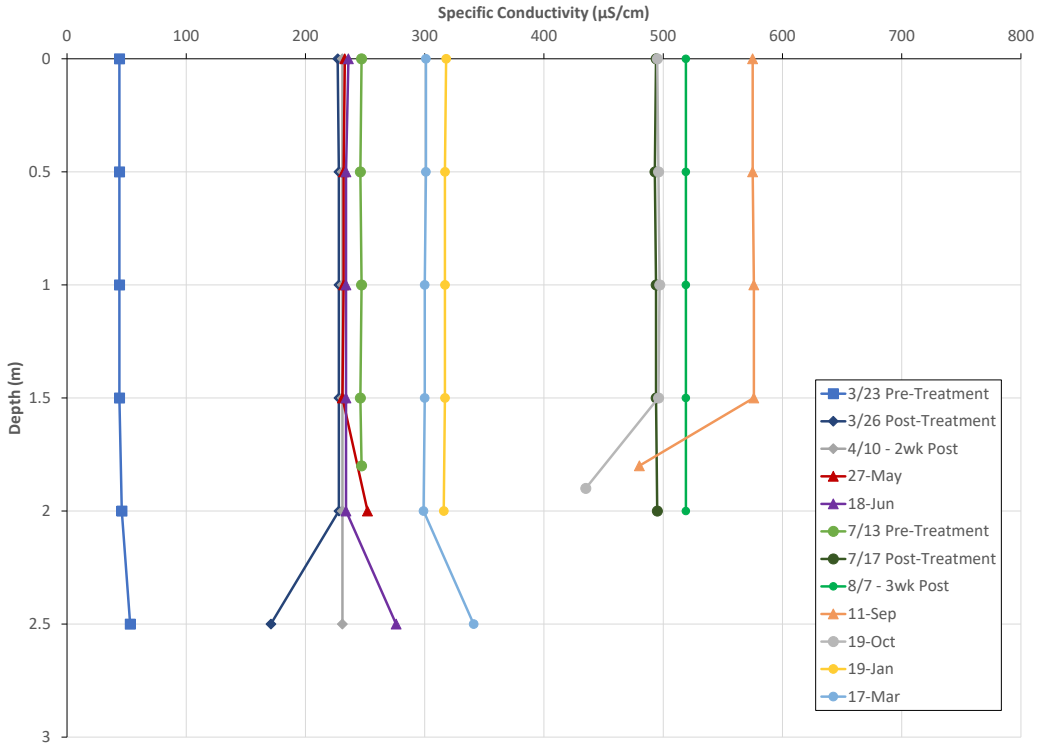

Figure 19. Conductivity profiles in Waughop Lake in 2020 and January/March 2021.

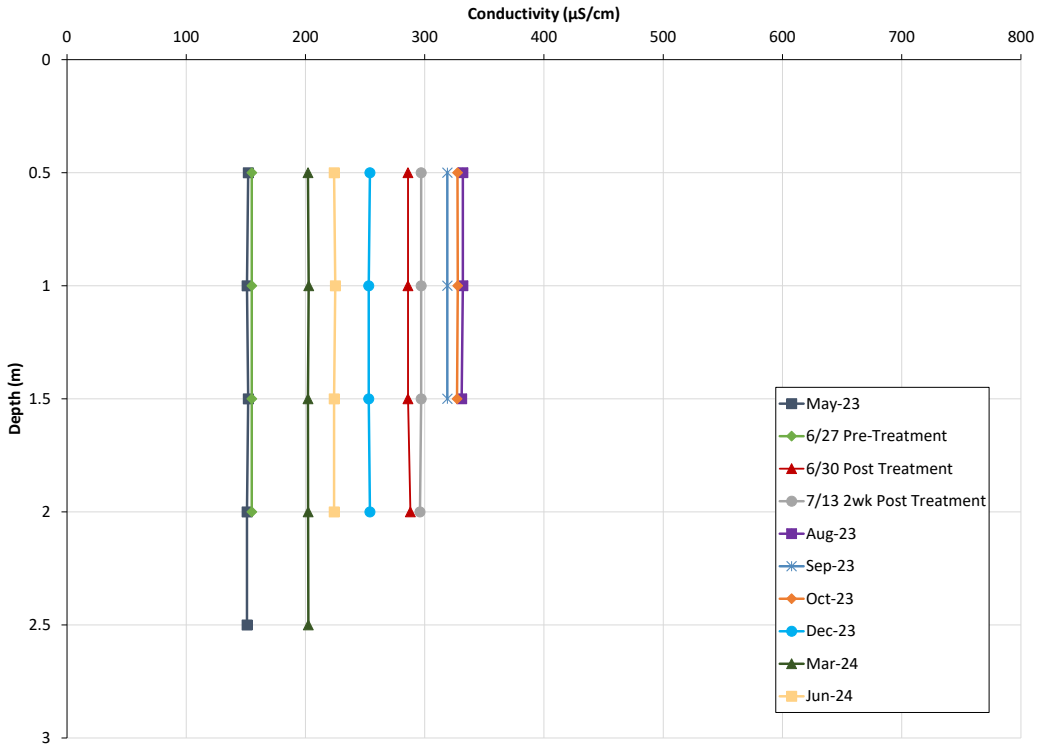

Figure 20. Conductivity profiles in Waughop Lake in 2023 and March/June 2024.

6.3 WATER CLARITY

Water clarity, or transparency, was measured with a Secchi disk during each monitoring event and numerous times during each alum treatment. Prior to the first alum treatment in March 2020, water clarity at Waughop Lake was less than 1 m at the mid-lake station. After the first day of treatment with alum, water clarity had increased to 1.7 m, and after completion of the March alum treatment, water clarity had increased such that the Secchi disk was visible at the bottom of the lake at 2.5 m depth. The high level of clarity was maintained throughout the summer of 2020 and the Secchi disk continued to be visible at the bottom of the lake. All measurements of water clarity from March 25 through October 19, 2020, were recorded at the bottom of the lake, varying between 1.45 to 2.5 m depending on location and date. Water clarity at Waughop Lake in 2020 is shown in Figure 21. The apparent decreasing trend from July to October 2020 is a representation of the decreasing lake level and does not represent a decline in water clarity. Higher levels of water clarity corresponded with lower observed chlorophyll concentrations and a reduction in algal production due to the alum treatments.

The increase in water clarity was persistent throughout 2020 and early 2021 (Figure 21). In March 2021, the Secchi disk was not visible all the way to the lake bottom for the first time since the March 2020 alum treatment. The slight decrease in water clarity observed in March 2021 is likely due to the seasonal winds and storm events resulting in some sediment mixing and resuspension, as well as spring algal activity. The lake bottom sediments are known to be very loose and observed to be easily resuspended in the water column.

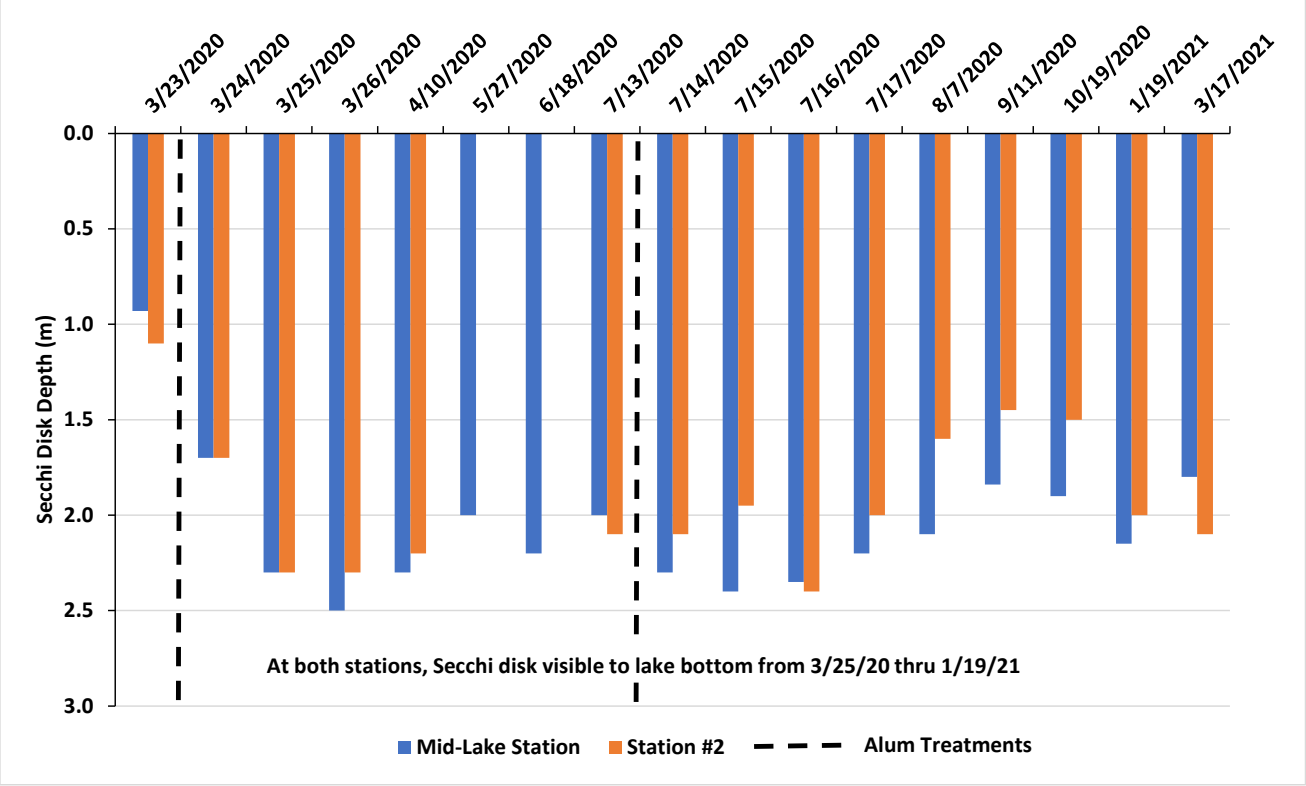

Figure 21. Secchi disk depth (water transparency) in Waughop Lake during 2020 and January/March 2021.

Water clarity in Waughop Lake during the summers of 2021 and 2022 was substantially less than in 2020 (Figure 22). May – October average Secchi disk depth was 1.2 m in 2021 and 0.92 m in 2022, compared to an average of

2.1 m in 2020. Chlorophyll concentrations were still significantly reduced from pre-treatment conditions in 2021 but increased during the summer of 2022 which most likely influenced water transparency.

Water clarity was less than 1 m deep at the mid-lake station prior to the June 2023 alum treatment (Figure 23). As was the case in 2020, after the first day of treatment with alum, water clarity had increased significantly to 2.2 m, and after completion of the treatment, water clarity had increased such that the Secchi disk was visible at the bottom of the lake (Figure 23). The high level of clarity was maintained throughout most of the summer of 2023 and the Secchi disk continued to be visible at the bottom or near the bottom of the lake through September. Average May to October Secchi disk depth for 2023 was 1.6 m. Water clarity decreased substantially in October and December 2023, with corresponding high concentrations of chlorophyll, back to less than 1 m. Water clarity remained low in March and May 2024 before increasing in early June (Figure 23). May to October average Secchi disk depth in 2024 was low compared to previously years at just 0.81 m.

There is a strong relationship between water clarity and chlorophyll concentrations and algal production in Waughop Lake. The photic zone in lakes, the zone where there is enough light for algal production, is typically around three times the Secchi disk depth. At times throughout the summer season, due to the shallowness of the lake, the majority of the water column in is in the photic zone. Higher levels of water clarity in Waughop Lake corresponded with lower observed chlorophyll concentration and a reduction in algal production following all three alum treatments. There is also a relationship between water clarity and lake water levels. In all years, there is a decrease in water clarity in the fall which is typically when the lake experiences its lowest water levels. Decreased water clarity in October 2023 corresponded with the lowest lake levels recorded and sediment resuspension, given the very shallow water depths, could have contributed to decreased clarity.

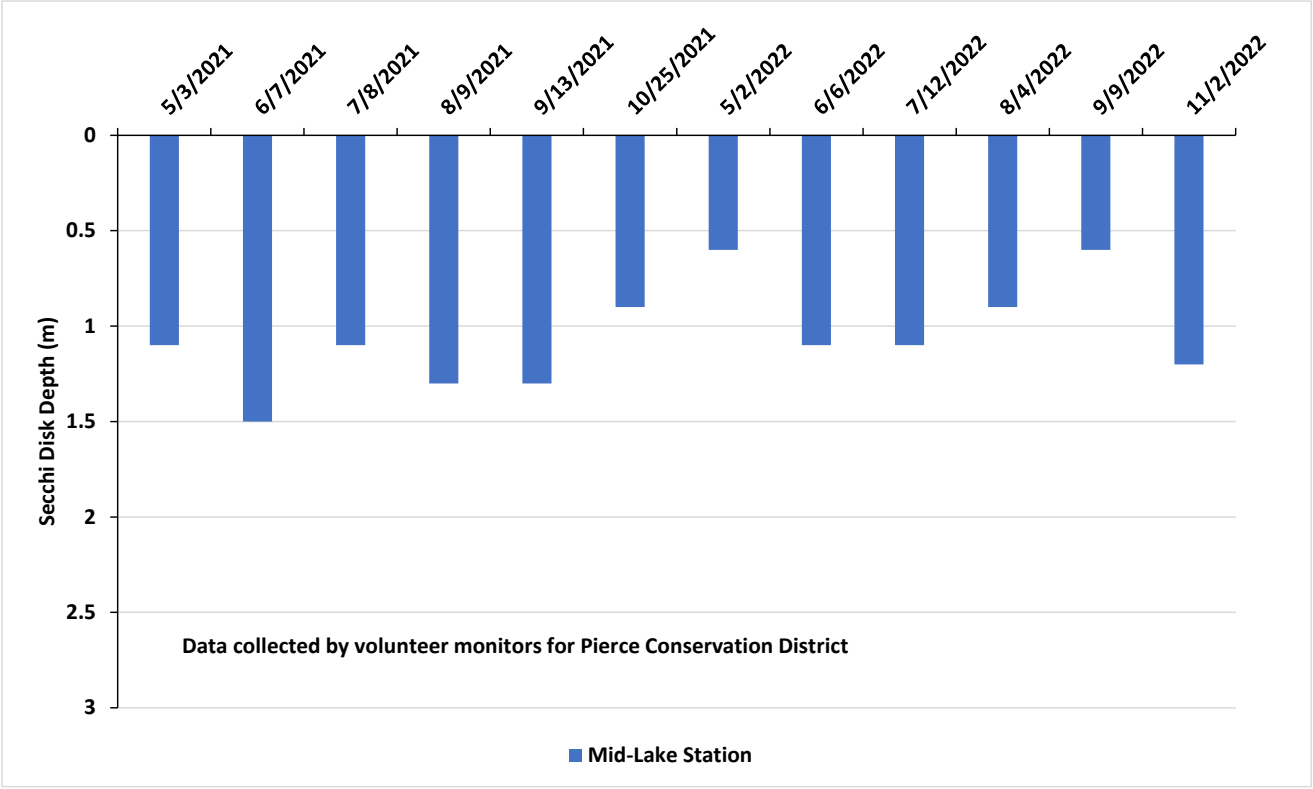

Figure 22. Secchi disk depth (water transparency) in Waughop Lake during 2021 and 2022.

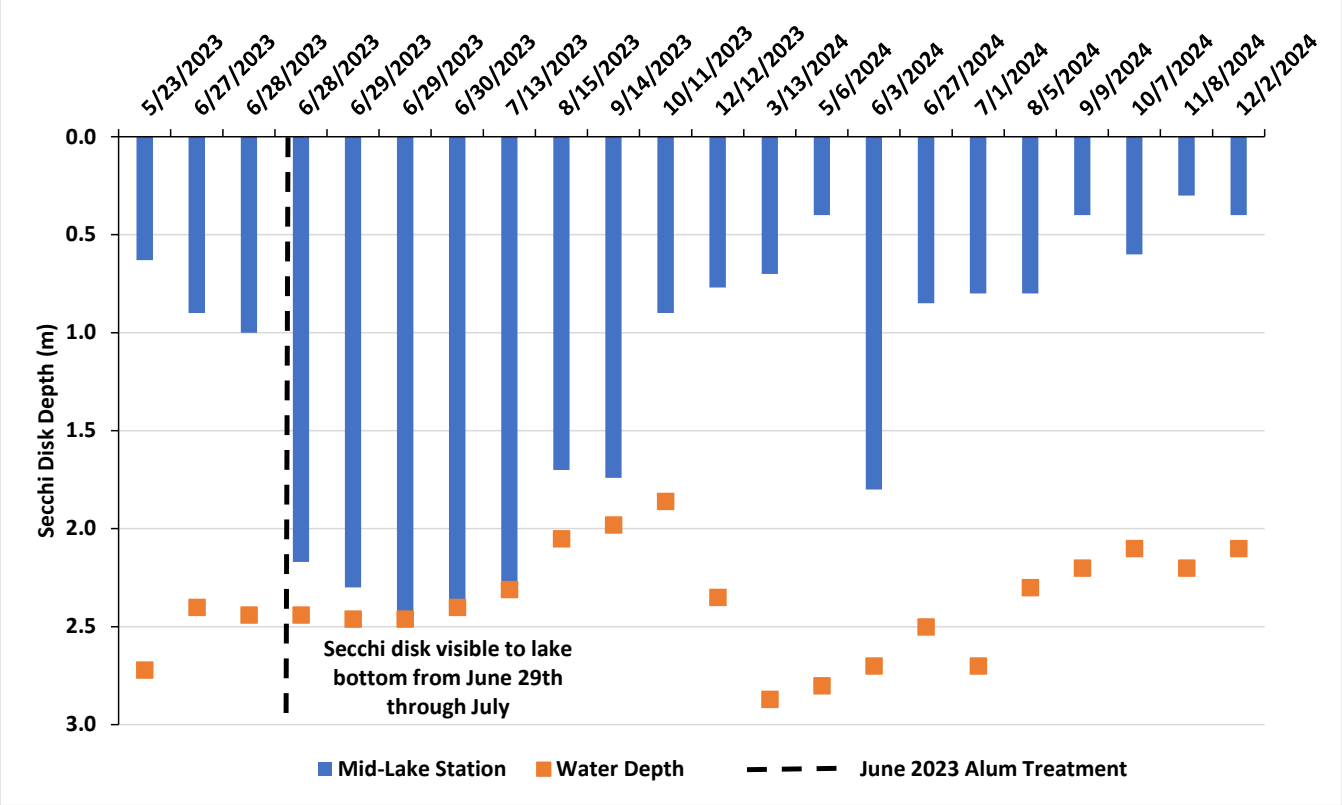

Figure 23. Secchi disk depth (water transparency) in Waughop Lake during 2023 and 2024.

6.4 TOTAL AND SOLUBLE PHOSPHORUS

6.4.1 Total Phosphorus

Prior to the March 2020 alum treatment, the average total phosphorus (TP) concentration in Waughop Lake was 89 µg/L. Total phosphorus concentrations at the mid-lake station prior to treatment were 85 and 96 µg/L at 1 m and 1.5 m depths, respectively (Figure 24). At Station #2, TP concentrations were 90 and 85 µg/L at 1 m and 1.5 m depths, respectively (Figure 24). Total phosphorus concentrations measured in Waughop Lake prior to the March 2020 alum treatment were similar to concentrations measured in previous year by various other entities. Total phosphorus concentrations in Waughop Lake during October 2014 through October 2015 ranged from 34 to 170 µg/L (Brown and Caldwell, 2017). According to the Waughop Lake Management Plan, TP concentrations during the 2014-2015 study were similar to concentrations measured by LaFontaine in 2007 which were as high as 85 µg/L (LaFontaine, 2012). Samples collected by PCD between 2011 and 2014 had an average TP of 61 µg/L with a maximum of 130 µg/L (Brown and Caldwell, 2017). Summer average TP concentrations above 30 µg/L are considered indicative of eutrophic, or overly productive, conditions (Welch and Jacoby, 2004; Nürnberg, 1996). To limit the risk of cyanobacteria dominance and potential presence of cyanotoxins in a waterbody, lake TP concentrations should remain below 30 µg/L (Downing et al., 2001).

Immediately after the March 2020 alum treatment, water column TP was reduced by 75 to 82% to an average of 13 µg/L (Figure 24). A gradual increase in TP was observed from April to July corresponding to warmer weather and increasing lake productivity. In July, one day before beginning the second alum treatment, the average lake TP was 29.4 µg/L, which was the highest average TP recorded in 2020, but still only one third of the pre-treatment

TP concentrations. Total phosphorus immediately decreased following the July alum treatment to 5 ug/L, and two weeks after treatment, TP was 11.4 ug/L. The general trend of increasing TP throughout the summer—decreasing only due to alum treatments—is consistent with seasonal productivity and the lowering of water level in the lake which had a concentrating effect due to lower lake volumes. However, despite these effects, water column TP concentrations remained in the target range of less than 35 µg/L for the duration of the post-treatment monitoring in 2020.

Total phosphorus concentrations in January and March 2021 were consistent with post-treatment levels observed in 2020. Starting in May 2021, TP concentrations increased and fluctuated between 26 and 44 µg/L throughout the summer of 2021 with an average TP over the summer of 35 µg/L (Figure 24). Total phosphorus concentrations in May – October 2022 were higher than those observed in 2021 and ranged from 30 µg/L to 290 µg/L (Figure 24). The very high TP concentration of 290 µg/L on July 12th, 2022, is suspected to be an outlier, however a similar spike in TP was also observed in June 2024 and was attributed to wind driven sediment resuspension during an incredibly windy day. So, the spike observed in July 2022 could have also been due to low water levels and subsequent wind sediment resuspension. Regardless, there was a general trend of increasing water column TP concentrations in the lake between 2021 and 2022, with the majority of samples having TP concentrations above the target range of less than 35 µg/L.

In May and June 2023, prior to the 2023 alum treatment, the average TP concentration in Waughop Lake was 42 µg/L (Figure 24). Similar to conditions in 2020, immediately after the June 2023 alum treatment, water column TP was reduced by 79% to 9 µg/L. A gradual increase in TP concentration was observed from July to October 2023 corresponding to warmer weather and the lowering of water level in the lake which had a concentrating effect on TP due to lower lake volumes. Despite the extreme low water levels and decreased lake volume, water column TP concentrations remained in the target range of less than 35 µg/L for most of the summer and early fall 2023. Although TP had increased to around 40 µg/L in October and December 2023, concentrations during the growing period in 2023 (July through September) were lower than in 2022 and much lower than TP observed in March 2020 prior to any alum treatments.

Total phosphorus concentrations increased in May 2024, up to around 50 µg/L, and remained elevated throughout the summer season and into the fall and early winter (Figure 24). Total phosphorus concentrations in November and December 2024 were similar to those measured in May, 52 and 51 µg/L, respectively. As mentioned earlier, there was a spike in TP concentration measured on June 27th, 2024 which was thought to be the result of low water levels and wind driven sediment resuspension, especially given that the TP concentrations measured on June 3rd and July 1st, just a few days after the 27th, were 37 and 41 µg/L, respectively. The source of phosphorus contributing to increasing TP concentrations in the lake is unknown. Most likely the major phosphorus loading source is from groundwater, but it could also be from localized runoff and stormwater inputs. During the summer months however groundwater inputs are assumed to be negligible and increases in TP concentration are due to either a concentrating effect of lower lake volume or internal loading from the sediments. If internal loading was occurring during the summer, there would be a corresponding increase in the total mass of phosphorus in the lake and not just an increase in concentration. An increase in TP concentration can be observed simply because the amount of water in the lake is less (concentration is mass divided by water volume - µg of phosphorus / volume of water).

To help further evaluate phosphorus in Waughop Lake, even with decreasing water levels during the summer, which had a concentrating effect on TP concentration, the mass of TP in the whole lake was calculated for each sampling event using estimated lake volumes and TP concentrations. To calculate TP mass, the concentration of TP on each sampling day was multiplied by the estimated lake volume for that day and then converted to kilograms (kg). Figure 25 shows the mass of TP in Waughop Lake for sampling events that had water level recorded to estimate lake volume. Total phosphorus mass was not calculated for the sampling event in July 2022 that had a very high TP concentration as it is believed to be an outlier. Total phosphorus mass in Waughop Lake

decreased dramatically, as expected, following the first alum treatment in March 2020 as well as the alum treatment in July 2020. The mass of TP in the lake remained low through most of 2021 then increased to above 10 kg during 2022 and 2023. Following the June 2023 alum treatment, TP mass in the lake was dramatically reduced and remained at 5 kg or below until October 2023. From October 2023 through May 2024 there was a small increasing trend in TP mass in the lake. This was most likely due to increasing inflows and external or groundwater loading of phosphorus into the lake.

During the summer of 2024, TP mass was stable and generally below 10 kg with the exception of the one high TP concentration measured in June on the windy day (Figure 25). The high TP concentrations in June was mostly likely due to sediment resuspension into the water column due to wind and the shallowness of the lake. The stability and slightly decreasing trend of the mass of TP in the lake over the summer of 2024 shows that lowering water levels and decreased lake volume did have a concentrating effect on TP concentration as TP concentrations increased over the summer period, but TP mass did not (Figures 24 and 25). In October 2024, there was a slight decrease in TP mass, possibly due to settling, before TP mass increased slightly in November and December 2024. Lake level also increased slightly in November and December 2024 so this increase in TP mass was mostly likely due to increasing inflows and external loading. In December 2024, the TP mass in the lake was around 8.4 kg which is much lower than the TP mass in the lake in March 2020 (23 kg) prior to any alum treatment (Figure 25).

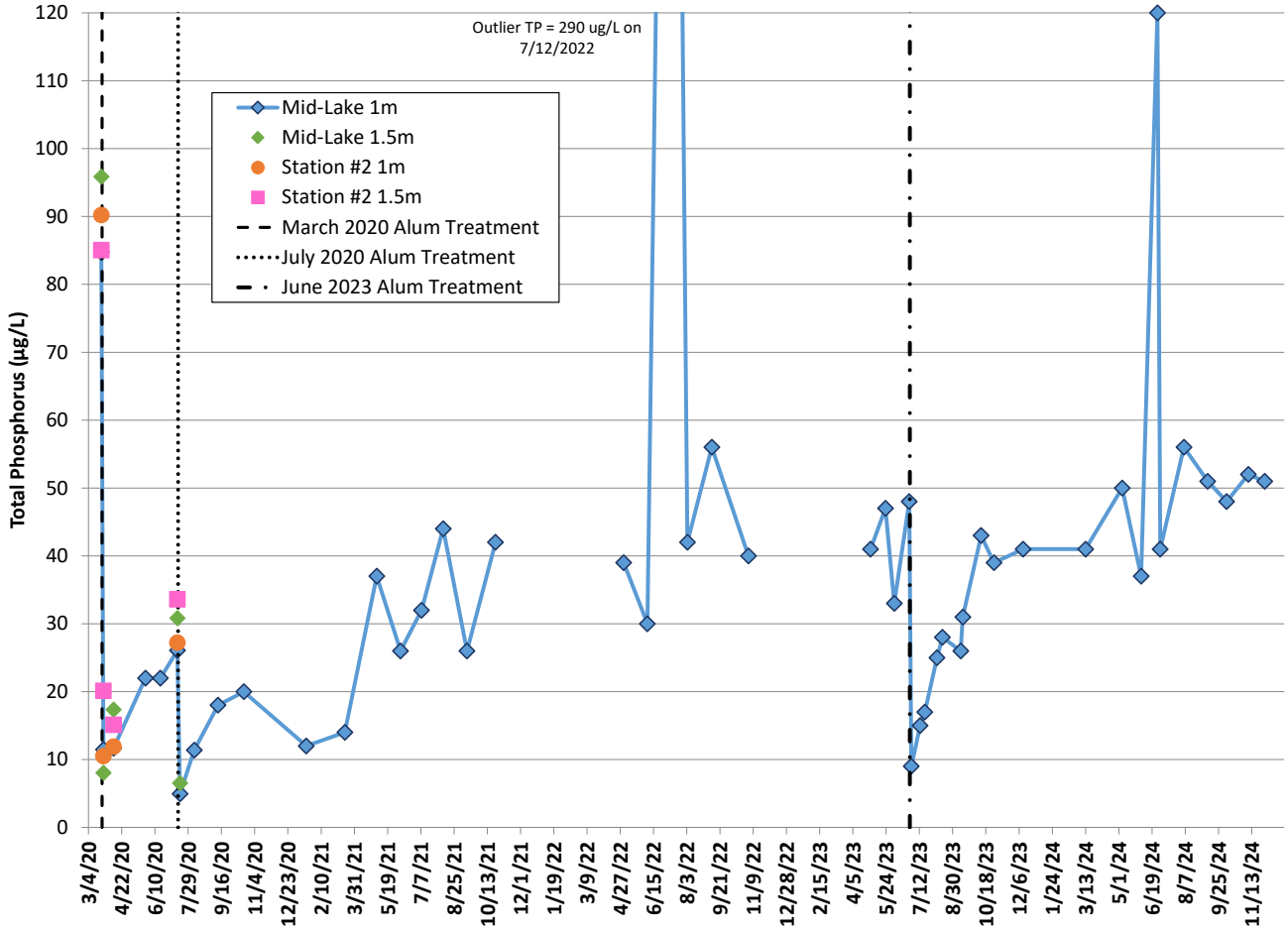

Figure 24. Total phosphorus concentrations in Waughop Lake in 2020 -2024.

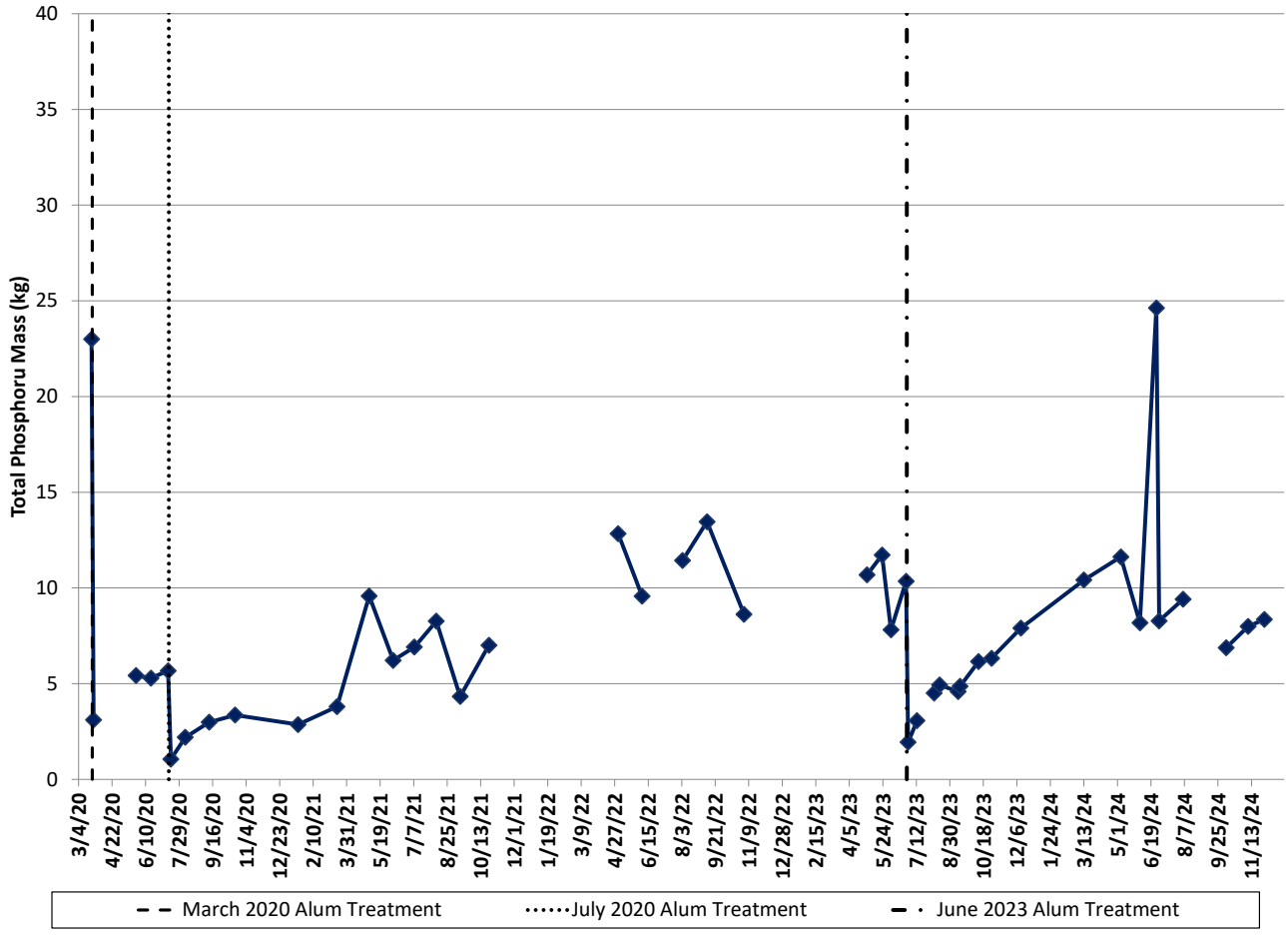

Figure 25. Total phosphorus mass in Waughop Lake 2020 – 2024.

6.4.2 Soluble Phosphorus

Soluble Reactive Phosphorus (SRP) was relatively low prior to the March 2020 alum treatment, ranging from 3 to 5 µg/L. Most likely SRP concentrations were low due to algal uptake and algal productivity as this is the fraction that is most available for algal uptake. Nevertheless, a significant reduction in SRP to below the detection limit of 1 µg/L was observed after the March 2020 treatment and SRP concentrations were consistently less than 1 µg/L throughout the summer and fall of 2020. Samples were not collected for SRP analysis in January and March 2021 however SRP concentrations measured in samples collected May – October 2021 and 2022, were consistently at or below the detection limit of 1 µg/L. On occasion during those two summers, SRP concentrations measured at just above the detection limit at 2 µg/L.

In 2023, prior to the June alum treatment, SRP concentrations in the lake were still low and ranged from below the detection limit to 2 µg/L. There was not a significant change in SRP concentrations following the treatment and concentrations during the rest of the summer in 2023 ranged from below the detection limit to 3 µg/L.

Soluble phosphorus concentrations in 2024 were slightly higher than those in 2023, ranging from below the detection limit to a maximum of 7 µg/L measured in May 2024. During the summer (June – September) of 2024,

SRP was below the detection limit or just slightly higher at 2 µg/L. In October 2024, SRP increased to 5 µg/L, before decreasing again to below or near the detection limit in November and December 2024.

6.5 CHLOROPHYLL-A

Prior to the March 2020 alum treatment, the average chlorophyll concentration in Waughop Lake was 52 µg/L (Figure 26). There was some slight variability in chlorophyll concentrations in the lake prior to treatment with concentrations ranging from 45 µg/L at 1 m depth at Station #2 to 81 µg/L at 1.5 m depth at the mid-lake station. Immediately after the March alum treatment, the chlorophyll concentration was dramatically reduced to an average of 1 µg/L. This reduction in chlorophyll in the water column reflects the physical removal of algae from the water column as a result of the alum treatment and represents a shift from a highly productive hypereutrophic state to a borderline oligotrophic-mesotrophic state (Welch & Jacoby, 2004). A slight increase in chlorophyll was observed from April to July corresponding to increasing lake productivity, but concentrations were still less than 10 percent of the concentrations in March prior to the first treatment and were mostly less than 5 µg/L. After the July 2020 alum treatment, chlorophyll concentrations were consistently low, ranging from 0.4 to 4.5 ug/L throughout October 2020 even with the concentrating effect of the lowering water level in the lake. These chlorophyll concentrations indicate the lake remained in a borderline oligotrophic-mesotrophic state in 2020.

There was a slight increase in chlorophyll observed from October 2020 to March 2021, from 2.5 to around 5.5 µg/L (Figure 26). Chlorophyll concentrations during the summer of 2021 remained below the eutrophic boundary of 9.0 µg/L and reflected more of a mesotrophic, or well-balanced system. However, there was a large increase in chlorophyll in October 2021 when concentrations peaked at 33 µg/L. Chlorophyll concentrations were also elevated in the lake at the start of the growing season in May 2022 and were generally higher in 2022 than in 2021. During June - October 2022, chlorophyll concentrations fluctuated over the season and ranged from 5.9 to 22 µg/L (Figure 26). On July 25th and August 15th, 2022, samples were collected from Waughop Lake and analyzed for cyanotoxins by King County Environmental Laboratory due to the presence of a noticeable bloom. The sample from July 25th had a detection for microcystin (0.225 µg/L) but well below the state recreational guideline of 8 µg/L. The sample collected on August 15th also had a small detection of microcystin (0.190 µg/L) which was well below the state guideline. Anatoxin-a was not detected in either sample collected in 2022.

Spring chlorophyll concentrations in 2023 were similar to those measured in 2022. The average chlorophyll concentration in Waughop Lake in May and June 2023, prior to the alum treatment, was 12.5 µg/L (Figure 26). Immediately after the June alum treatment, the chlorophyll concentration was dramatically reduced to 0.7 µg/L. As was the case in 2020, this reduction in chlorophyll in the water column reflected the physical removal of algae from the water column as a result of the alum treatment. Chlorophyll concentrations remained low, averaging 5.4 µg/L for the remainder of the summer, July through September 2023 (Figure 26). These chlorophyll concentrations indicate the lake remained in a mesotrophic state (moderately productive) through the summer. There was an increase in chlorophyll in October 2023, which may have been the result of the concentrating effect of lowering water level of the lake, but chlorophyll was also high in December, when water level had started to increase. Precipitation and groundwater recharge also increased in December which may have aided in phosphorus and nitrogen bioavailability. The chlorophyll concentration in December was 54 µg/L, which was very high compared to concentrations measured since the 2020 alum treatment. The lake was green in color in December 2023, but field crews did not observe a scum or any indication that the algae present was cyanobacteria. The algae observed in December 2023 appeared to be green algae.

Chlorophyll concentrations remained elevated in 2024 with a maximum concentration of 67 µg/L observed in March 2024 (Figure 26). This concentration is similar to concentrations observed prior to the 2020 alum treatments. Following the peak in March, chlorophyll concentrations during May through October 2024 averaged 20 µg/L. The chlorophyll concentration increased in November 2024 to just under 50 µg/L, which is consistent with the low water clarity (Secchi disk depth of only 0.3 m). In December 2024, the reported chlorophyll

concentration was 109 µg/L, which is considered to be an outlier and suspect data point. The very high chlorophyll concentration is inconsistent with the measured TP concentration in December of 51 µg/L and results in a chlorophyll to TP ratio of 2.1 to 1. Typical chlorophyll to TP ratios range from 0.3 to 0.6 and can reach as high as 1 to 1.5 in hypereutrophic waterbodies. The sample collected in December by PCD volunteer monitors may have accidentally contained a large portion of algal scum or algal mat that could have artificially inflated the chlorophyll concentration. The December chlorophyll concentration is included in Figure 26 below but not considered to be a valid data point.

In May 2024 there was concern that the lake had a large bloom of a small species of cyanobacteria, either *Synechocystis* or *Gloeothece.* A sample was collected and sent to the King County Environmental Laboratory for cyanotoxin analysis on May 8th, 2024. A sample was also collected in mid-May by City staff and shipped to Dr. Barry Rosen, a phycologist at Florida Gulf Coast University, for algal identification. Neither microcystin nor anatoxin-a was detected in the sample and microscopy conducted by Dr. Rosen revealed that there were no cyanobacteria species present in the lake. Dr. Rosen identified that the dinoflagellate *Parvodinium* was abundant in the lake as well as two species of green algae, *Chlamydomonas* and *Tetraedron*.

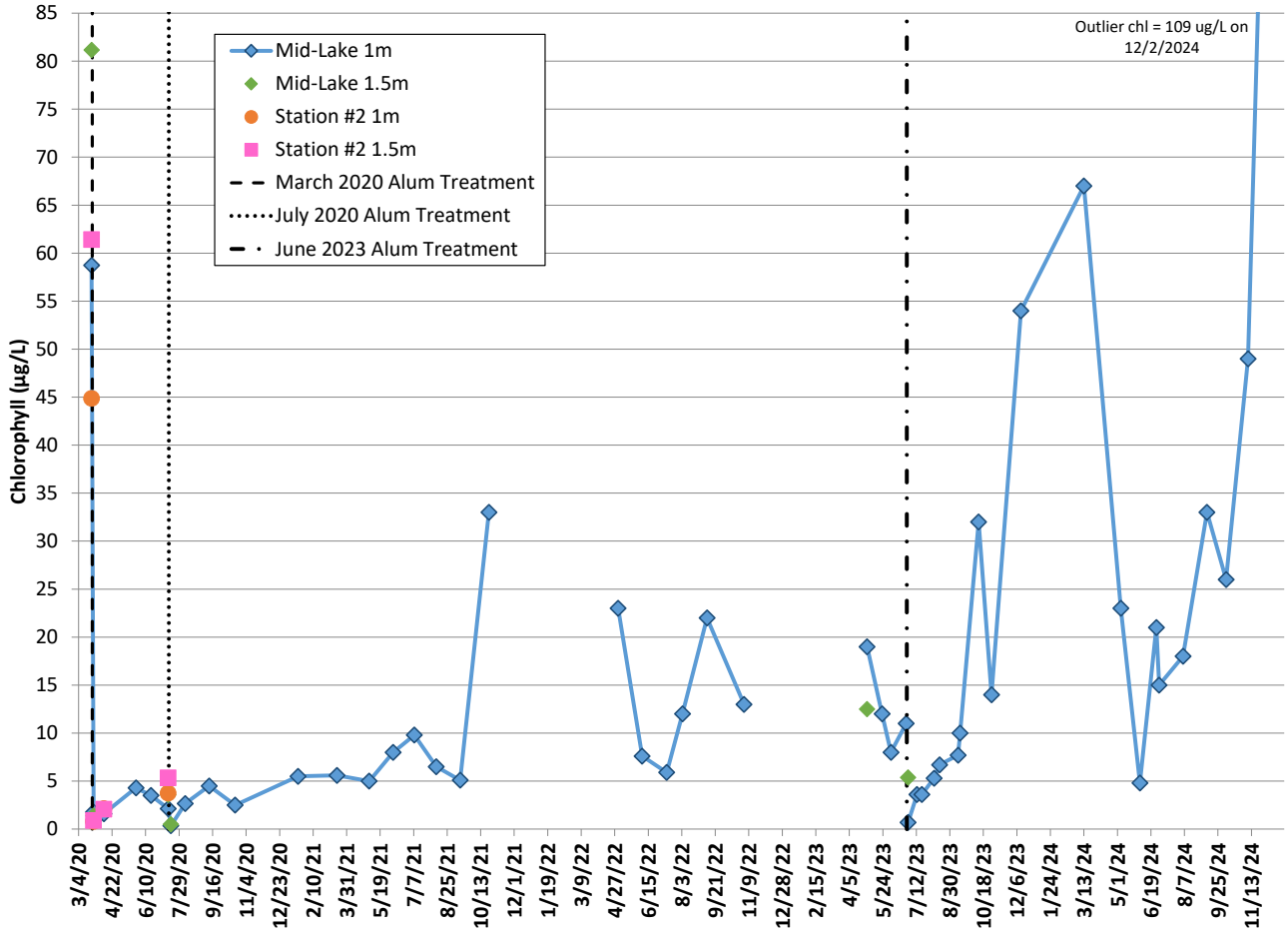

Figure 26. Chlorophyll concentrations in Waughop Lake in 2020 – 2024.

6.6 NITROGEN

The average total nitrogen (TN) concentration in Waughop Lake prior to the March 2020 alum treatment was 1,650 µg/L (Figure 27). Following the March treatment, TN was reduced by 70% from pre-treatment

concentrations due to its tie to organic compounds. There was an immediate, temporary decrease in TN observed following the July 2020 alum treatment but TN concentrations returned to near post March treatment concentrations by early August 2020 and remained relatively steady through the end of monitoring in October 2020 (Figure 27). Nitrate and nitrite concentrations were also reduced following the March treatment, by 25 to 50%. The average nitrate and nitrite concentration in the lake prior to treatment was 48 µg/L. The average nitrate and nitrite concentration in the lake following treatment, through October 2020, had decreased to 17 µg/L.

In January 2021, a temporary increase in TN concentration was observed from the relatively steady post-treatment levels in 2020. However, the January 2021 concentration (1,160 µg/L) was still lower than the March 2020 pre-treatment TN concentrations. After the temporary increase in TN in January, concentrations decreased to 527 µg/L, only slightly higher than the post-treatment 2020 concentrations, by March 2021 (Figure 27). The general trend of lower TN concentrations after the 2020 alum treatments is likely a response to the reduction in biogenic production due to phosphorus inactivation.

Total nitrogen concentrations fluctuated with a general increasing trend through the summers of 2021 and 2022. Concentrations ranged from 206 µg/L in September 2021 to 1,170 µg/L in June 2023, right before the 2023 alum treatment (Figure 27). Seasonal fluctuations of TN was anticipated based on plant and algal productivity, as well as external nitrogen loading from groundwater and direct precipitation.

After the 2023 alum treatment, TN was reduced by 46% from a pre-treatment average concentration of 1,060 µg/L to an immediate post-treatment average concentration of 545 µg/L (Figure 27). Total nitrogen concentrations remained reduced through July 2023 then started to increase to near pre-treatment concentrations in August. In December 2023, TN had returned to pre-treatment levels at 1,040 µg/L. Total nitrogen remained high and generally increased through 2024 (Figure 27). Nitrate and nitrite concentrations were at or near detection limits (10 µg/L) prior to the 2023 treatment and remained stable throughout the monitoring period with the exception of a slight increase to 17-19 µg/L, measured the day after treatment.

Alum does not specifically target nitrogen species in the water column or sediment. The reductions in nitrogen following each alum treatment was due to its tie with organic compounds in the water column which are physically removed with the alum floc. It is not uncommon to see a temporary reduction in nitrogen following an alum treatment followed by a rebound back to pre-treatment concentrations.

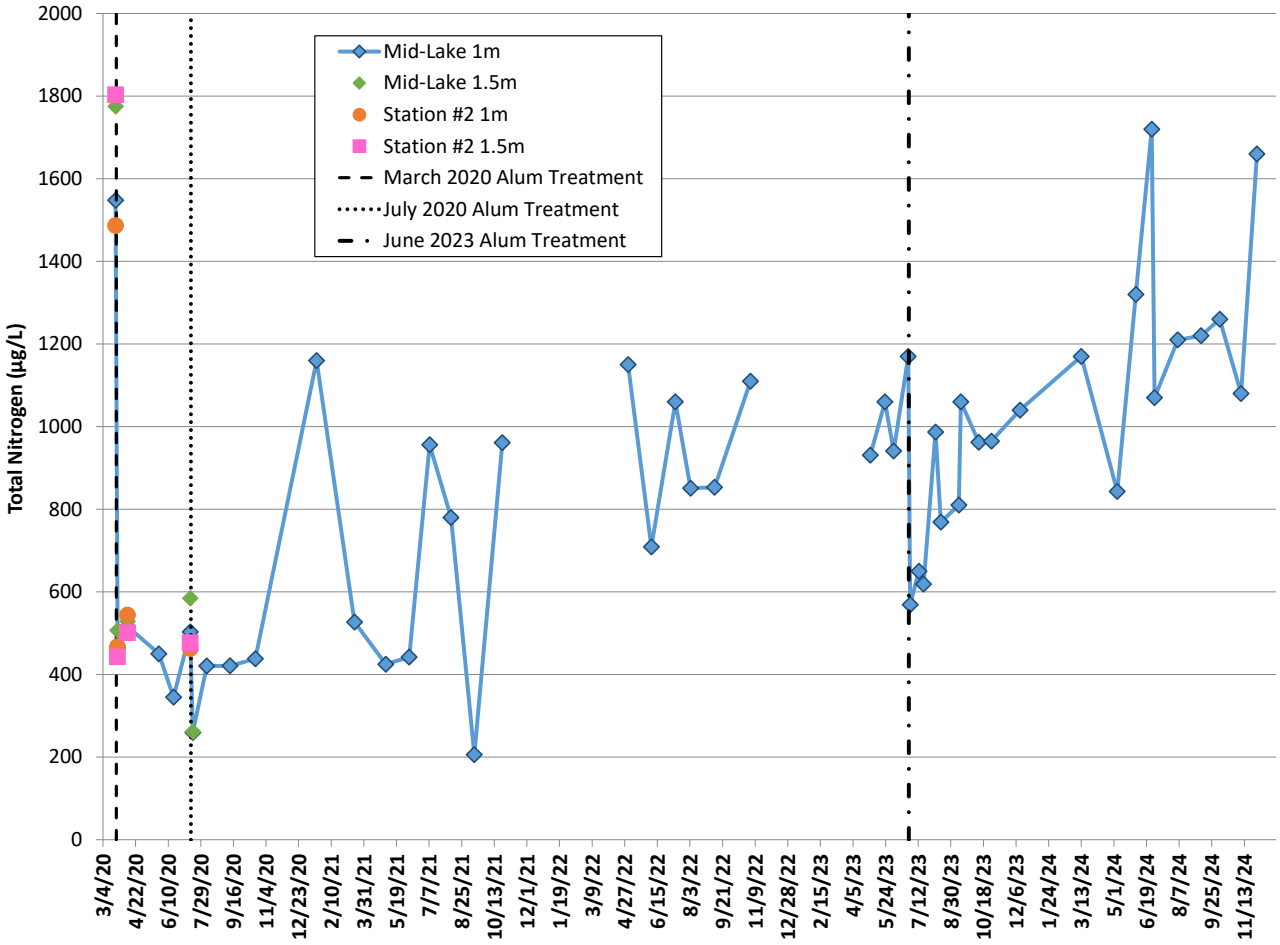

Figure 27. Total nitrogen concentrations in Waughop Lake in 2020 – 2024.

6.7 ALKALINITY

Lake alkalinity (as calcium carbonate) was significantly reduced following each alum treatment, which is expected following an alum treatment given that alum is an acidic compound. Alkalinity decreased by 50 percent to a low of 10 mg $CaCO_3$/L following the March 2020 alum treatment and then gradually increased to pre-treatment levels of 20 mg $CaCO_3$/L by July. A reduction in alkalinity was again observed following the alum treatment in July 2020, but a return to pre-treatment levels was achieved by October (Figure 28). The lowest alkalinity recorded in 2020 was 6.3 mg $CaCO_3$/L in September, reflecting the slower rebound following the July alum treatment. The observed reduction and slower rebound of alkalinity following each 2020 alum treatment is a direct result of the low build-up of alkalinity that normally occurs in lakes due to surface runoff and stream inflow. Given the lack of surface water input of calcium and carbonate, the only source to Waughop Lake is from atmospheric fallout which is very low in the Puget Sound region. Hence with the hydration of Al there is a reduction in reserve carbonate to help the alkalinity rebound like in other lakes.

January 2021 samples were not analyzed for alkalinity, but the March 2021 concentration of 15 mg $CaCO_3$/L indicated only a slight decrease in lake alkalinity when compared to the October 2020 concentration and pre-

treatment concentration in March 2020 (Figure 28). The slight decrease is likely tied to the dramatic increase of water level in the lake over the winter season which had a diluting effect due to higher lake volumes.

Over the course of 2021 and 2022, lake alkalinity steadily increased (Figure 28). Towards the end of 2021 and during 2022, alkalinity in the lake increased dramatically from pre-treatment concentrations in 2020 of around 20 mg $CaCO_3$/L. Maximum alkalinity in 2022 and 2023 prior to the June 2023 alum treatment was 58.2 mg $CaCO_3$/L. It is unknown what caused the increase in alkalinity at the end of 2021 and during 2022 but it could be the result of higher-than-normal inflows from groundwater and precipitation. Water levels during the end of 2021 and 2022 were also higher than typical indicating increased inflows.

As previously observed with the 2020 treatments, alkalinity was significantly reduced following the June 2023 alum treatment. Alkalinity decreased from a pre-treatment average of around 53 mg $CaCO_3$/L to an average of around 38 mg $CaCO_3$/L. Alkalinity in the lake remained stable, at around 30 mg $CaCO_3$/L for most of the summer and then gradually decreased over the fall and winter of 2023. A sharp increase in lake alkalinity was observed between the beginning of May 2024 to end of June 2024 with the last measured concentration reaching 47.2 mg $CaCO_3$/L in November 2024 (Figure 28).

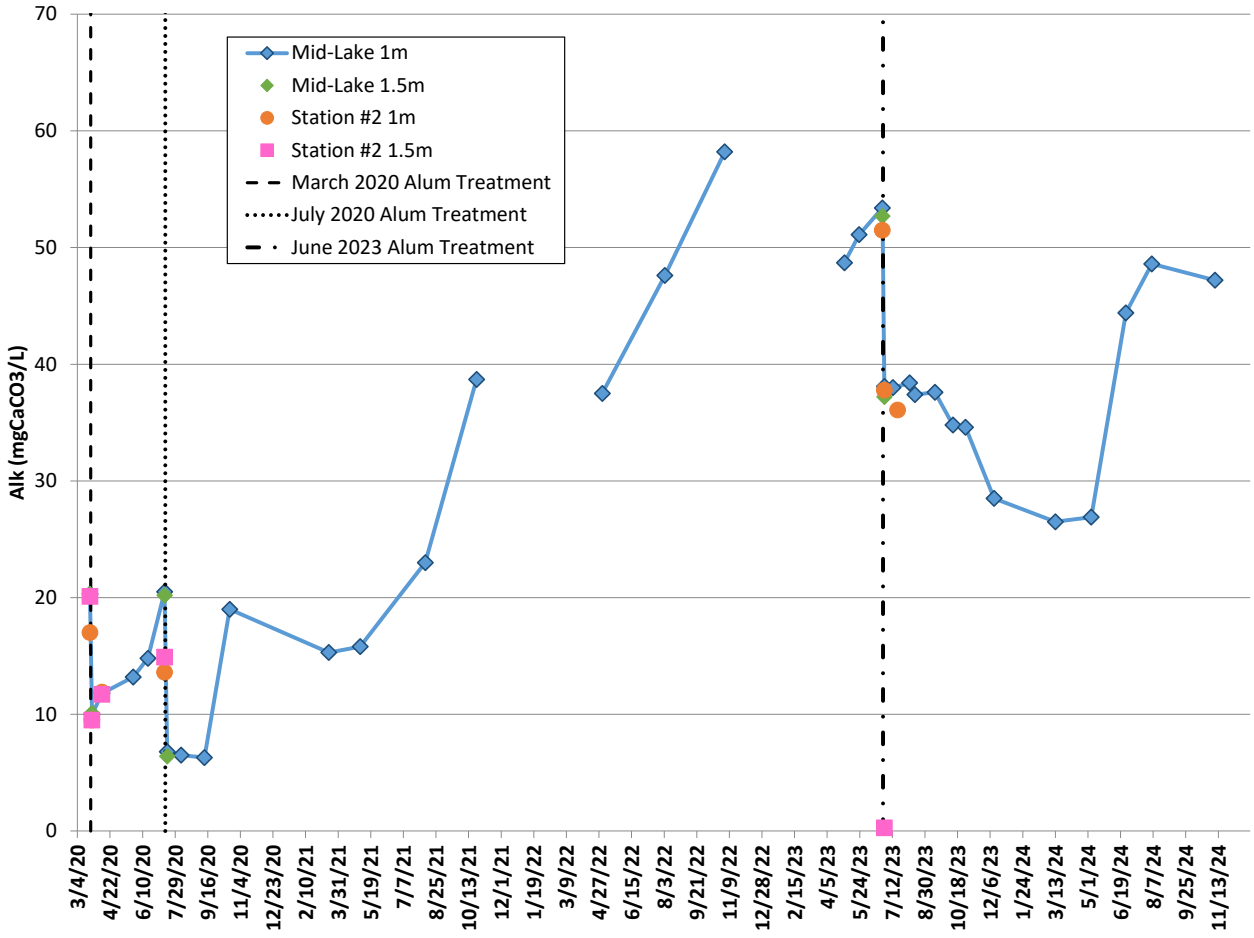

Figure 28. Alkalinity in Waughop Lake in 2020 – 2024.

6.8 SULFATE

Sulfate concentrations in Waughop Lake increased following the alum treatments. At a depth of 1 m at the mid-lake station, sulfate concentrations ranged from a low of 1.5 mg/L before the March treatment to a high of 245 mg/L in September after treatments (Figure 29). Due to the lack of inflow and outflow from the lake, a temporary increase in sulfate was expected. The normal settling of the sulfate following alum treatments was observed to be slower given that there is no outlet and no flushing. In addition, the high levels of sulfate in the sediment contributed to the observed increase as sulfate was likely entering the water column to replace the loss of negative carbonate ions with the reduction in alkalinity. As expected, sulfate again increased after the July 2020 treatment. A decrease in sulfate was observed from September to October 2020 with an increase in fall inflow to the lake.

Sulfate concentrations continued to decrease during the winter season of 2020 as expected with the seasonal increase in groundwater inflow to the lake. In May 2021 the concentration of sulfate in the lake at 1 m depth was 22.1 mg/L, still higher than the pre-treatment concentrations in March 2020, but significantly lower than the high concentration of 245 mg/L measured in September 2020 (Figure 29). Sulfate was only analyzed for a handful of samples collected over the summers of 2021 and 2022. There was an unexplained dramatic increase in sulfate concentration between May 2021 and August 2021 when the sulfate concentration in the lake at 1 m depth reached 133 mg/L. Following that increase sulfate concentrations in the lake declined steadily to a low of around 26 mg/L immediately prior to the June 2023 alum treatment (Figure 29). Following the 2023 alum treatment, sulfate increased, as expected, to around 92 mg/L. Sulfate remained elevated through December 2023 but as was observed in previous years, a reduction in sulfate was expected as groundwater flow increased over the winter. Sulfate concentrations did decrease from December 2023 to March 2024 and remained around 50 mg/L throughout 2024 (Figure 29). In December 2024 the concentration of sulfate had decreased to 38.2 mg/L (Figure 29).

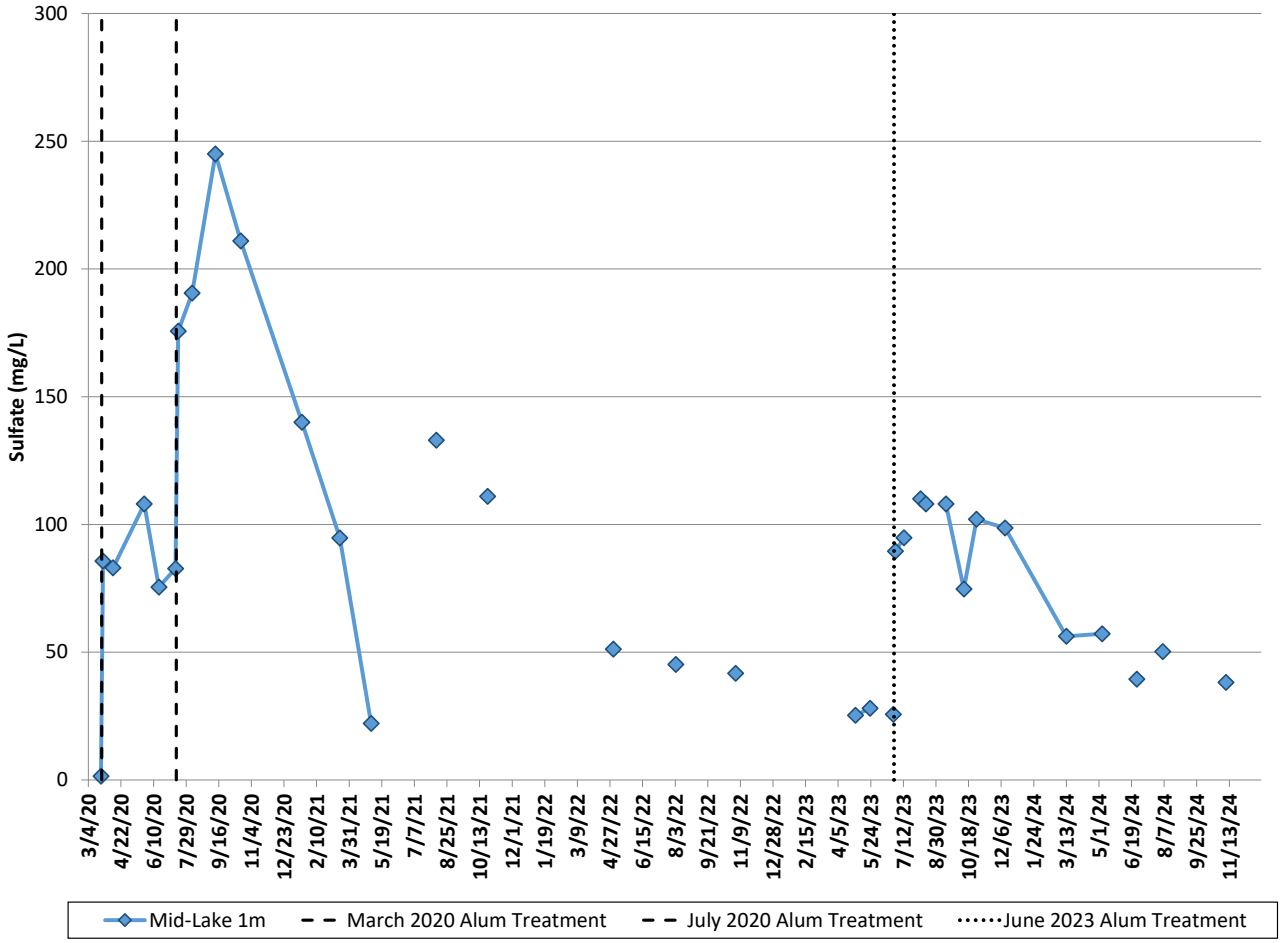

Figure 29. Sulfate concentrations in Waughop Lake at 1 m depth at the mid-lake station in 2020 – 2024.

6.9 TOTAL SULFIDES

Prior to the June 2023 alum treatment, Ecology required that the City collect samples as part of their permit monitoring in Waughop Lake for analysis of total sulfides. Samples were collected by Tetra Tech for total sulfides analysis beginning the day before treatment, on June 27th, 2023. Samples were collected at a depth of 1 m and at a depth of 0.5 m off the bottom, if water depths allowed. Samples were analyzed by Fremont Analytical using method SM 4500-S2-D which quantifies total sulfides in the water including dissolved hydrogen sulfide, hydrosulfide, and metallic sulfides (which are common in suspended particulates). Table 2 summarizes total sulfides results from samples collected at Waughop Lake before and after the June alum treatment.

Total sulfides concentrations were 1.6 and 2.8 mg/L in surface and bottom samples respectively, prior to the June 2023 alum treatment. Following the treatment, surface total sulfides concentrations increased but bottom concentrations decreased (Table 2). Two weeks post treatment, the surface total sulfides concentration had decreased substantially while the bottom concentration increased back to near pre-treatment levels. Starting in August, two months post-treatment, total sulfides in Waughop Lake decreased even further to concentrations near or at the detection limit or below the reporting limit. Concentrations in red italicized font in Table 2 indicate samples that were reported below the detection limit and the concentration in the table is the detection limit for that sample. Total sulfides concentrations in the lake remained low through November 2024 (the last date samples were collected and analyzed for total sulfides) and were just above the detection limit (Table 2).

Table 2. Waughop Lake Total Sulfides Concentrations, 2023 and 2024.

Date	Time Period	Total Sulfides (mg/L)	
		1 m	0.5 m off bottom
6/27/2023	Day before Treatment	1.6	2.8
6/30/2023	Day after Treatment	4	1.2
7/13/2023	2 Weeks Post Treatment	0.8	2.4
8/15/2023	Two Months After	0.6	*0.128 (ND)*
9/14/2023	Three Months After	*0.0138 (ND)*	0.0139 (J)
10/11/2023	Four Months After	*0.0138 (ND)*	--
12/12/2023	Six Months After	0.0336 (J)	0.0383 (J)
3/13/2024	Nine Months After	0.0232 (J)	0.107
5/6/2024	PCD May Event	*0.0500 (ND)*	*0.0500 (ND)*
6/27/2024	Twelve Months After	0.0508	0.117
8/5/2024	PCD August Event	*0.0500 (ND)*	*0.0500 (ND)*
11/8/2024	PCD November Event	0.052	0.052

6.10 ALUMINUM

Following the March 2020 alum treatment, both Total Aluminum (TA) and dissolved aluminum (DA) increased due to the aluminum addition but did not reach exceedingly high levels. Surprisingly, the highest levels of TA and DA were observed one day before the July alum treatment (Figure 30; Table 3). The high aluminum concentrations were not anticipated and did not correspond to dramatic changes in measurements of pH and DO, which were all considered normal. Therefore, the high aluminum concentrations in July were likely a result of interactions between aluminum and organic compounds in the lake. Under the somewhat alkaline conditions at Waughop Lake (average pH above 8.0), the solubility of aluminum is enhanced, and may form complexes with dissolved organic carbon (DOC). The complexing of aluminum and DOC has been observed in other lakes (Long Lake, Kitsap County; Cooke et al. 2005) because of humic substances in the water column and is a likely cause of high aluminum concentrations prior to the July treatment. Aluminum concentrations were also impacted by the lowering of water level in the lake which has a concentrating effect due to lower lake volumes.

A decrease in both TA and DA was observed following the July 2020 alum treatment. Despite the high levels in early July, DA quickly returned to similar levels observed in pre-treatment conditions. Total aluminum fluctuated through the late summer 2020 with a general decreasing trend. A similar effect was observed when DA decreased following an alum treatment in Long Lake, Kitsap County and the decrease was thought to have been the result of natural levels of aluminum complexed with humic materials by the alum floc in the relatively brow-water lake (Cooke et al. 2005).

Following the high concentration of both TA and DA in July 2020, Tetra Tech reached out to the contract laboratory, IEH Analytical, to see if samples could be analyzed for DOC and total organic carbon (TOC). Unfortunately, the July and August samples had already been disposed of, however, DOC and TOC were both analyzed in September and DOC in October. DOC and TOC concentrations in September were essentially the same, 4.18 and 4.22 mg/L, respectively, indicating that all of the organic carbon in the lake is in the dissolved fraction.

In early 2021, the decreasing trend in TA concentration observed in the fall of 2020 continued, and pre-treatment equilibrium concentrations were achieved (Figure 30; Table 3). In March 2020, prior to alum treatments, TA was 62 µg/L, while in January and March of 2021 measured TA concentrations were 54 µg/L and 69 ug/L, respectively. Samples collected by PCD were analyzed for TA three times per year in 2021 and 2022; May, August, and either October or November. Total aluminum concentrations in the lake increased from March 2021 to May 2021 and remained elevated through the end of the monitoring period in 2022 (Figure 30; Table 3). It is unknown what caused the sudden increase in TA concentrations. Unfortunately, there is limited to no corresponding data for DOC and hardness for TA samples in 2020 – 2022, so acute and chronic TA criteria could not be calculated using the EPA calculator.

Monitoring requirements for alum treatments changed prior to the 2023 June treatment and samples for analysis of TA, DOC and hardness were required to be collected by Ecology. Immediately following the June alum treatment (1 hour after treatment completion), TA increased due to the aluminum addition and temporarily exceeded the EPA aluminum acute and chronic criterion (Figure 30; Table 3). Total aluminum concentrations from samples collected the day after treatment were substantially lower and below both the acute and chronic EPA criterion concentrations (Table 3). The EPA aluminum criteria were calculated using an EPA published aluminum criteria spreadsheet and are based on concentrations of DOC, hardness, and pH. The EPA aluminum criteria are for total recoverable aluminum.

Total aluminum concentrations remained below the EPA acute and chronic criterion through the rest of 2023 and most of 2024. However, there was a slight increase in TA in July, two-weeks post treatment and again in September, before concentrations decreased to less than pre-treatment concentrations in December (Table 3). Total aluminum concentrations remained stable through May 2024. There was a spike in TA in June 2024 which was confirmed by the laboratory. Total phosphorus concentrations were also very high on the June sampling date and the spike in TP and TA is thought to be caused by wind driven sediment resuspension with the low water levels. The spike in TA in June 2024 was above the EPA chronic criterion but not the acute criterion (Table 3). Total aluminum concentrations were lower in August and November 2024 but still slightly higher than the concentrations measured prior to the spike in June (Figure 30). August and November 2024 TA concentrations were both below the EPA acute and chronic criterion (Table 3).

Dissolved aluminum (DA) was higher than expected in June 2023 prior to the alum treatment. There was an immediate decrease in DA following the treatment (Table 3). A similar effect was observed when DA decreased following the July 2020 alum treatment. Concentrations of DA increased two weeks post treatment and remained at concentrations higher than pre-treatment through August. Samples for DA were not collected after two months post treatment (Table 3). Following the high concentration of DA in July, Tetra Tech reached out to the contract laboratory, IEH Analytical, to see if samples could be re-analyzed for confirmation. IEH Analytical confirmed the DA concentrations from July. DOC concentrations increased steadily back to pre-treatment levels or higher throughout the summer. Samples for total organic carbon (TOC) analysis were not collected in 2023 but based on previous data, all of the organic carbon in Waughop Lake is typically in the dissolved fraction. The increased DA concentrations are most likely due to the complexing of aluminum and DOC in the water column.

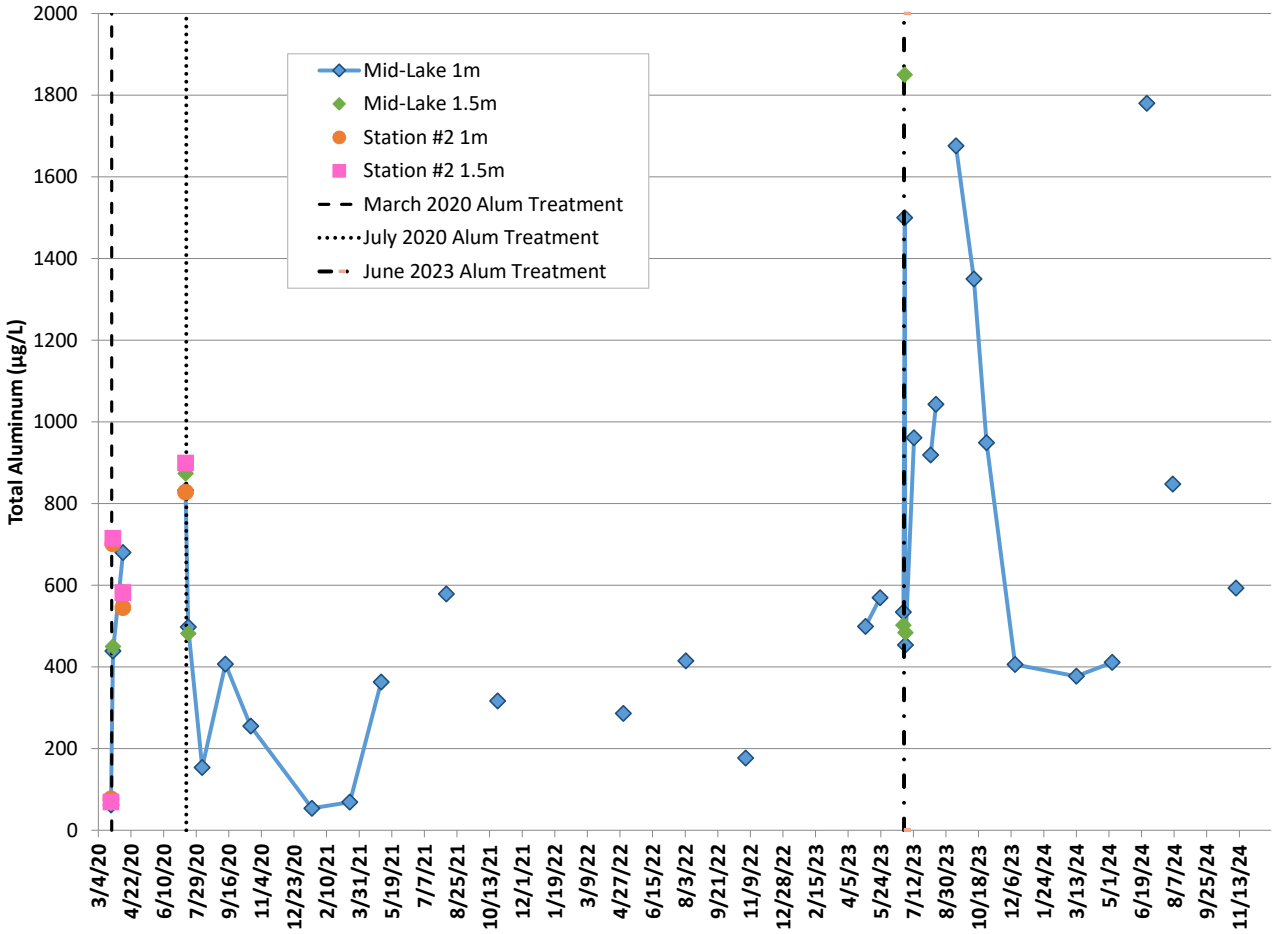

Figure 30. Total aluminum concentrations in Lake Waughop in 2020 – 2024.

Table 3. Waughop Lake Aluminum Concentrations, 2020 – 2024.

Date	Time Period	Depth (m)	Total Aluminum (ug/L)	Dissolved Aluminum (ug/L)	DOC (mg/L)	Hardness (mg CaCO3/L)	pH	EPA Aluminum Criteria Total Aluminum (ug/L)	
								Acute	Chronic
3/23/2020	Day Before	1	62	28	--	--	8.37	--	--
		1.5	72	17	--	--	8.12	--	--
3/26/2020	Day After	1	439	37	--	--	8.06	--	--
		1.5	450	38	--	--	8.01	--	--
4/10/2020	2-weeks Post	1	680	14	--	--	7.88	--	--
		1.5	584	17	--	--	7.75	--	--
7/13/2020	Day Before	1	833	763	--	--	8.82	--	--
		1.5	874	764	--	--	8.8	--	--
7/17/2020	Day After	1	498	21	--	--	7.8	--	--
		1.5	482	19	--	--	7.62	--	--
8/7/2020	3-weeks Post	1	154	66	--	--	8.18	--	--
9/11/2020	Monthly	1	407	27	4.18	--	8.13	--	--
10/19/2020	Monthly	1	255	24	4.05	--	8.06	--	--
1/19/2021	Monthly	1	54	8	4.98	--	8.52	--	--
3/17/2021	Monthly	1	69	14	3.59	--	8.11	--	--
5/3/2021	Monthly PCD	1	363	--	--	--	6.9	--	--
8/9/2021	Monthly PCD	1	579	--	--	--	7.9	--	--
10/25/2021	Monthly PCD	1	317	--	--	--	7.25	--	--
5/2/2022	Monthly PCD	1	286	--	--	--	7.5	--	--
8/4/2022	Monthly PCD	1	415	--	--	--	7.5	--	--
11/2/2022	Monthly PCD	1	177	--	--	--	7	--	--
5/1/2023	Monthly PCD	1	499	--	--	--	8.5	--	--
5/23/2023	Month Before	1	569	--	8.4	23.8	8.25	3900	1600
6/27/2023	Day Before	1	535	408.3	9.43	19.6	8.49	4400	2100

Date	Time Period	Depth (m)	Total Aluminum (ug/L)	Dissolved Aluminum (ug/L)	DOC (mg/L)	Hardness (mg CaCO3/L)	pH	EPA Aluminum Criteria Total Aluminum (ug/L)	
								Acute	Chronic
6/27/2023	Day Before	1.8	503	428.4	8.98	18.3	8.43	4200	2000
6/29/2023	1 hr Post	1	**1500**	41.4	--	--	6.99	1300*	500*
6/29/2023	1 hr Post	1.8	**1850**	39.2	--	--	6.95	1200*	480*
6/30/2023	Day After	1	454	61.4	5.94	17.9	7.21	1600	590
6/30/2023	Day After	1.8	484	50.7	6.01	17.9	7.22	1600	600
7/13/2023	2-weeks Post	1	961	845.8	6.21	19.5	8.21	3500	1600
7/13/2023	2-weeks Post	1.8	969	821.9	5.97	19.8	8.20	3400	1600
8/15/2023	Two Months After	1	1043	995.3	7.7	20.9	8.30	3900	1700
9/14/2023	Three Months After	1	1676	--	9.7	21.8	8.60	4500	2200
10/11/2023	Four Months After	1	1350	--	11.6	20.3	8.72	4900	2400
12/12/2023	Six Months After	1	406	--	10.7	18.2	8.21	4000	1500
3/13/2024	Nine Months After	1	377	--	13.4	18.5	8.76	4900	2600
5/6/2024	Monthly PCD	1	411	--	22.9	19	7.5	2700	840
6/27/2024	Twelve Months After	1	**1780**	--	12.7	22.5	7.29	2400	740
8/5/2024	Monthly PCD	1	848	--	11.4	25	8.0	3800	1200
11/8/2024	Monthly PCD	1	593	--	20.7	21.2	8.4	4500	1800

*Estimated based on DOC of 6 mg/L and a hardness of 18 mg $CaCO_3$/L

6.11 ADDITIONAL PARAMETERS REQUIRED BY ECOLOGY

Prior to the June 2023 alum treatment, Ecology required that the City collect additional samples for analysis of chloride, calcium, magnesium, potassium, sodium, carbonate (CO_3), and bicarbonate (HCO_3) as part of the APAM permit required monitoring. Tetra Tech collected samples for the above analyses starting the day before treatment. Samples were collected at a depth of 1 m and on occasion at 0.5 m off the bottom. Table 4 summarizes the data results for these additional requested parameters.

For most parameters, there was little difference between concentrations prior to the alum treatment and concentrations post treatment (Table 4). Sodium concentrations in the lake increased following the alum treatment, from an average of 28.3 mg/L to an average of 52.6 mg/L post treatment through December 2023. This increase was expected given that sodium is a main component of the buffer applied during treatment, sodium aluminate. The increase in sodium could have also been partially due to the concentrating effect of lowering lake water levels. Sodium levels in March and June 2024 were less than concentrations in December 2023. All parameters with the exception of chloride, decreased slightly from October 2023 to June 2024, which corresponded to an increase in lake water levels and volume.

Bicarbonate and alkalinity concentrations were very similar throughout the monitoring period and decreased following the treatment as expected. As stated previously, alum is an acidic compound and alkalinity/bicarbonate would be expected to decrease as alum is added. Prior to the alum treatment, bicarbonate averaged 51.1 mg $CaCO_3$/L and alkalinity averaged 53.1 mg $CaCO_3$/L. Post treatment bicarbonate concentrations averaged 33.8 mg $CaCO_3$/L and alkalinity averaged 36.4 mg $CaCO_3$/L through December 2023. This indicates that the majority of the alkalinity in Waughop Lake is due to the presence of bicarbonate in the water. Carbonate concentrations measured before and after the alum treatment were consistently below the detection limit of 1 mg $CaCO_3$/L. This was also expected given that carbonate becomes dominant in waters at pH values greater than 10.3. Bicarbonate is typically the dominant form of the carbonate cycle in surface waters with pH between 6.3 and 10.3.

Table 4. Summary of Additional Water Quality Parameters Requested by Ecology Before and After the June 2023 Alum Treatment.

Date	Time Period	Depth (m)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	HCO3 (mg CaCO3/L)	CO3 (mg CaCO3/L)
6/27/2023	Day Before Treatment	1	4.62	5.99	1.12	3.37	28.5	51	<1.00
		1.8	4.94	5.81	0.913	2.92	28	51.1	<1.00
6/30/2023	Day After Treatment	1	4.73	5.84	0.804	2.73	48.8	32.3	<1.00
		1.8	4.41	5.82	0.816	2.71	48.5	30.6	<1.00
7/13/2023	2 Weeks Post Treatment	1	3.99	6.36	0.876	3.05	50.5	36.9	<1.00
		1.8	3.99	6.47	0.896	2.98	50.8	38	<1.00
8/15/2023	Two Months After	1	4.52	6.74	0.998	4.81	56.6	36.3	<1.00
9/14/2023	Three Months After	1	5.15	6.98	1.06	3.46	62.8	36.7	<1.00
10/11/2023	Four Months After	1	4.62	6.43	1.03	3.51	58.1	32.9	<1.00
12/12/2023	Six Months After	1	4.62	5.74	0.94	3.07	45	26.5	<1.00
3/13/2024	Nine Months After	1	5.36	5.92	0.902	2.77	34.7	25.6	<1.00
5/6/2024	PCD May Event	1	3.99	6.04	0.953	2.88	--	25.6	<1.00
6/27/2024	Twelve Months After	1	4.52	7.23	1.08	3.16	37.1	25	<1.00
8/5/2024	PCD August Event	1	5.47	8.06	1.18	3.59	--	44.7	<1.00
11/8/2024	PCD November Event	1	4.62	6.67	1.11	3.82	--	43.1	<1.00
Pre-Treatment Average			4.78	5.9	1.02	3.15	28.3	51.1	<1.00
Post-Treatment Average			4.61	6.5	0.97	3.27	49.3	33.4	<1.00

7.0 LAKE SEDIMENT MONITORING

Personnel from HAB Aquatics (currently known as SOLitude Lake Management), the contractor who conducted all three alum applications, collected sediment cores from Waughop Lake on the day prior to the March 2020 treatment (March 23, 2020), immediately following the March treatment on March 25, 2020, and immediately following the July 2020 treatment on July 16, 2020. The purpose of collecting the sediment core prior to the March 2020 treatment was to obtain baseline sediment characteristics and data prior to the application of alum. The purpose of collecting the sediment core immediately following the March treatment was mostly to visually see the alum floc layer, however, it was decided to also send the core to the laboratory for analysis. A comparison between the two cores collected in March and the visible alum floc layer is shown in Figure 31. During the July 2020 treatment, the City and Tetra Tech decided to have HAB Aquatics collect a third core upon completion of the application. Analysis of this third core would provide insights into the aluminum binding efficiency and conversion of mobile phosphorus to aluminum bound phosphorus following the March treatment.

Each of the three sediment cores were hand delivered to IEH Analytical Laboratory in Seattle, WA. Each of the cores were sectioned by the laboratory into the following sample increments: 0 to 10 cm, 11 to 20 cm, 21 to 30 cm, and 30 to 40 cm (or until the bottom of the core). The core collected on March 23, 2020 was 43 cm long, the core collected on March 25, 2020 was shorter and only 35 cm long, and the core collected on July 16, 2020 was 40 cm long. Due to budget constraints larger than normal increments, 10 cm vs. 2 or 5 cm, were analyzed for Waughop Lake. Each of the sediment increments were analyzed for the following parameters: TP, loosely-bound phosphorus, iron bound phosphorus, aluminum bound phosphorus, biogenic phosphorus, organic phosphorus, calcium bound phosphorus, total aluminum, total iron, total calcium, % solids, and % water. Unfortunately, due to issues in the laboratory, the core collected on July 16, 2020 was only analyzed for the phosphorus fractions and was not analyzed for total aluminum, total iron, or total calcium. To determine the different phosphorus fractions in each sediment increment, a series of sediment digestions were used by the laboratory as outlined in Rydin & Welch (1998). Laboratory data reports for the three sediment cores are included in Appendix A.

Figure 31. Sediment core collected prior to treatment on March 23, 2020 (left) and sediment core collected immediately following treatment on March 25, 2020 (right) with visible alum floc layer.

7.1 SEDIMENT CORE DATA

Data from the sediment cores collected post alum application on March 25 and July 16, 2020, show the expected increase in Al and aluminum bound phosphorus, and the subsequent decrease in iron bound phosphorus (mobile phosphorus) that is observed after nearly every alum treatment studied (Cooke et al., 2005; Rydin and Welch, 1999; Rydin et al., 2000; Reitzel et al., 2005). The conversion of iron bound phosphorus to stable aluminum bound phosphorus is the primary objective of an alum treatment. Figures 32 and 33 show the profiles of iron bound and aluminum bound phosphorus in the three sediment cores.

Iron bound phosphorus in the top 10 cm was 396 mg/kg prior to the March 2020 alum treatment and 462 mg/kg immediately following the March treatment. Iron bound phosphorus in the top 10 cm of the core collected in July 2020 had decreased to 294 mg/kg (Figure 32). For reference, iron bound phosphorus concentrations in sediments at Lake Ketchum prior to alum ranged from 140 to 215 mg/kg and in Wapato Lake iron bound phosphorus in the top 10 cm ranged from 199 to 368 mg/kg prior to alum. An immediately decrease in iron bound phosphorus was not expected following an application as it takes time for the alum floc to integrate into the lake sediments. So the decrease in iron bound phosphorus observed in the July core was most likely the result of the March treatment. There was a corresponding increase in aluminum bound phosphorus from 1403 mg/kg in the March 23 core to 2096 mg/kg in the July core (Figure 33). Total aluminum, while only available for the two cores collected in March, also increased in the top 10 cm following the treatment. The total aluminum concentration in the top 10 cm of the pre-treatment core was 11,845 mg/kg compared to 13,298 mg/kg in the core immediately collected post-treatment.

There was an overall increase in sediment TP between the core collected pre-treatment and the two cores collected following the March and July applications. This is not unusual as the alum application removes most all

of the particulates and TP from the water column as the floc settles to the lake bottom, which would result in the addition of phosphorus to the sediments.

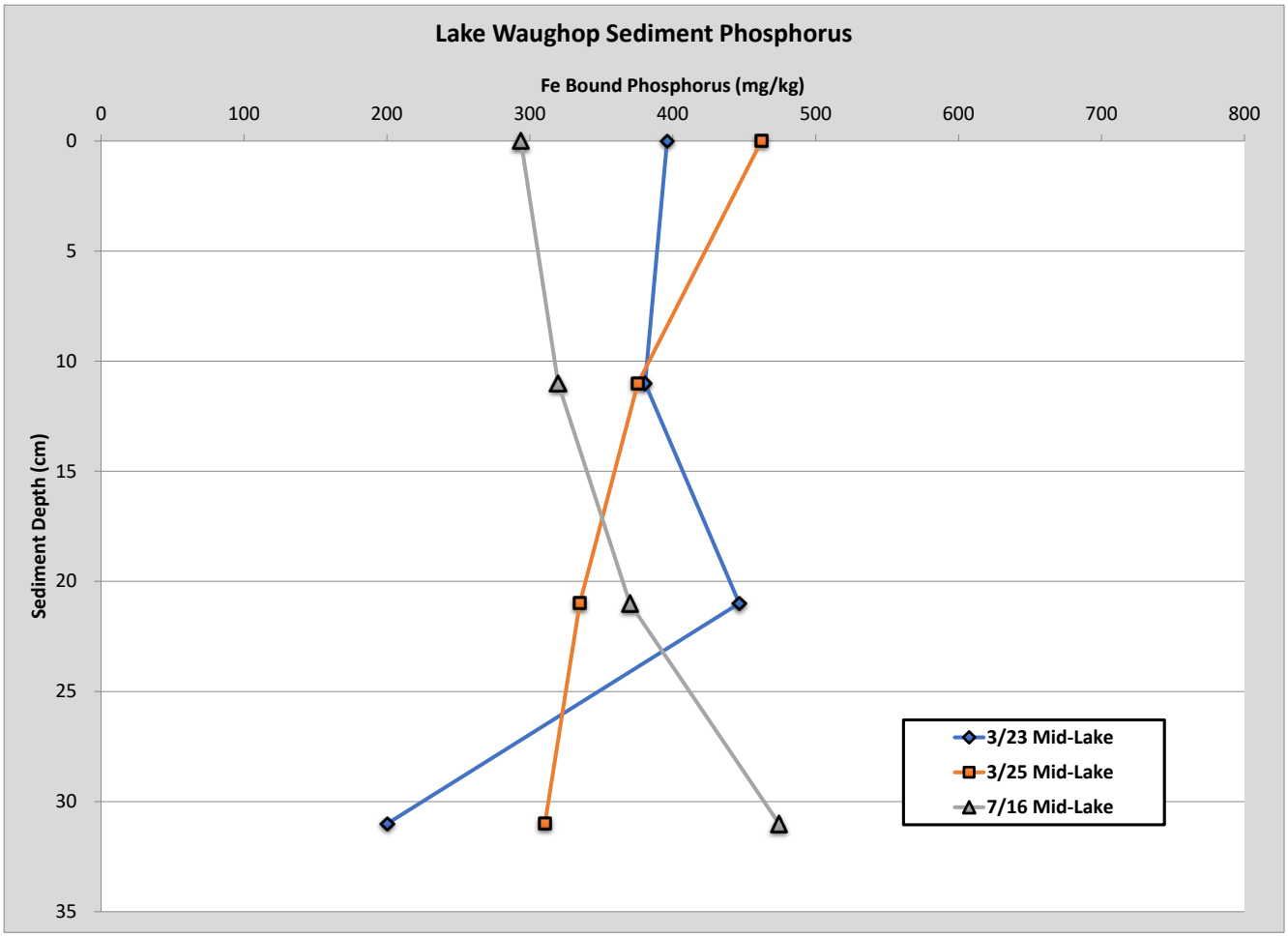

Figure 32. Iron bound phosphorus profiles in Waughop Lake sediments, 2020.

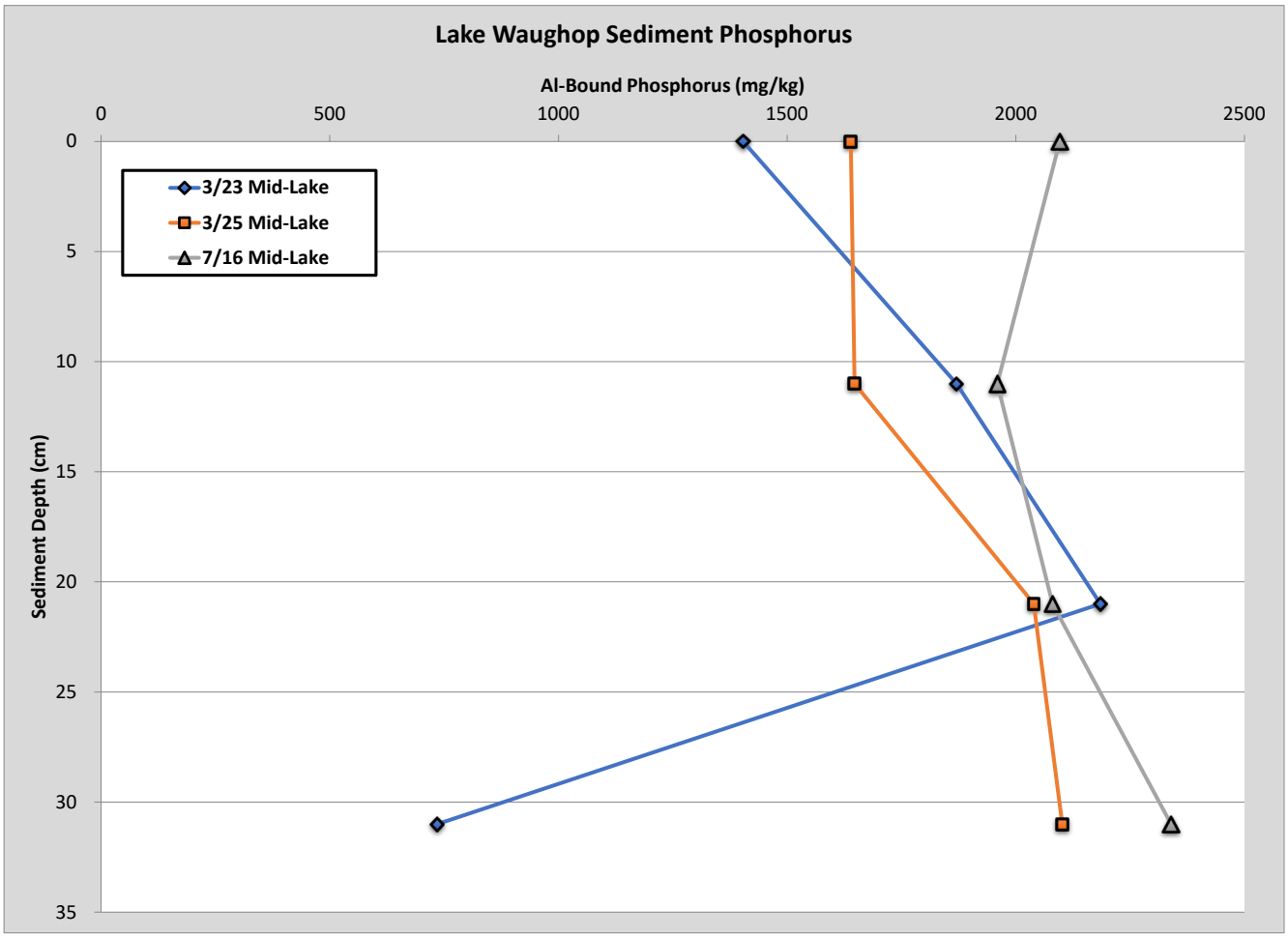

Figure 33. Aluminum bound phosphorus profiles in Waughop Lake sediments, 2020.

8.0 SUMMARY AND DISCUSSION

Following the 2020 treatments, Waughop Lake did not experience a toxic algae bloom for the first time in over a decade. Similar to conditions following the 2020 alum treatments, in 2023, Waughop Lake did not experience a toxic algae bloom. In 2022, the cyanotoxin microcystin was detected at concentrations just above the detection limit but well below the state recreational guideline. The growth of toxic algae was reduced by the two whole-lake buffered alum treatments conducted in March and July 2020 and the whole-lake buffered alum treatment conducted in June 2023. The alum treatments were designed to remove phosphorus from the water column and to inactivate the release of phosphorus from the lake sediments to reduce algal production.

In-situ water quality monitoring was conducted by Tetra Tech staff before, during, and after the alum treatments, with water samples collected for laboratory analysis before and after each treatment. Tetra Tech staff also conducted in-situ monitoring and collected water samples for analysis monthly from May through October 2023. Volunteer monitors associated with PCD conducted monthly monitoring at Waughop Lake May through October in 2021, 2022, 2023, and May through December 2024. Data collected by both Tetra Tech and volunteer monitors associated with PCD was presented in this report. Below is a summary of findings from the 2020 – 2024 monitoring conducted by both Tetra Tech and PCD at Waughop Lake.

- Waughop Lake experienced dramatic water level fluctuations with significant loss of water throughout each summer.
    - Water level decreased steadily over the summer months during all years due to limited recharge, even during 2022 when lake water levels were overall much higher than other years.
    - Water levels in the summer of 2023 and 2024 were much lower than recorded in previous years with minimum gage depths of 3.0 ft – 0.5 to 1.75 ft lower than minimums recorded in 2020 – 2022.
    - Water levels in 2022 were much higher than recorded in other years with a maximum gage measurement of 7.5 ft in May and a low of 4.75 ft in November.
    - Low water levels and lake volumes during the summer have a concentrating effect on nutrients, aluminum, and other parameters.
    - Water level in Waughop Lake is correlated with groundwater levels and reflects direct contact with the shallow groundwater-flow system.
    - The drastic water level decreases in Waughop Lake have a concentrating effect throughout the summer.
    - Lake volume decreased by 38% during the summers of 2020 and 2021, by 34% during the summer of 2022 and by 45% and 44% in 2023 and 2024, respectively.
- Temperature, pH, DO, and conductivity did not vary significantly throughout the water column.
    - Waughop Lake is a shallow lake that mixes frequently throughout the year with no evidence of stratification occurring in the summer.
    - Higher values of pH and DO were most likely due to higher photosynthetic activity in the water column.
    - Conductivity temporarily increased following the alum treatments.
    - There was a slight decrease in water column pH following each alum treatment, but water column average pH never fell below 7.0.
- Alum treatments reduced phosphorus concentrations and internal loading in Waughop Lake.

  - After the 2020 alum treatments, water column TP concentrations remained well below the target range of less than 35 µg/L through March 2021. Average water column TP during the growing season of 2021 was right at the target concentration of 35 µg/L.
  - Despite the concentrating effects of lowering water levels, water column TP after the June 2023 alum treatment remained well below the 35 µg/L target level for the duration of the summer.
  - The mass of phosphorus in Waughop Lake decreased dramatically following the alum treatments and remained low throughout the summer of 2023 and 2024 compared to pre-treatment levels.

- Alum treatments reduced algal production and the occurrence of cyanobacteria blooms in Waughop Lake.
  - Waughop Lake did not experience a toxic bloom in 2020 or 2021 that had been reoccurring every year on record from 2007-2018 (King County, 2018).
  - Chlorophyll concentrations in the lake were below the eutrophic boundary of 9.0 µg/L during 2020 and 2021 and reflected more of a mesotrophic, or well-balanced system.
  - In 2022 chlorophyll concentrations were higher and averaged about 14 µg/L during the growing season. Samples collected for cyanotoxin analysis had detections for microcystin at levels just above the detection limit but well below the state recreational guideline of 8 µg/L.
  - Waughop Lake did not experience a toxic bloom in 2023, even with more than favorable climatic and hydrologic conditions. Chlorophyll concentrations were reduced following the June 2023 treatment from an average of 12.5 µg/L to 5.4 µg/L prior to a large increase in October 2023.
  - Increased water clarity was observed throughout the summers of 2020 and 2023 and to some extent in 2021 due to the decrease in algae.
  - Waughop Lake also did not experience a toxic bloom in 2024 even though chlorophyll concentrations were elevated throughout the year. A sample was collected for cyanotoxin analyses in May 2024 and a second sample was collected in mid-May 2024 for algal identification. There were no cyanobacteria species present in the sample collected in mid-May 2024.

- The alum treatments did temporarily impact lake chemical composition.
  - Concentrations of aluminum and sulfate were temporarily increased in the lake. However, total aluminum concentrations only exceeded the calculated EPA aluminum criteria immediately following treatment, with concentrations decreasing dramatically the day after treatment.
  - Nitrogen and alkalinity were temporarily reduced in the lake as was expected.
  - Concentration of total sulfides varied after the 2023 alum treatment but eventually were well below pre-treatment concentrations and typically below the detection limit.
  - Concentrations of chloride, calcium, magnesium, potassium, and carbonate were unchanged following the 2023 alum treatment.
  - Sodium was temporarily increased but with concentrations trending downwards toward pre-treatment levels.

- Improved water quality in 2020, 2021, and 2023 compared to pre-treatment conditions.
  - After the first alum treatment in March 2020, average TP and chlorophyll were significantly reduced from March 2020 through March 2021. Although average TP and chlorophyll increased slightly during the summer of 2021, TP concentrations were near the target level of 35 µg/L and chlorophyll concentrations were below the eutrophic boundary.
  - Water clarity increased and the Secchi disk was visible to the lake bottom through January 2021. On average water clarity increased significantly from March 2020 through March 2021.

  - After the June 2023 alum treatment, average TP and chlorophyll were substantially reduced throughout the remainder of the 2023 summer.
  - Water clarity increased and the Secchi disk was visible to the lake bottom through September 2023.
  - Higher levels of water clarity in Waughop Lake corresponded with lower observed chlorophyll concentration and a reduction in algal production following all three alum treatments. In all years, there is a decrease in water clarity in the fall which is typically when the lake experiences its lowest water levels.
- Waughop Lake water column nutrient concentrations are influenced by external loading with water recharge in the winter and early spring months, as well as wind and subsequent sediment resuspension due to the shallowness of the lake.

9.0 RECOMMENDATIONS FOR FUTURE WORK

The 2020 and 2023 alum treatments dramatically reduced phosphorus availability in Waughop Lake and prevented the occurrence of a toxic algae bloom in 2020, 2021, 2023 and 2024, even with elevated chlorophyll concentrations in late 2023 and throughout 2024. Water quality improvements resulting from the 2020 treatments lasted through early 2022 but improvements from the 2023 treatments were shorter lived. This is most likely due to continued internal and external loading of phosphorus and adverse climatic and hydrologic conditions, as well as the reduced alum dosing in 2023. Dramatic decreases in water level during the summer growing season, exacerbates eutrophication, sediment resuspension, and increases nutrient concentrations, all potentially leading to higher algal production. Although water quality conditions in Waughop Lake during 2024 were reflective of a eutrophic system, with high chlorophyll concentrations, rather than a more mesotrophic system, there was no documented cyanobacteria bloom or cyanotoxins in the lake in 2024. In 2024 lake volume decreased by almost half during the summer exacerbating eutrophic conditions. A total phosphorus target range of around 35 µg/L is still a reasonable goal for Waughop Lake and will help control dominance by cyanobacteria and potentially toxic algal species. Additional water column phosphorus stripping or sediment inactivation treatments will most likely be needed in the future to continue to limit HAB events. Future treatments could explore modifications to the buffering and/or aluminum trichloride or other products, in addition to or versus alum to accelerate the general water chemistry recovery due to the limited surface water input of calcium, sodium, and flushing of sulfate.

Long-term monitoring in Waughop Lake is recommended to track water quality parameters, observe any changes in the lake, and to continue to monitor the effectiveness of the alum treatments. Long-term monitoring also will provide the necessary data for adaptive management. In addition to monthly sampling for TP, TN, SRP, and chlorophyll, periodic analysis (every other month) for alkalinity, sulfate, TA, DOC, and hardness are recommended. In-situ monitoring to collect profiles of water temperature, DO, pH, and conductivity should also occur monthly. Continued water quality monitoring will allow for adaptive management of the lake and help inform management decisions, such as aquatic plant management and the potential use of other phosphorus inactivation products instead of alum for possible future phosphorus inactivation treatments, if needed. A high degree of water clarity paired with abundant solar energy may allow for an increase in aquatic plant production, so continued monitoring of conditions at Waughop Lake should include observations of changes to aquatic plants such as mapping for density and community structure. Sediment core collection and analysis of phosphorus fractions, as well as TA, total iron, and total calcium, is also recommended to evaluate sediment chemistry pre- and post-treatment.

Since it has become apparent that there is some external loading of nutrients, especially phosphorus, from either groundwater inputs or stormwater runoff, it is recommended that monitoring of these two water sources to the lake also be conducted. Understanding the source and magnitude of nutrient loadings to the lake will help to guide future lake management decisions.

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APPENDIX A: SEDIMENT DATA

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1713770A**	**PAGE**	**1**
REPORT DATE:	**06/23/20**		
DATE SAMPLED:	**03/23,25/20**	**DATE RECEIVED:**	**03/25/20**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON SEDIMENT SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

Two sediment cores were received by the laboratory in good condition and analyzed according to the chain of custody. Phosphorus fractions were determined according to the method of Rydin and Welch. Successive extractions with NH4Cl, Bicarbonate/Dithionate, NaOH, and HCL were performed and analyzed for phosphorus. One part of Organic P was determined by digesting the residue after the inorganic fractions were extracted. Organic P includes the P after the inorganic fractions plus Biogenic P. Total P is the sum of all fractions minus Biogenic P, which is part of the Organic P fraction. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows, while QA/QC data is contained on subsequent pages.

SAMPLE DATA - SEDIMENTS (DRY WT. BASIS)

SAMPLE ID	% SOLIDS	% WATER	TOTAL-P (mg/kg)	LOOSELY BOUND P (NH4CL) (mg/kg)	FE BOUND P (DITHIONATE) (mg/kg)	AL BOUND P (NAOH) (mg/kg)	BIOGENIC P (mg/kg)	CA BOUND P (HCL) (mg/kg)	ORGANIC P (mg/kg)	
Sediment Core 0-10cm	3.77%	96.2%	3809	<2.00	396	1403	1527	156	1853	collected 3/23/20
Sediment Core 11-20cm	4.90%	95.1%	3876	<2.00	381	1870	1101	213	1411	
Sediment Core 21-30cm	7.21%	92.8%	4714	<2.00	446	2185	1491	316	1767	
Sediment Core 31-43cm	6.27%	93.7%	2188	<2.00	200	735	934	118	1134	
Sediment Core 0-10cm	3.77%	96.2%	4077	<2.00	462	1639	1430	168	1807	
Sediment Core 11-20cm	5.03%	95.0%	3529	<2.00	376	1648	1020	184	1322	
Sediment Core 21-30cm	7.03%	93.0%	3881	<2.00	335	2039	941	283	1223	collected 3/25/20
Sediment Core 31-35cm	7.82%	92.2%	4261	<2.00	311	2101	1186	364	1485	

IEH ANALYTICAL LABORATORIES
LABORATORY & CONSULTING SERVICES
3927 AURORA AVENUE NORTH, SEATTLE, WA 98103
PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1713770A**	**PAGE**	**2**
REPORT DATE:	**06/23/20**		
DATE SAMPLED:	**03/23,25/20**	**DATE RECEIVED:**	**03/25/20**

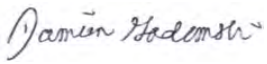
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON SEDIMENT SAMPLES FROM TETRA TECH INC.

QA/QC DATA- SEDIMENTS

QC PARAMETER	% SOLIDS	TOTAL-P (mg/kg)	LOOSELY BOUND P (NH4CL) (mg/kg)	FE BOUND P (DITHIONATE) (mg/kg)	AL BOUND P (NAOH) (mg/kg)	BIOGENIC P (mg/kg)	CA BOUND P (HCL) (mg/kg)	ORGANIC P (mg/kg)
METHOD	SM18 2540B	CALCULATED	SM18 4500PF	SM18 4500PF	SM18 4500PF	EPA 365.1	SM18 4500PF	EPA 365.1
DATE PREPARED	05/28/20	06/01/20	05/29/20	05/29/20	05/29/20	06/01/20	05/29/20	06/01/20
DATE ANALYZED	1.00%	5.00	2.00	2.00	2.00	2.00	2.00	2.00
DETECTION LIMIT								
DUPLICATE								
SAMPLE ID	Sediment Core 31-35cm	Sediment Core 31-35cm	Sediment Core 31-35cm	Sediment Core 31-35cm	Sediment Core 31-35cm	Sediment Core 31-35cm	Sediment Core 31-35cm	Sediment Core 31-35cm
ORIGINAL	7.82%	4261	<2.00	311	2101	1186	364	1485
DUPLICATE	7.86%	4323	<2.00	328	2137	1201	367	1491
RPD	0.56%	1.43%	NC	5.35%	1.66%	1.27%	0.74%	0.41%
SPIKE SAMPLE								
SAMPLE ID								
ORIGINAL								
SPIKED SAMPLE								
SPIKE ADDED	NA	NA	NA	NA	NA	NA	NA	NA
% RECOVERY								
QC CHECK (mg/l)								
FOUND			0.042	0.042	0.042	0.097	0.042	0.097
TRUE			0.039	0.039	0.039	0.094	0.039	0.094
% RECOVERY	NA	NA	107.69%	107.69%	107.69%	103.19%	107.69%	103.19%
BLANK	NA	NA	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski
Project Manager

IEH ANALYTICAL LABORATORIES
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CASE FILE NUMBER:	**1713770B**	**PAGE**	**1**
REPORT DATE:	**06/23/20**		
DATE SAMPLED:	**03/23,25/20**	**DATE RECEIVED:**	**03/25/20**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON SEDIMENT SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

Two sediment cores were received by the laboratory and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows, while QA/QC data is contained on subsequent pages.

SAMPLE DATA - SEDIMENTS (DRY WT. BASIS)

SAMPLE ID	% SOLIDS	% WATER	ALUMINUM (mg/kg)	IRON (mg/kg)	CALCIUM (mg/kg)	MERCURY (mg/kg)	
Sediment Core 0-10cm	3.77%	96.2%	11845	7783	8055	<0.50	collected 3/23/20
Sediment Core 11-20cm	4.90%	95.1%	15674	9831	8674	<0.50	
Sediment Core 21-30cm	7.21%	92.8%	16485	13103	8392	<0.50	
Sediment Core 31-43cm	6.27%	93.7%	8118	5611	6419		
Sediment Core 0-10cm	3.77%	96.2%	13298	9729	8534	<0.50	
Sediment Core 11-20cm	5.03%	95.0%	13744	9416	9106	<0.50	
Sediment Core 21-30cm	7.03%	93.0%	16019	10875	9130	<0.50	collected 3/25/20
Sediment Core 31-35cm	7.82%	92.2%	16476	12508	9316		

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CASE FILE NUMBER:	**1713770B**	**PAGE**	**2**
REPORT DATE:	**06/23/20**		
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FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON SEDIMENT SAMPLES FROM TETRA TECH INC.

QA/QC DATA- SEDIMENTS

QC PARAMETER	% SOLIDS	ALUMINUM (mg/kg)	IRON (mg/kg)	CALCIUM (mg/kg)	MERCURY (mg/kg)
METHOD	SM18 2540B	EPA 6010	EPA 6010	EPA 6010	EPA 6020
DATE ANALYZED	05/28/20	05/29/20	05/29/20	05/29/20	05/27/20
DETECTION LIMIT	1.00%	2.00	2.00	2.00	0.50
DUPLICATE					
SAMPLE ID	Sediment Core 31-35cm	BATCH	BATCH	BATCH	BATCH
ORIGINAL	7.82%	<2.00	<2.00	<2.00	<0.50
DUPLICATE	7.86%	<2.00	<2.00	<2.00	<0.50
RPD	0.56%	NC	NC	NC	NC
SPIKE SAMPLE					
SAMPLE ID					
ORIGINAL					
SPIKED SAMPLE					
SPIKE ADDED					
% RECOVERY	NA	NA	NA	NA	NA
QC CHECK **(mg/L)**					
FOUND		0.466	0.528	9.87	0.002
TRUE		0.500	0.500	10.0	0.002
% RECOVERY	NA	93.20%	105.60%	98.70%	105.00%
BLANK	NA	<2.00	<2.00	<2.00	<0.50

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski
Project Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
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Chain of Custody Form 1713770

Page ___ of ___

Return to Agent

REPORT TO:
Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo, Harry Gibbons
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 206-838-6258 Fax

INVOICE TO: (IF DIFFEREN ...OM REPORT)
Client: Same
Addres
Contac
Email:
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☐ Email ☐ Mail

QC Data Reported
☐ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard

Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

SAMPLING			SAMPLE DESCRIPTION		Number of Containers	Analysis Requested															LAB USE ONLY		
Date (mm-dd-yy)	Time	Matrix**	(This Will Appear On The Report)			% water	solids	total organic	total organic P	Biogenic Phosphorus	Total Phosphorus	mobile P	Fe-P	Al-P	Ca-P	Total Aluminum	Total Fe	total Calcium	Total Hg	methyl Hg	Containers Received	Case File Number	
																						Temp	Lab ID
23-Mar		Sediment core		Sediment core	1																		
		0-10 cm		0-10 cm		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			41881
		11-20 cm		11-20 cm		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			41882
		21-30 cm		21-30 cm		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			41883
		~~31-50 cm~~	31-43cm	~~31-50 cm~~ 31-43		x	x	x	x	x	x	x	x	x	x	x	x	x					41884
		~~51-70 cm~~		~~51-70 cm~~		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
		~~71-90 cm~~		~~71-90 cm~~		x	x	x	x	x	x	x	x	x	x	x	x	x					
3/25/2020		Sediment core			1																		
		0-10 cm				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			41885
		11-20 cm				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			41886
		21-30 cm				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			41887
		~~31-50 cm~~	31-35cm			x	x	x	x	x	x	x	x	x	x	x	x	x					41888
		~~51-70 cm~~				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
		~~71-90 cm~~				x	x	x	x	x	x	x	x	x	x	x	x	x					

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:

Sampled By	Date	Time
Received By	Date	Time
Relinquished to IAL By (Signature)	Date	Time

Shipped By
Shipping Reference
Received at IAL By: Samuels
Date: 3/25/20 Time:

IEH ANALYTICAL LABORATORIES
LABORATORY & CONSULTING SERVICES
3927 AURORA AVENUE NORTH, SEATTLE, WA 98103
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CASE FILE NUMBER:	**1715123A**	**PAGE**	**1**
REPORT DATE:	**08/15/20**		
DATE SAMPLED:	**07/16/20**	**DATE RECEIVED:**	**07/16/20**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON SEDIMENT SAMPLES FROM TETRA TECH

CASE NARRATIVE

Four sediment samples were received by the laboratory in good condition and analyzed according to the chain of custody. Phosphorus fractions were determined according to the method of Rydin and Welch. Successive extractions with NH4Cl, Bicarbonate/Dithionate, NaOH, and HCL were performed and analyzed for phosphorus. One part of Organic P was determined by digesting the residue after the inorganic fractions were extracted. Organic P includes the P after the inorganic fractions plus Biogenic P. Total P is the sum of all fractions minus Biogenic P, which is part of the Organic P fraction. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows, while QA/QC data is contained on subsequent pages.

SAMPLE DATA - SEDIMENTS (DRY WT. BASIS)

SAMPLE ID	% SOLIDS	% WATER	TOTAL-P (mg/kg)	LOOSELY BOUND P (NH4CL) (mg/kg)	FE BOUND P (DITHIONATE) (mg/kg)	AL BOUND P (NAOH) (mg/kg)	BIOGENIC P (mg/kg)	CA BOUND P (HCL) (mg/kg)	ORGANIC P (mg/kg)
Warghop 0-10cm	3.25%	96.8%	5204	<2.00	294	2096	2228	113	2702
Warghop 11-20cm	4.85%	95.1%	3862	<2.00	320	1959	1183	156	1427
Warghop 21-30cm	6.17%	93.8%	4024	<2.00	370	2080	995	145	1429
Warghop 31-40cm	7.34%	92.7%	4191	<2.00	474	2340	889	247	1130

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CASE FILE NUMBER:	**1715123A**	**PAGE**	**2**
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FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON SEDIMENT SAMPLES FROM TETRA TECH

QA/QC DATA- SEDIMENTS

QC PARAMETER	% SOLIDS	TOTAL-P (mg/kg)	LOOSELY BOUND P (NH4CL) (mg/kg)	FE BOUND P (DITHIONATE) (mg/kg)	AL BOUND P (NAOH) (mg/kg)	BIOGENIC P (mg/kg)	CA BOUND P (HCL) (mg/kg)	ORGANIC P (mg/kg)
METHOD	SM18 2540B	CALCULATED	SM18 4500PF	SM18 4500PF	SM18 4500PF	EPA 365.1	SM18 4500PF	EPA 365.1
DATE PREPARED	08/05/20	08/10/20	08/06/20	08/06/20	08/07/20	08/10/20	08/07/20	08/10/20
DATE ANALYZED	1.00%	5.00	2.00	2.00	2.00	2.00	2.00	2.00
DETECTION LIMIT								
DUPLICATE								
	Warghop 31-40cm	Warghop 31-40cm	Warghop 31-40cm	Warghop 31-40cm	Warghop 31-40cm	Warghop 31-40cm	Warghop 31-40cm	Warghop 31-40cm
SAMPLE ID	7.34%	4191	<2.00	474	2340	889	247	1130
ORIGINAL	7.42%	4201	<2.00	423	2436	867	248	1094
DUPLICATE	0.98%	0.23%	NC	11.30%	4.02%	2.46%	0.28%	3.26%
RPD								
SPIKE SAMPLE								
SAMPLE ID								
ORIGINAL								
SPIKED SAMPLE								
SPIKE ADDED	NA	NA	NA	NA	NA	NA	NA	NA
% RECOVERY								
QC CHECK (mg/l)								
FOUND			0.040	0.040	0.039	0.099	0.039	0.099
TRUE			0.039	0.039	0.039	0.094	0.039	0.094
% RECOVERY	NA	NA	102.56%	102.56%	100.00%	105.32%	100.00%	105.32%
BLANK	NA	NA	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski
Project Manager

IEH Analytical Laboratories
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Chain of Custody Form

Page ____ of ____

REPORT TO:
Client: Tetra Tech
Address:
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: Fax:

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client:
Address:
Contact:
Email:
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project:

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Day ☒ Standard
Specific Date:
*Advanced notice required for Rush Analysis

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

LAB USE ONLY
Case File Number
Containers Received
Temp
Lab ID

SAMPLING		SAMPLE DESCRIPTION	Number of Containers	Analysis Requested																
Date (mm-dd-yy)	Matrix	(This Will Appear On The Report)		% water	% solids	Total Phosphorus	Loosely sorbed P	Fe-P	Al-P	Ca-P	Organic P	Biogenic P	Total Iron	Total Aluminum	Total Calcium	Total Mercury				
7/16/20	sediment	Wayshop 0-10 cm																		
		Wayshop 11-20 cm																		
		" 21-30 cm																		
		" 31-40 cm																		

Sample Retension Policy: Environmental - 90 days; Food & Perishables - 14 days

Comments:

	Date	Time
Sampled By: Iris Lippert		
Received By:		
Relinquished to IAL By (Signature):	7/16/20	4:42 PM

Shipped By:
Shipping Reference:
Received at IAL By:
Date: 7-16-20 Time: 4:40

APPENDIX B: FIELD DATA TABLES

Table B-1. Waughop Lake Field Monitoring Data Collected by Tetra Tech, 2020-2021.

Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Secchi (m)	Notes
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	0	10.22	0.044	13.85	8.35	0.93	
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	0.5	10.23	0.044	13.93	8.36		
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	1	10.19	0.044	13.99	8.37		
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	1.5	10.04	0.044	13.75	8.12		
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	2	9.32	0.046	12.02	7.60		
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	2.5	8.98	0.053	10.77	7.27		
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	0	10.64	0.044	13.49	8.09	1.1	
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	0.5	10.61	0.044	13.45	8.02		
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	1	10.59	0.044	13.33	7.97		
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	1.5	10.28	0.044	13.48	8.03		
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	2	9.62	0.046	11.85	7.64		
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	2.5	9.04	0.060	2.72	6.81		
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	0	10.19	0.045	13.02	8.25	0.95	
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	0.5	10.19	0.045	13.02	8.19		
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	1	10.17	0.045	12.98	8.13		
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	1.5	10.11	0.045	12.79	8.04		
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	2	10.07	0.045	12.90	7.59		
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	2.5	9.64	0.091	5.10	6.98		
3/24/2020	2020	10:15 AM	Station #2	During treatment	0	10.15	0.045	12.99	7.80	0.9	
3/24/2020	2020	10:15 AM	Station #2	During treatment	0.5	10.18	0.045	13.11	7.98		
3/24/2020	2020	10:15 AM	Station #2	During treatment	1	10.18	0.045	13.02	8.03		
3/24/2020	2020	10:15 AM	Station #2	During treatment	1.5	9.99	0.045	12.42	7.71		
3/24/2020	2020	10:15 AM	Station #2	During treatment	2	9.82	0.045	10.74	7.44		
3/24/2020	2020	10:15 AM	Station #2	During treatment	2.5	9.45	0.050	4.80	7.01		
3/24/2020	2020	10:30 AM	East bank 10 mins after passing	During treatment	0	10.22	0.058	13.16	7.12		
3/24/2020	2020	10:30 AM	East bank 10 mins after passing	During treatment	0.5	10.23	0.066	13.12	7.14		
3/24/2020	2020	10:30 AM	East bank 10 mins after passing	During treatment	1	10.23	0.080	13.09	7.14		
3/24/2020	2020	10:30 AM	East bank 10 mins after passing	During treatment	1.5	10.22	0.107	12.91	7.03		
3/24/2020	2020	10:30 AM	East bank 10 mins after passing	During treatment	1.8	10.23	0.140	12.84	6.70		
3/24/2020	2020	1:00 PM	East bank	During treatment	0	10.44	0.051	13.58	8.45	1	
3/24/2020	2020	1:00 PM	East bank	During treatment	0.5	10.45	0.052	13.86	8.45		
3/24/2020	2020	1:00 PM	East bank	During treatment	1	10.42	0.052	14.29	8.33		
3/24/2020	2020	1:00 PM	East bank	During treatment	1.5	10.41	0.052	14.05	8.21		
3/24/2020	2020	1:00 PM	East bank	During treatment	1.8	10.37	0.083	13.33	7.94		

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Secchi (m)	Notes
3/24/2020	2020	1:30 PM	North end 10 mins after passing	During treatment	0	10.36	0.084	13.41	7.94	1	
3/24/2020	2020	1:30 PM	North end 10 mins after passing	During treatment	0.5	10.38	0.069	13.61	7.99		
3/24/2020	2020	1:30 PM	North end 10 mins after passing	During treatment	1	10.37	0.086	13.37	8.02		
3/24/2020	2020	1:30 PM	North end 10 mins after passing	During treatment	1.5	10.19	0.127	13.03	7.91		
3/24/2020	2020	1:30 PM	North end 10 mins after passing	During treatment	2	10.27	0.149	13.29	7.80		
3/24/2020	2020	1:30 PM	North end 10 mins after passing	During treatment	2.5	10.27	0.156	12.74	7.74		
3/24/2020	2020	1:30 PM	North end 10 mins after passing	During treatment	3	10.17	0.101	12.48	7.83		
3/24/2020	2020	2:00 PM	Station #2	During treatment	0	10.31	0.083	12.60	7.73	1.1	floc visible
3/24/2020	2020	2:00 PM	Station #2	During treatment	0.5	10.32	0.084	12.51	7.69		
3/24/2020	2020	2:00 PM	Station #2	During treatment	1	10.05	0.097	12.40	7.65		
3/24/2020	2020	2:00 PM	Station #2	During treatment	1.5	10.07	0.140	12.32	7.58		
3/24/2020	2020	2:00 PM	Station #2	During treatment	2	10.16	0.161	12.46	7.54		
3/24/2020	2020	2:00 PM	Station #2	During treatment	2.5	9.78	0.090	8.63	7.30		
3/24/2020	2020	11:30 AM	Mid-Lake Station	During treatment	0	10.30	0.091	12.60	7.66	1.15	
3/24/2020	2020	11:30 AM	Mid-Lake Station	During treatment	0.5	10.28	0.096	12.39	7.64		
3/24/2020	2020	11:30 AM	Mid-Lake Station	During treatment	1	10.29	0.107	12.39	7.63		
3/24/2020	2020	11:30 AM	Mid-Lake Station	During treatment	1.5	10.24	0.143	12.29	7.61		
3/24/2020	2020	11:30 AM	Mid-Lake Station	During treatment	2	10.16	0.167	12.23	7.84		
3/24/2020	2020	11:30 AM	Mid-Lake Station	During treatment	2.5	9.75	0.146	11.45	7.89		
3/24/2020	2020	6:00 PM	East bank	During treatment	0	10.59	0.083	13.37	7.96	1.4	
3/24/2020	2020	6:00 PM	East bank	During treatment	0.5	10.55	0.087	13.80	7.92		
3/24/2020	2020	6:00 PM	East bank	During treatment	1	10.48	0.088	13.52	7.85		
3/24/2020	2020	6:00 PM	East bank	During treatment	1.5	10.46	0.090	13.55	7.78		
3/24/2020	2020	6:00 PM	North end	During treatment	0	10.44	0.110	12.93	7.80	1.8	
3/24/2020	2020	6:00 PM	North end	During treatment	0.5	10.46	0.110	13.15	7.82		
3/24/2020	2020	6:00 PM	North end	During treatment	1	10.47	0.110	13.60	7.80		
3/24/2020	2020	6:00 PM	North end	During treatment	1.5	10.40	0.133	13.13	7.74		
3/24/2020	2020	6:00 PM	North end	During treatment	2	10.29	0.145	12.80	7.65		
3/24/2020	2020	6:00 PM	North end	During treatment	2.5	10.26	0.173	12.80	7.57		
3/24/2020	2020	6:00 PM	North end	During treatment	3	10.21	0.180	12.73	7.28		
3/24/2020	2020	6:00 PM	Mid-Lake Station	During treatment	0	10.43	0.114	13.20	7.61	1.7	
3/24/2020	2020	6:00 PM	Mid-Lake Station	During treatment	0.5	10.53	0.121	13.20	7.73		
3/24/2020	2020	6:00 PM	Mid-Lake Station	During treatment	1	10.51	0.133	13.09	7.75		
3/24/2020	2020	6:00 PM	Mid-Lake Station	During treatment	1.5	10.45	0.196	13.12	7.71		
3/24/2020	2020	6:00 PM	Mid-Lake Station	During treatment	2	10.51	0.267	12.86	7.68		

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Secchi (m)	Notes
3/24/2020	2020	6:00 PM	Mid-Lake Station	During treatment	2.5	10.39	0.236	12.85	7.71		
3/24/2020	2020	6:00 PM	Station #2	During treatment	0	10.59	0.136	12.99	8.20	1.7	floc still faintly visible
3/24/2020	2020	6:00 PM	Station #2	During treatment	0.5	10.63	0.151	12.78	8.14		
3/24/2020	2020	6:00 PM	Station #2	During treatment	1	10.62	0.157	13.09	8.08		
3/24/2020	2020	6:00 PM	Station #2	During treatment	1.5	10.58	0.164	12.96	7.95		
3/24/2020	2020	6:00 PM	Station #2	During treatment	2	10.53	0.263	13.14	7.89		
3/24/2020	2020	6:00 PM	Station #2	During treatment	2.5	9.93	0.178	12.27	7.71		
3/25/2020	2020	10:00 AM	Mid-Lake Station	During treatment	0	9.87	0.164	12.81	8.22	2.50	
3/25/2020	2020	10:00 AM	Mid-Lake Station	During treatment	0.5	9.95	0.166	12.95	8.03		
3/25/2020	2020	10:00 AM	Mid-Lake Station	During treatment	1	9.93	0.167	13.10	7.98		
3/25/2020	2020	10:00 AM	Mid-Lake Station	During treatment	1.5	9.95	0.204	12.99	8.02		
3/25/2020	2020	10:00 AM	Mid-Lake Station	During treatment	2	9.97	0.246	12.68	8.33		
3/25/2020	2020	10:00 AM	Mid-Lake Station	During treatment	2.5	9.91	0.233	8.59	8.08		
3/25/2020	2020	10:00 AM	Station #2	During treatment	0	9.82	0.157	13.04	7.85	2.4	
3/25/2020	2020	10:00 AM	Station #2	During treatment	0.5	9.91	0.157	12.84	7.79		
3/25/2020	2020	10:00 AM	Station #2	During treatment	1	9.87	0.192	12.64	7.85		
3/25/2020	2020	10:00 AM	Station #2	During treatment	1.5	9.89	0.245	12.69	7.93		
3/25/2020	2020	10:00 AM	Station #2	During treatment	2	9.91	0.276	12.81	7.80		
3/25/2020	2020	10:00 AM	Station #2	During treatment	2.5	9.82	0.154	6.90	7.50		
3/25/2020	2020	10:30 AM	East bank	During treatment	0	9.92	0.152	12.94	7.51	1.9	
3/25/2020	2020	10:30 AM	East bank	During treatment	0.5	9.89	0.154	13.01	7.50		
3/25/2020	2020	10:30 AM	East bank	During treatment	1	9.91	0.156	13.12	7.50		
3/25/2020	2020	10:30 AM	East bank	During treatment	1.5	9.92	0.162	13.08	7.51		
3/25/2020	2020	10:30 AM	East bank	During treatment	1.7	9.93	0.162	12.17	7.48		
3/25/2020	2020	10:30 AM	North end	During treatment	0	10.03	0.164	12.81	7.44	2.9	
3/25/2020	2020	10:30 AM	North end	During treatment	0.5	10.04	0.167	12.95	7.44		
3/25/2020	2020	10:30 AM	North end	During treatment	1	10.09	0.202	12.94	7.46		
3/25/2020	2020	10:30 AM	North end	During treatment	1.5	10.19	0.236	12.90	7.49		
3/25/2020	2020	10:30 AM	North end	During treatment	2	10.18	0.252	12.64	7.49		
3/25/2020	2020	10:30 AM	North end	During treatment	2.5	10.13	0.250	12.43	7.48		
3/25/2020	2020	10:30 AM	North end	During treatment	3	9.60	0.238	11.64	7.33		
3/25/2020	2020	1:00 PM	Station #2	Post-treatment	0	10.16	0.176	12.98	7.49	2.3	
3/25/2020	2020	1:00 PM	Station #2	Post-treatment	0.5	10.17	0.173	13.17	7.55		
3/25/2020	2020	1:00 PM	Station #2	Post-treatment	1	10.11	0.209	13.02	7.58		
3/25/2020	2020	1:00 PM	Station #2	Post-treatment	1.5	10.11	0.300	13.15	6.83		
3/25/2020	2020	1:00 PM	Station #2	Post-treatment	2	10.13	0.339	13.18	5.81		
3/25/2020	2020	1:00 PM	Station #2	Post-treatment	2.5	10.15	0.241	12.98	5.39		
3/25/2020	2020	1:00 PM	Mid-Lake Station	Post-treatment	0	10.41	0.188	12.78	7.57	2.3	
3/25/2020	2020	1:00 PM	Mid-Lake Station	Post-treatment	0.5	10.41	0.188	12.89	7.92		
3/25/2020	2020	1:00 PM	Mid-Lake Station	Post-treatment	1	10.34	0.192	12.77	7.75		
3/25/2020	2020	1:00 PM	Mid-Lake Station	Post-treatment	1.5	10.15	0.231	13.02	7.70		

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Secchi (m)	Notes
3/25/2020	2020	1:00 PM	Mid-Lake Station	Post-treatment	2	10.20	0.312	13.13	8.33		
3/25/2020	2020	1:00 PM	Mid-Lake Station	Post-treatment	2.5	10.14	0.253	10.83	8.16		
3/25/2020	2020	2:00 PM	North end	Post-treatment	0	10.53	0.192	13.11	7.32	2.6	
3/25/2020	2020	2:00 PM	North end	Post-treatment	0.5	10.38	0.205	13.04	7.30		
3/25/2020	2020	2:00 PM	North end	Post-treatment	1	10.27	0.224	12.69	7.29		
3/25/2020	2020	2:00 PM	North end	Post-treatment	1.5	10.16	0.243	13.24	7.31		
3/25/2020	2020	2:00 PM	North end	Post-treatment	2	10.17	0.279	12.92	7.34		
3/25/2020	2020	2:00 PM	North end	Post-treatment	2.5	10.18	0.317	13.02	7.60		
3/25/2020	2020	2:00 PM	North end	Post-treatment	2.9	9.87	0.289	4.09	7.30		
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	0	9.730	0.23	12.60	8.25	2.5	
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	0.5	9.73	0.228	12.20	8.17		
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	1	9.74	0.228	12.25	8.06		
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	1.5	9.74	0.228	12.31	8.01		
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	2	9.73	0.228	12.37	7.93		
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	2.5	9.98	0.171	4.05	7.57		
3/26/2020	2020	11:00	Station #2	Post-treatment	0	9.99	0.246	12.13	7.44	2.3	
3/26/2020	2020	11:00	Station #2	Post-treatment	0.5	9.99	0.247	12.26	7.42		
3/26/2020	2020	11:00	Station #2	Post-treatment	1	10.00	0.248	12.26	7.41		
3/26/2020	2020	11:00	Station #2	Post-treatment	1.5	9.99	0.247	12.35	7.39		
3/26/2020	2020	11:00	Station #2	Post-treatment	2	9.96	0.243	12.42	7.39		
3/26/2020	2020	11:00	Station #2	Post-treatment	2.5	9.94	0.168	1.70	7.19		
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	0	13.52	0.231	9.59	8.23	2.3	
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	0.5	13.51	0.231	9.72	7.98		
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	1	13.51	0.231	9.58	7.88		
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	1.5	13.51	0.231	9.68	7.75		
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	2	13.51	0.231	9.66	7.64		
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	2.5	13.45	0.231	9.15	7.55		
4/10/2020	2020	11:00	Station #2	Post-treatment	0	13.65	0.231	9.66	7.40	2.2	
4/10/2020	2020	11:00	Station #2	Post-treatment	0.5	13.62	0.232	9.47	7.33		
4/10/2020	2020	11:00	Station #2	Post-treatment	1	13.66	0.231	9.52	7.27		
4/10/2020	2020	11:00	Station #2	Post-treatment	1.5	13.64	0.231	9.57	7.24		
4/10/2020	2020	11:00	Station #2	Post-treatment	2	13.61	0.231	9.59	7.20		
4/10/2020	2020	11:00	Station #2	Post-treatment	2.3	12.20	0.170	3.31	6.83		
5/27/2020	2020	14:30	Mid-Lake Station	Monthly Sampling	0	20.94	0.233	7.44	8.07	2.00	GAGE 5.5' note: DO probe calibration issues
5/27/2020	2020	14:30	Mid-Lake Station	Monthly Sampling	0.5	20.88	0.232	7.46	8.05		
5/27/2020	2020	14:30	Mid-Lake Station	Monthly Sampling	1	20.73	0.232	7.61	8.01		
5/27/2020	2020	14:30	Mid-Lake Station	Monthly Sampling	1.5	19.91	0.231	7.93	8.17		
5/27/2020	2020	14:30	Mid-Lake Station	Monthly Sampling	2	19.96	0.252	3.11	7.06		
6/18/2020	2020	11:00	Mid-Lake Station	Monthly Sampling	0	20.65	0.236	9.83	8.06	2.2	GAGE 5.35'
6/18/2020	2020	11:00	Mid-Lake Station	Monthly Sampling	0.5	20.75	0.234	9.85	8.04		
6/18/2020	2020	11:00	Mid-Lake Station	Monthly Sampling	1	20.67	0.234	10.08	8.03		

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Secchi (m)	Notes
6/18/2020	2020	11:00	Mid-Lake Station	Monthly Sampling	1.5	20.57	0.234	10.17	8.00		
6/18/2020	2020	11:00	Mid-Lake Station	Monthly Sampling	2	20.37	0.234	10.27	7.98		
6/18/2020	2020	11:00	Mid-Lake Station	Monthly Sampling	2.5	20.06	0.276	2.28	6.74		
7/13/2020	2020	12:00	Mid-Lake Station	Pre-Treatment	0	22.79	0.247	10.23	8.82	2	secchi at bottom
7/13/2020	2020	12:00	Mid-Lake Station	Pre-Treatment	0.5	22.78	0.246	10.19	8.83		
7/13/2020	2020	12:00	Mid-Lake Station	Pre-Treatment	1	22.78	0.247	10.41	8.82		
7/13/2020	2020	12:00	Mid-Lake Station	Pre-Treatment	1.5	22.78	0.246	10.65	8.80		
7/13/2020	2020	12:00	Mid-Lake Station	Pre-Treatment	1.8	22.78	0.247	9.51	7.09		
7/13/2020	2020	12:30	Station #2	Pre-Treatment	0	22.92	0.248	10.56	8.72	2.10	secchi bottom. Lake level 4.8'
7/13/2020	2020	12:30	Station #2	Pre-Treatment	0.5	22.92	0.248	10.55	8.73		
7/13/2020	2020	12:30	Station #2	Pre-Treatment	1	22.92	0.247	10.45	8.73		
7/13/2020	2020	12:30	Station #2	Pre-Treatment	1.5	22.92	0.248	10.76	8.72		
7/13/2020	2020	12:30	Station #2	Pre-Treatment	1.9	22.94	0.247	10.66	8.73		
7/14/2020	2020	9:00	Mid-Lake Station	During treatment	0	22.73	0.247	10.68	8.73	2.15	
7/14/2020	2020	9:00	Mid-Lake Station	During treatment	0.5	22.75	0.247	10.54	8.70		
7/14/2020	2020	9:00	Mid-Lake Station	During treatment	1	22.71	0.247	10.42	8.64		
7/14/2020	2020	9:00	Mid-Lake Station	During treatment	1.5	22.58	0.248	10.59	8.61		
7/14/2020	2020	9:00	Mid-Lake Station	During treatment	2	22.49	0.250	10.46	8.54		
7/14/2020	2020	9:00	Mid-Lake Station	During treatment	2.4	22.05	0.273	3.68	7.36		reading 2.4m in bottom muck
7/14/2020	2020	9:30	Station #2	During treatment	0	22.74	0.248	10.32	8.61	1.60	in floc ~10 mins after passing. Secchi in much
7/14/2020	2020	9:30	Station #2	During treatment	0.5	22.72	0.251	10.38	8.55		
7/14/2020	2020	9:30	Station #2	During treatment	1	22.69	0.289	10.31	8.29		
7/14/2020	2020	9:30	Station #2	During treatment	1.5	22.70	0.311	10.48	8.15		
7/14/2020	2020	9:30	Station #2	During treatment	2	22.47	0.311	10.30	7.82		
7/14/2020	2020	9:30	In floc just after pass	During treatment	0	22.57	0.333	10.16	8.15		
7/14/2020	2020	9:30	In floc just after pass	During treatment	0.5	22.67	0.341	10.35	8.19		
7/14/2020	2020	9:30	In floc just after pass	During treatment	1	22.65	0.337	10.53	8.10		
7/14/2020	2020	9:30	In floc just after pass	During treatment	1.5	22.44	0.346	10.24	8.16		
7/14/2020	2020	9:30	In floc just after pass	During treatment	1.8	22.19	0.340	2.60	7.20		reading in bottom much
7/14/2020	2020	11:30	Mid-Lake Station	During treatment	0	23.02	0.276	10.22	8.04	1.6	recently treated
7/14/2020	2020	11:30	Mid-Lake Station	During treatment	0.5	23.01	0.281	10.28	8.03		
7/14/2020	2020	11:30	Mid-Lake Station	During treatment	1	22.93	0.328	10.43	8.07		
7/14/2020	2020	11:30	Mid-Lake Station	During treatment	1.5	22.83	0.338	10.64	8.10		
7/14/2020	2020	11:30	Mid-Lake Station	During treatment	2	22.74	0.324	10.53	8.05		
7/14/2020	2020	11:30	Station #2	During treatment	0	23.21	0.268	10.33	8.14	2	
7/14/2020	2020	11:30	Station #2	During treatment	0.5	23.21	0.272	10.38	8.16		

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Secchi (m)	Notes
7/14/2020	2020	11:30	Station #2	During treatment	1	23.19	0.279	10.54	8.16		
7/14/2020	2020	11:30	Station #2	During treatment	1.5	23.19	0.285	10.57	8.17		
7/14/2020	2020	11:30	Station #2	During treatment	2	23.20	0.319	13.67	8.06		reading in bottom
7/14/2020	2020	12:00	West side in untreated area	During treatment	0	23.18	0.271	10.36	8.21	1.5	secchi at bottom
7/14/2020	2020	12:00	West side in untreated area	During treatment	0.5	23.20	0.275	1018.00	8.21		
7/14/2020	2020	12:00	West side in untreated area	During treatment	1	22.82	0.257	10.53	8.24		
7/14/2020	2020	12:00	West side in untreated area	During treatment	1.5	22.90	0.320	0.55	6.91		reading at bottom
7/14/2020	2020	12:00	North end	During treatment	0	23.53	0.276	10.16	8.01	2.2	secchi at bottom
7/14/2020	2020	12:00	North end	During treatment	0.5	23.14	0.279	10.30	8.04		
7/14/2020	2020	12:00	North end	During treatment	1	22.84	0.299	10.24	8.08		
7/14/2020	2020	12:00	North end	During treatment	1.5	22.55	0.258	10.34	8.03		
7/14/2020	2020	12:00	North end	During treatment	2	22.48	0.259	10.26	8.05		
7/14/2020	2020	12:30	East bank	During treatment	0	23.55	0.269	9.99	8.11	1.9	in muck
7/14/2020	2020	12:30	East bank	During treatment	0.5	23.40	0.275	9.97	8.11		
7/14/2020	2020	12:30	East bank	During treatment	1	23.08	0.278	10.20	8.08		
7/14/2020	2020	12:30	East bank	During treatment	1.5	23.07	0.279	10.27	8.06		
7/14/2020	2020	15:30	Mid-Lake Station	During treatment	0	24.21	0.321	10.33	8.04	2.00	secchi at bottom
7/14/2020	2020	15:30	Mid-Lake Station	During treatment	0.5	24.21	0.322	10.14	8.02		
7/14/2020	2020	15:30	Mid-Lake Station	During treatment	1	24.18	0.322	9.99	8.01		
7/14/2020	2020	15:30	Mid-Lake Station	During treatment	1.5	24.07	0.311	10.95	8.04		
7/14/2020	2020	15:30	Mid-Lake Station	During treatment	2	24.62	0.278	6.03	7.10		reading at bottom
7/14/2020	2020	15:45	North end	During treatment	0	24.49	0.306	10.05	7.91	2.2	
7/14/2020	2020	15:45	North end	During treatment	0.5	24.37	0.311	10.19	7.92		
7/14/2020	2020	15:45	North end	During treatment	1	24.03	0.316	10.48	7.90		
7/14/2020	2020	15:45	North end	During treatment	1.5	23.89	0.309	10.52	7.90		
7/14/2020	2020	15:45	North end	During treatment	2	23.86	0.329	10.12	7.60		
7/14/2020	2020	15:45	North end	During treatment	2.2	24.13	0.326	2.99	6.54		reading at bottom
7/14/2020	2020	15:45	East bank	During treatment	0	24.41	0.285	10.12	7.76	1.6	secchi at bottom
7/14/2020	2020	15:45	East bank	During treatment	0.5	24.27	0.295	10.43	7.82		
7/14/2020	2020	15:45	East bank	During treatment	1	24.01	0.287	10.82	7.93		
7/14/2020	2020	15:45	East bank	During treatment	1.5	23.61	0.300	11.36	7.91		
7/14/2020	2020	16:00	Station #2	During treatment	0	24.85	0.322	10.19	7.92	1.7	secchi at bottom
7/14/2020	2020	16:00	Station #2	During treatment	0.5	24.82	0.319	10.25	7.91		
7/14/2020	2020	16:00	Station #2	During treatment	1	23.85	0.361	10.49	7.88		
7/14/2020	2020	16:00	Station #2	During treatment	1.5	23.62	0.349	10.67	7.92		
7/14/2020	2020	17:00	Mid-Lake Station	During treatment	0	24.77	0.376	9.85	7.87	2.30	secchi at bottom
7/14/2020	2020	17:00	Mid-Lake Station	During treatment	0.5	24.78	0.384	10.11	7.86		

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Secchi (m)	Notes
7/14/2020	2020	17:00	Mid-Lake Station	During treatment	1	24.42	0.344	10.37	7.91		
7/14/2020	2020	17:00	Mid-Lake Station	During treatment	1.5	23.70	0.338	10.83	7.97		
7/14/2020	2020	17:00	Mid-Lake Station	During treatment	2	23.60	0.347	10.74	7.97		
7/14/2020	2020	17:00	North end	During treatment	0	24.51	0.311	10.19	7.97	2.1	secchi at bottom
7/14/2020	2020	17:00	North end	During treatment	0.5	24.53	0.321	10.22	7.93		
7/14/2020	2020	17:00	North end	During treatment	1	24.20	0.337	10.58	7.97		
7/14/2020	2020	17:00	North end	During treatment	1.5	23.97	0.327	10.54	7.98		
7/14/2020	2020	17:00	North end	During treatment	2	24.01	0.338	11.46	7.96		
7/14/2020	2020	17:00	Station #2	During treatment	0	24.81	0.315	10.46	7.95	2.1	secchi at bottom
7/14/2020	2020	17:00	Station #2	During treatment	0.5	24.82	0.313	10.07	7.94		
7/14/2020	2020	17:00	Station #2	During treatment	1	24.22	0.336	10.91	7.94		
7/14/2020	2020	17:00	Station #2	During treatment	1.5	23.80	0.343	11.09	7.96		
7/14/2020	2020	17:00	Station #2	During treatment	2	23.80	0.344	11.04	7.97		
7/15/2020	2020	10:00	Station #2	During treatment	0	23.50	0.346	10.12	8.38	1.95	secchi at bottom
7/15/2020	2020	10:00	Station #2	During treatment	0.5	23.49	0.343	10.25	8.26		
7/15/2020	2020	10:00	Station #2	During treatment	1	23.19	0.335	10.29	8.17		
7/15/2020	2020	10:00	Station #2	During treatment	1.5	23.17	0.335	10.19	8.08		
7/15/2020	2020	10:00	Station #2	During treatment	2	23.56	0.338	10.97	7.90		
7/15/2020	2020	10:00	Mid-Lake Station	During treatment	0	23.51	0.337	9.90	8.03		
7/15/2020	2020	10:00	Mid-Lake Station	During treatment	0.5	23.49	0.343	9.93	7.96		
7/15/2020	2020	10:00	Mid-Lake Station	During treatment	1	23.46	0.350	10.15	7.85		
7/15/2020	2020	10:00	Mid-Lake Station	During treatment	1.5	23.46	0.381	10.25	7.71		
7/15/2020	2020	10:00	Mid-Lake Station	During treatment	2	23.53	0.326	8.69	7.57		reading at bottom
7/15/2020	2020	10:30	North end	During treatment	0	23.51	0.330	10.09	7.94		
7/15/2020	2020	10:30	North end	During treatment	0.5	23.47	0.337	10.17	7.94		
7/15/2020	2020	10:30	North end	During treatment	1	23.37	0.347	10.18	8.12		
7/15/2020	2020	10:30	North end	During treatment	1.5	23.37	0.350	10.24	8.24		
7/15/2020	2020	10:30	North end	During treatment	2	23.43	0.355	11.49	8.21		
7/15/2020	2020	12:00	Station #2	During treatment	0	23.89	0.367	10.02	7.93	1.7	secchi at bottom
7/15/2020	2020	12:00	Station #2	During treatment	0.5	23.88	0.368	10.16	7.86		
7/15/2020	2020	12:00	Station #2	During treatment	1	23.85	0.364	10.29	7.83		
7/15/2020	2020	12:00	Station #2	During treatment	1.5	23.79	0.360	10.46	7.84		
7/15/2020	2020	12:00	Mid-Lake Station	During treatment	0	23.78	0.350	9.96	7.82	2.1	secchi at bottom
7/15/2020	2020	12:00	Mid-Lake Station	During treatment	0.5	23.77	0.350	10.05	7.81		
7/15/2020	2020	12:00	Mid-Lake Station	During treatment	1	23.75	0.349	10.32	7.78		
7/15/2020	2020	12:00	Mid-Lake Station	During treatment	1.5	23.67	0.349	10.34	7.79		
7/15/2020	2020	12:00	Mid-Lake Station	During treatment	2	23.51	0.347	10.31	7.82		
7/15/2020	2020	14:30	Station #2	During treatment	0	24.48	0.384	10.16	7.82	1.8	secchi at bottom
7/15/2020	2020	14:30	Station #2	During treatment	0.5	24.48	0.383	10.07	7.81		
7/15/2020	2020	14:30	Station #2	During treatment	1	24.37	0.378	10.25	7.82		
7/15/2020	2020	14:30	Station #2	During treatment	1.5	24.30	0.374	10.34	7.86		

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Secchi (m)	Notes
7/15/2020	2020	3:00 PM	Mid-Lake Station	During treatment	0	24.34	0.362	9.90	7.83	2.1	secchi at bottom
7/15/2020	2020	3:00 PM	Mid-Lake Station	During treatment	0.5	24.34	0.364	9.87	7.85		
7/15/2020	2020	3:00 PM	Mid-Lake Station	During treatment	1	24.34	0.362	9.98	7.86		
7/15/2020	2020	3:00 PM	Mid-Lake Station	During treatment	1.5	24.37	0.372	10.12	7.85		
7/15/2020	2020	3:00 PM	Mid-Lake Station	During treatment	2	24.39	0.378	10.31	7.85		
7/15/2020	2020	3:00 PM	In floc just after pass, W of lake gage	During treatment	0	24.36	0.373	9.78	7.57		
7/15/2020	2020	3:00 PM	In floc just after pass, W of lake gage	During treatment	0.5	24.38	0.375	9.74	7.71		
7/15/2020	2020	3:00 PM	In floc just after pass, W of lake gage	During treatment	1	24.33	0.366	9.96	7.69		
7/15/2020	2020	3:00 PM	In floc just after pass, W of lake gage	During treatment	1.5	24.38	0.371	10.08	7.71		
7/15/2020	2020	3:00 PM	In floc just after pass, W of lake gage	During treatment	2	24.32	0.383	10.10	7.69		
7/15/2020	2020	5:00 PM	Station #2	During treatment	0	25.45	0.424	9.26	7.94	1.90	secchi at bottom
7/15/2020	2020	5:00 PM	Station #2	During treatment	0.5	25.10	0.413	9.70	7.88		
7/15/2020	2020	5:00 PM	Station #2	During treatment	1	24.96	0.411	9.78	7.84		
7/15/2020	2020	5:00 PM	Station #2	During treatment	1.5	24.64	0.401	10.11	7.83		
7/15/2020	2020	5:00 PM	Station #2	During treatment	2	25.02	0.397	11.42	7.65		
7/15/2020	2020	5:00 PM	Mid-Lake Station	During treatment	0	25.01	0.402	9.78	7.68	2.4	secchi at bottom
7/15/2020	2020	5:00 PM	Mid-Lake Station	During treatment	0.5	25.00	0.400	9.77	7.69		
7/15/2020	2020	5:00 PM	Mid-Lake Station	During treatment	1	24.71	0.391	9.92	7.64		
7/15/2020	2020	5:00 PM	Mid-Lake Station	During treatment	1.5	24.69	0.398	9.98	7.52		
7/15/2020	2020	5:00 PM	Mid-Lake Station	During treatment	2	24.61	0.415	10.15	7.64		
7/15/2020	2020	5:00 PM	In floc just after pass, W of lake gage	During treatment	0.5	24.85	0.393	9.83	7.72		
7/15/2020	2020	5:00 PM	In floc just after pass, W of lake gage	During treatment	1	24.81	0.427	10.02	7.62		
7/15/2020	2020	8:00 PM	East bank	During treatment	0	25.24	0.395	9.15	7.93	1.6	secchi at bottom
7/15/2020	2020	8:00 PM	East bank	During treatment	0.5	25.17	0.397	9.92	7.86		
7/15/2020	2020	8:00 PM	East bank	During treatment	1	25.01	0.412	10.03	7.82		
7/15/2020	2020	8:00 PM	East bank	During treatment	1.5	24.88	0.421	10.28	7.82		
7/15/2020	2020	8:00 PM	North end	During treatment	0	25.24	0.447	9.46	7.78	2.1	secchi at bottom
7/15/2020	2020	8:00 PM	North end	During treatment	0.5	24.27	0.447	9.69	7.75		
7/15/2020	2020	8:00 PM	North end	During treatment	1	25.16	0.452	9.85	7.68		

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Secchi (m)	Notes
7/15/2020	2020	8:00 PM	North end	During treatment	1.5	25.08	0.445	9.98	7.70		
7/15/2020	2020	8:00 PM	North end	During treatment	2	24.84	0.411	10.37	7.76		
7/15/2020	2020	8:00 PM	Mid-Lake Station	During treatment	0	25.57	0.452	9.09	7.66	2.05	secchi at bottom
7/15/2020	2020	8:00 PM	Mid-Lake Station	During treatment	0.5	25.43	0.444	9.21	7.58		
7/15/2020	2020	8:00 PM	Mid-Lake Station	During treatment	1	24.97	0.441	9.80	7.50		
7/15/2020	2020	8:00 PM	Mid-Lake Station	During treatment	1.5	24.81	0.398	10.01	7.57		
7/15/2020	2020	8:00 PM	Mid-Lake Station	During treatment	2	24.8	0.395	4.41	7.47		reading at bottom
7/15/2020	2020	8:00 PM	Station #2	During treatment	0	25.15	0.473	9.04	7.51	1.7	secchi at bottom
7/15/2020	2020	8:00 PM	Station #2	During treatment	0.5	25.44	0.469	9.19	7.50		
7/15/2020	2020	8:00 PM	Station #2	During treatment	1	25.39	0.466	9.41	7.58		
7/15/2020	2020	8:00 PM	Station #2	During treatment	1.5	25.08	0.453	9.75	7.76		
7/16/2020	2020	10:00 AM	Mid-Lake Station	During treatment	0	23.73	0.453	9.38	8.54	2.35	secchi at bottom
7/16/2020	2020	10:00 AM	Mid-Lake Station	During treatment	0.5	23.78	0.448	9.41	8.38		
7/16/2020	2020	10:00 AM	Mid-Lake Station	During treatment	1	23.81	0.461	9.51	8.31		
7/16/2020	2020	10:00 AM	Mid-Lake Station	During treatment	1.5	23.79	0.485	9.33	8.24		
7/16/2020	2020	10:00 AM	Mid-Lake Station	During treatment	2	23.61	0.462	9.37	8.24		
7/16/2020	2020	10:00 AM	Station #2	During treatment	0	23.76	0.465	9.24	8.04	2.4	secchi at bottom
7/16/2020	2020	10:00 AM	Station #2	During treatment	0.5	23.8	0.464	9.31	8.01		
7/16/2020	2020	10:00 AM	Station #2	During treatment	1	23.78	0.466	9.45	7.96		
7/16/2020	2020	10:00 AM	Station #2	During treatment	1.5	23.77	0.466	9.30	7.88		
7/16/2020	2020	10:00 AM	Station #2	During treatment	2	23.73	0.479	9.12	7.82		
7/16/2020	2020	10:00 AM	Station #2	During treatment	2.3	23.74	0.507	7.25	7.33		reading at bottom
7/16/2020	2020	10:30 AM	North end	During treatment	0	23.94	0.445	9.50	7.83	2.1	secchi at bottom
7/16/2020	2020	10:30 AM	North end	During treatment	0.5	23.94	0.445	9.46	7.85		
7/16/2020	2020	10:30 AM	North end	During treatment	1	23.93	0.446	9.47	7.86		
7/16/2020	2020	10:30 AM	North end	During treatment	1.5	23.89	0.479	9.82	7.89		
7/16/2020	2020	10:30 AM	North end	During treatment	2	23.92	0.486	9.52	7.83		
7/16/2020	2020	10:30 AM	In floc 5 mins after passing	During treatment	0	23.79	0.513	9.61	7.81		
7/16/2020	2020	10:30 AM	In floc 5 mins after passing	During treatment	0.5	23.79	0.495	9.55	7.84		
7/16/2020	2020	10:30 AM	In floc 5 mins after passing	During treatment	1	23.79	0.506	9.47	7.88		
7/16/2020	2020	12:00 PM	Station #2	During treatment	0	24.03	0.499	9.29	7.58	1.7	secchi at bottom
7/16/2020	2020	12:00 PM	Station #2	During treatment	0.5	23.99	0.510	9.22	7.62		
7/16/2020	2020	12:00 PM	Station #2	During treatment	1	23.94	0.538	9.23	7.62		
7/16/2020	2020	12:00 PM	Station #2	During treatment	1.5	23.86	0.522	9.27	7.57		
7/16/2020	2020	12:00 PM	Mid-Lake Station	During treatment	0	24	0.473	9.13	7.69	2.3	secchi at bottom. Floc still visible in water column
7/16/2020	2020	12:00 PM	Mid-Lake Station	During treatment	0.5	24	0.475	9.19	7.66		
7/16/2020	2020	12:00 PM	Mid-Lake Station	During treatment	1	23.98	0.485	9.17	7.64		
7/16/2020	2020	12:00 PM	Mid-Lake Station	During treatment	1.5	23.99	0.498	9.36	7.69		

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Secchi (m)	Notes
7/16/2020	2020	12:00 PM	Mid-Lake Station	During treatment	2	24	0.508	9.32	7.86		
7/16/2020	2020	2:00 PM	Mid-Lake Station	Post-treatment	0	24.4	0.483	9.35	7.75	2.1	secchi at bottom
7/16/2020	2020	2:00 PM	Mid-Lake Station	Post-treatment	0.5	24.42	0.483	9.38	7.56		
7/16/2020	2020	2:00 PM	Mid-Lake Station	Post-treatment	1	24.37	0.484	9.43	7.33		
7/16/2020	2020	2:00 PM	Mid-Lake Station	Post-treatment	1.5	24.38	0.489	9.45	7.14		
7/16/2020	2020	2:00 PM	Mid-Lake Station	Post-treatment	2	24.43	0.505	12.76	7.12		reading at bottom
7/16/2020	2020	2:00 PM	Station #2	Post-treatment	0	24.51	0.484	9.06	7.13	1.95	secchi at bottom
7/16/2020	2020	2:00 PM	Station #2	Post-treatment	0.5	24.51	0.485	9.23	7.05		
7/16/2020	2020	2:00 PM	Station #2	Post-treatment	1	24.51	0.486	9.23	6.97		
7/16/2020	2020	2:00 PM	Station #2	Post-treatment	1.5	24.51	0.486	9.26	6.93		
7/16/2020	2020	2:00 PM	North end	Post-treatment	0	24.78	0.487	9.15	7.20	2.3	secchi at bottom
7/16/2020	2020	2:00 PM	North end	Post-treatment	0.5	24.59	0.494	9.24	7.17		
7/16/2020	2020	2:00 PM	North end	Post-treatment	1	24.23	0.505	9.29	7.00		
7/16/2020	2020	2:00 PM	North end	Post-treatment	1.5	24.23	0.506	9.47	6.86		
7/16/2020	2020	2:00 PM	North end	Post-treatment	2	24.23	0.506	9.59	6.76		
7/17/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	0	23.79	0.494	9.03	8.17	2.2	secchi at bottom
7/17/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	0.5	23.84	0.493	9.02	8.10		
7/17/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	1	23.86	0.494	9.01	7.80		
7/17/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	1.5	23.85	0.494	9.10	7.62		
7/17/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	2	23.85	0.495	8.70	7.58		
7/17/2020	2020	12:00 PM	Station #2	Post-treatment	0	23.81	0.497	8.84	7.32	2	secchi at bottom. GAGE 4.7'
7/17/2020	2020	12:00 PM	Station #2	Post-treatment	0.5	23.81	0.498	8.74	7.28		
7/17/2020	2020	12:00 PM	Station #2	Post-treatment	1	23.81	0.497	8.87	7.26		
7/17/2020	2020	12:00 PM	Station #2	Post-treatment	1.5	23.81	0.497	8.90	7.24		
7/17/2020	2020	12:00 PM	Station #2	Post-treatment	2	24.17	0.494	8.11	7.03		
8/7/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	0	23.2	0.519	8.94	8.45	2.1	secchi at bottom
8/7/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	0.5	23.2	0.519	8.88	8.30		
8/7/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	1	23.21	0.519	9.02	8.18		
8/7/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	1.5	23.21	0.519	9.13	8.18		
8/7/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	2	23.22	0.519	9.09	8.06		
8/7/2020	2020	12:00 PM	Station #2	Post-treatment	0	23.29	0.521	9.04	7.82	1.6	secchi at bottom. GAGE 4.2'
8/7/2020	2020	12:00 PM	Station #2	Post-treatment	0.5	23.28	0.519	8.95	7.82		
8/7/2020	2020	12:00 PM	Station #2	Post-treatment	1	23.29	0.519	8.93	7.81		
8/7/2020	2020	12:00 PM	Station #2	Post-treatment	1.5	23.3	0.519	4.19	7.30		at bottom
9/11/2020	2020	11:30 AM	Mid-Lake Station	Monthly Sampling	0	21.28	0.575	9.85	8.41	1.84	in muck. GAGE 3.55'
9/11/2020	2020	11:30 AM	Mid-Lake Station	Monthly Sampling	0.5	21.28	0.575	9.79	8.33		
9/11/2020	2020	11:30 AM	Mid-Lake Station	Monthly Sampling	1	21.29	0.576	9.84	8.13		
9/11/2020	2020	11:30 AM	Mid-Lake Station	Monthly Sampling	1.5	21.26	0.576	10.11	8.09		
9/11/2020	2020	11:30 AM	Mid-Lake Station	Monthly Sampling	1.8	21.26	0.480	2.58	7.58		at bottom
9/11/2020	2020	12:00 PM	Station #2	Monthly Sampling	0	21.39	0.578	9.82	7.65	1.45	secchi at bottom

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Secchi (m)	Notes
9/11/2020	2020	12:00 PM	Station #2	Monthly Sampling	0.5	21.38	0.576	9.79	7.66		
9/11/2020	2020	12:00 PM	Station #2	Monthly Sampling	1	21.37	0.576	9.81	7.66		
9/11/2020	2020	12:00 PM	Station #2	Monthly Sampling	1.5	21.4	0.506	6.83	6.97		at bottom
10/19/2020	2020		Mid-Lake Station	Monthly Sampling	0	14.49	0.495	10.57	8.44	1.9	secchi at bottom. GAGE 3.6' . After bringing up secchi, sulfur smell was observed, but 1m depth samples don't smell noticeably
10/19/2020	2020		Mid-Lake Station	Monthly Sampling	0.5	14.48	0.496	10.42	8.11		
10/19/2020	2020		Mid-Lake Station	Monthly Sampling	1	14.49	0.497	10.47	8.06		
10/19/2020	2020		Mid-Lake Station	Monthly Sampling	1.5	14.5	0.496	10.38	8.02		
10/19/2020	2020		Mid-Lake Station	Monthly Sampling	1.9	15.21	0.435	1.10	6.93		bottom
10/19/2020	2020		Station #2	Monthly Sampling	0	14.54	0.496	10.35	7.33	1.5	secchi at bottom
10/19/2020	2020		Station #2	Monthly Sampling	0.5	14.51	0.497	10.50	7.36		
10/19/2020	2020		Station #2	Monthly Sampling	1	14.52	0.497	10.48	7.39		
10/19/2020	2020		Station #2	Monthly Sampling	1.5	14.59	0.496	5.68	7.16		
1/19/2021	2021		Mid-Lake Station	Off-Season Sampling	0	7.04	0.318	11.79	9.20	2.15	secchi at bottom. GAGE 5.3'
1/19/2021	2021		Mid-Lake Station	Off-Season Sampling	0.5	7.01	0.317	11.88	8.97		
1/19/2021	2021		Mid-Lake Station	Off-Season Sampling	1	7.00	0.317	11.90	8.52		
1/19/2021	2021		Mid-Lake Station	Off-Season Sampling	1.5	6.93	0.317	11.78	8.42		
1/19/2021	2021		Mid-Lake Station	Off-Season Sampling	2	6.74	0.316	11.85	8.34		
1/19/2021	2021		Station #2	Off-Season Sampling	0	6.92	0.320	11.97	8.04	2.0	secchi at bottom
1/19/2021	2021		Station #2	Off-Season Sampling	0.5	6.89	0.317	12.17	8.13		
1/19/2021	2021		Station #2	Off-Season Sampling	1	6.94	0.319	12.01	8.04		
1/19/2021	2021		Station #2	Off-Season Sampling	1.5	6.87	0.318	12.01	8.00		
1/19/2021	2021		Station #2	Off-Season Sampling	2	6.89	0.317	12.03	7.97		
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	0	9.98	3.010	12.36	8.26	1.8	secchi NOT bottom. Gage 6.1 ft. several ducks observed
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	0.5	9.91	0.301	12.46	8.15		
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	1	9.64	0.300	12.29	8.11		
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	1.5	8.98	0.300	12.15	8.07		
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	2	8.90	0.299	12.75	8.04		
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	2.5	8.92	0.341	7.61	6.80		bottom
3/17/2021	2021		Station #2	Off-Season Sampling	0	10.09	0.301	11.82	7.44	2.1	just above/at bottom
3/17/2021	2021		Station #2	Off-Season Sampling	0.5	10.04	0.301	11.92	7.42		
3/17/2021	2021		Station #2	Off-Season Sampling	1	9.99	0.302	12.08	7.48		
3/17/2021	2021		Station #2	Off-Season Sampling	1.5	9.86	0.301	12.14	7.50		
3/17/2021	2021		Station #2	Off-Season Sampling	2	9.98	0.288	12.01	7.26		
3/17/2021	2021		Station #2	Off-Season Sampling	2.4	9.72	0.286	8.10	7.00		resting at bottom in muck

Table B-2. Waughop Lake Field Monitoring Data Collected by Tetra Tech, 2023-2024.

Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	pH	Secchi (m)	Water Depth (m)	Notes
5/23/2023	2023	11:40 AM	Mid-Lake	Monthly	0.5	20.16	0.152	9.57	105.10	8.25	0.63	2.72	gage 5.54'
5/23/2023	2023	11:40 AM	Mid-Lake	Monthly	1	19.98	0.151	9.77	107.20	8.26			
5/23/2023	2023	11:40 AM	Mid-Lake	Monthly	1.5	19.87	0.152	9.68	105.80	8.21			
5/23/2023	2023	11:40 AM	Mid-Lake	Monthly	2	19.32	0.151	8.85	95.30	7.86			
5/23/2023	2023	11:40 AM	Mid-Lake	Monthly	2.5	18.98	0.151	7.87	83.90	7.41			
6/27/2023	2023	12:16 PM	Mid-Lake	Pre Treatment/Monthly	0.5	22.52	0.155	9.58	112.70	8.49	0.90	2.40	gage 4.75
6/27/2023	2023	12:16 PM	Mid-Lake	Pre Treatment/Monthly	1	22.39	0.155	9.45	113.90	8.49			
6/27/2023	2023	12:16 PM	Mid-Lake	Pre Treatment/Monthly	1.5	22.23	0.155	9.82	112.80	8.43			
6/27/2023	2023	12:16 PM	Mid-Lake	Pre Treatment/Monthly	2	22.16	0.155	9.64	107.30	8.24			
6/28/2023	2023	8:39 AM	Mid-Lake	Morning of Treatment	0.5	22.38	0.155	9.35	108.30	8.40	1.00	2.44	gage 4.75
6/28/2023	2023	8:39 AM	Mid-Lake	Morning of Treatment	1	22.37	0.155	9.35	109.10	8.41			
6/28/2023	2023	8:39 AM	Mid-Lake	Morning of Treatment	1.5	22.36	0.155	9.43	109.70	8.37			
6/28/2023	2023	8:39 AM	Mid-Lake	Morning of Treatment	2	22.31	0.155	8.75	101.20	8.16			
6/28/2023	2023	8:28 AM	Station #2	Morning of Treatment	0.5	22.25	0.155	9.09	105.50	8.16	0.93	1.85	
6/28/2023	2023	8:28 AM	Station #2	Morning of Treatment	1	22.30	0.155	9.25	107.00	8.23			
6/28/2023	2023	8:28 AM	Station #2	Morning of Treatment	1.5	22.26	0.155	9.16	106.10	8.17			
6/28/2023	2023	9:50 AM	Station #2	During	0.5	22.50	0.156	9.35	108.70	8.39	1.10		
6/28/2023	2023	9:50 AM	Station #2	During	1	22.40	0.156	9.21	106.90	8.33			
6/28/2023	2023	9:50 AM	Station #2	During	1.5	22.32	0.156	9.05	104.70	8.13			
6/28/2023	2023	10:02 AM	Mid-Lake	During	0.5	22.58	0.155	9.61	111.80	8.50			
6/28/2023	2023	10:02 AM	Mid-Lake	During	1	22.58	0.155	9.75	114.90	8.49			

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	pH	Secchi (m)	Water Depth (m)	Notes
6/28/2023	2023	10:02 AM	Mid-Lake	During	1.5	22.30	0.155	9.06	105.00	8.34			
6/28/2023	2023	10:02 AM	Mid-Lake	During	2	22.13	0.155	7.88	90.80	7.80			
6/28/2023	2023	11:14 AM	In Floc	During	0.5	22.69	0.179	9.50	111.00	7.80			
6/28/2023	2023	11:14 AM	In Floc	During	1.5	22.46	0.157	9.52	110.80	8.05			
6/28/2023	2023	11:24 AM	Mid-Lake	During	0.5	22.75	0.170	9.49	110.90	7.91	1.13		
6/28/2023	2023	11:24 AM	Mid-Lake	During	1	22.71	0.169	9.72	114.20	7.92			
6/28/2023	2023	11:24 AM	Mid-Lake	During	1.5	22.68	0.163	9.70	113.20	8.03			
6/28/2023	2023	11:24 AM	Mid-Lake	During	2	22.27	0.161	9.18	106.80	7.91			
6/28/2023	2023	11:40 AM	Station #2	During	0.5	22.82	0.166	9.42	110.10	7.91	0.97		
6/28/2023	2023	11:40 AM	Station #2	During	1	22.81	0.169	9.52	111.30	7.82			
6/28/2023	2023	11:40 AM	Station #2	During	1.5	22.79	0.167	9.19	107.40	7.69			
6/28/2023	2023	12:45 PM	Station #2	During	0.5	23.12	0.174	9.50	111.70	7.96	1.08		
6/28/2023	2023	12:45 PM	Station #2	During	1	7.63	0.174	9.47	111.40	7.93			
6/28/2023	2023	12:45 PM	Station #2	During	1.5	7.65	0.175	9.52	112.00	7.92			
6/28/2023	2023	12:56 PM	Mid-Lake	During	0.5	23.12	0.207	9.45	111.20	7.63	1.20		
6/28/2023	2023	12:56 PM	Mid-Lake	During	1	23.14	0.204	9.62	113.20	7.65			
6/28/2023	2023	12:56 PM	Mid-Lake	During	1.5	22.93	0.202	9.41	110.30	7.64			
6/28/2023	2023	12:56 PM	Mid-Lake	During	2	22.70	0.195	9.20	107.40	7.58			
6/28/2023	2023	2:39 PM	Station #2	During	0.5	23.75	0.209	9.36	111.50	7.59	1.29		
6/28/2023	2023	2:39 PM	Station #2	During	1	23.68	0.228	9.45	112.50	7.46			
6/28/2023	2023	2:39 PM	Station #2	During	1.5	23.68	0.234	4.94	58.80	7.33			

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	pH	Secchi (m)	Water Depth (m)	Notes
6/28/2023	2023	2:55 PM	Mid-Lake	During	0.5	23.73	0.202	9.65	115.20	7.67	1.33		
6/28/2023	2023	2:55 PM	Mid-Lake	During	1	23.34	0.208	9.72	115.00	7.55			
6/28/2023	2023	2:55 PM	Mid-Lake	During	1.5	23.14	0.213	9.87	116.40	7.55			
6/28/2023	2023	2:55 PM	Mid-Lake	During	2	22.87	0.202	10.18	118.60	7.55			
6/28/2023	2023	4:07 PM	Station #2	During	0.5	24.35	0.215	9.45	114.00	7.55	1.48		
6/28/2023	2023	4:07 PM	Station #2	During	1	24.23	0.228	9.40	113.30	7.44			
6/28/2023	2023	4:07 PM	Station #2	During	1.5	23.39	0.216	9.88	117.00	7.41			
6/28/2023	2023	4:20 PM	Mid-Lake	During	0.5	24.14	0.222	9.57	115.00	7.51	1.53		
6/28/2023	2023	4:20 PM	Mid-Lake	During	1	23.64	0.230	9.64	114.70	7.44			
6/28/2023	2023	4:20 PM	Mid-Lake	During	1.5	23.68	0.230	9.74	116.00	7.41			
6/28/2023	2023	4:20 PM	Mid-Lake	During	2	23.37	0.219	9.78	116.00	7.42			
6/28/2023	2023	6:30 PM	Station #2	After 1st day Application	0.5	24.30	0.239	9.61	115.80	7.53	1.73		
6/28/2023	2023	6:30 PM	Station #2	After 1st day Application	1	24.29	0.242	9.87	118.90	7.46			
6/28/2023	2023	6:30 PM	Station #2	After 1st day Application	1.5	24.25	0.251	9.80	118.00	7.41			
6/28/2023	2023	6:45 PM	Mid-Lake	After 1st day Application	0.5	24.26	0.267	9.36	112.60	7.32	2.17		
6/28/2023	2023	6:45 PM	Mid-Lake	After 1st day Application	1	24.25	0.262	9.81	118.10	7.27			
6/28/2023	2023	6:45 PM	Mid-Lake	After 1st day Application	1.5	24.08	0.250	9.79	117.50	7.36			
6/28/2023	2023	6:45 PM	Mid-Lake	After 1st day Application	2	23.85	0.241	10.27	122.60	7.35			
6/29/2023	2023	6:55 AM	Mid-Lake	Before 2nd day Application	0.5	23.08	0.232	--	--	7.61	2.3		gage 4.75; DO not recorded due to barge motor and interference
6/29/2023	2023	6:55 AM	Mid-Lake	Before 2nd day Application	1	23.19	0.232	--	--	7.60			
6/29/2023	2023	6:55 AM	Mid-Lake	Before 2nd day Application	1.5	23.19	0.231	--	--	7.59			

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	pH	Secchi (m)	Water Depth (m)	Notes
6/29/2023	2023	6:55 AM	Mid-Lake	Before 2nd day Application	2	23.17	0.230	--	--	7.59			
6/29/2023	2023	7:45 AM	Station #2	During	0.5	23.10	0.239	9.76	114.60	7.54	bottom	1.92	windy, lots of geese
6/29/2023	2023	7:45 AM	Station #2	During	1	23.15	0.238	9.79	115.10	7.47	bottom		
6/29/2023	2023	7:45 AM	Station #2	During	1.5	23.12	0.239	9.71	114.10	7.48	bottom		
6/29/2023	2023	7:30 AM	Mid-Lake	During	0.5	23.17	0.232	10.05	118.50	7.65	2.20	2.46	windy; barge drove by right when collecting 2 m measurements
6/29/2023	2023	7:30 AM	Mid-Lake	During	1	23.14	0.235	9.93	117.30	7.57			
6/29/2023	2023	7:30 AM	Mid-Lake	During	1.5	23.10	0.236	9.62	113.20	7.53			
6/29/2023	2023	7:30 AM	Mid-Lake	During	2	23.11	0.234	9.77	114.70	7.49			
6/29/2023	2023	9:25 AM	Station #2	During	0.5	23.09	0.284	9.59	112.50	7.27	bottom	1.92	
6/29/2023	2023	9:25 AM	Station #2	During	1	23.08	0.286	9.77	114.70	7.15	bottom		
6/29/2023	2023	9:25 AM	Station #2	During	1.5	23.07	0.286	9.71	115.10	7.14	bottom		
6/29/2023	2023	9:40 AM	Mid-Lake	During	0.5	23.12	0.273	9.65	113.30	7.26	bottom	2.46	
6/29/2023	2023	9:40 AM	Mid-Lake	During	1	23.13	0.272	9.80	115.10	7.19	bottom		
6/29/2023	2023	9:40 AM	Mid-Lake	During	1.5	23.15	0.283	9.65	113.40	7.13	bottom		
6/29/2023	2023	9:40 AM	Mid-Lake	During	2	23.16	0.299	9.64	113.30	7.06	bottom		
6/29/2023	2023	10:55 AM	Station #2	During	0.5	23.42	0.302	9.20	108.70	7.03	bottom		
6/29/2023	2023	10:55 AM	Station #2	During	1	23.42	0.302	9.28	109.80	6.99	bottom		
6/29/2023	2023	10:55 AM	Station #2	During	1.5	23.38	0.302	9.26	109.40	6.98	bottom		
6/29/2023	2023	11:15 AM	Mid-Lake	During	0.5	23.40	0.276	9.59	112.90	7.25	bottom		
6/29/2023	2023	11:15 AM	Mid-Lake	During	1	23.35	0.278	9.65	113.90	7.21	bottom		
6/29/2023	2023	11:15 AM	Mid-Lake	During	1.5	23.33	0.281	9.83	116.10	7.12	bottom		

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	pH	Secchi (m)	Water Depth (m)	Notes
6/29/2023	2023	11:15 AM	Mid-Lake	During	2	23.33	0.289	9.70	114.30	7.14	bottom		
6/29/2023	2023	12:53 PM	Station #2	After 2nd Day Application	0.5	23.90	0.293	9.67	115.30	7.08	bottom		very windy; waves and white caps
6/29/2023	2023	12:53 PM	Station #2	After 2nd Day Application	1	23.84	0.293	9.62	114.60	6.98	bottom		
6/29/2023	2023	12:53 PM	Station #2	After 2nd Day Application	1.5	23.83	0.294	9.59	114.20	6.94	bottom		
6/29/2023	2023	1:10 PM	Mid-Lake	After 2nd Day Application	0.5	23.76	0.276	9.65	114.80	7.11	bottom		
6/29/2023	2023	1:10 PM	Mid-Lake	After 2nd Day Application	1	23.71	0.276	9.80	116.40	6.99	bottom		
6/29/2023	2023	1:10 PM	Mid-Lake	After 2nd Day Application	1.5	23.71	0.276	9.85	116.90	6.95	bottom		
6/29/2023	2023	1:10 PM	Mid-Lake	After 2nd Day Application	2	23.70	0.276	9.91	117.70	6.98	bottom		
6/30/2023	2023	12:10 PM	Mid-Lake	Post Treatment - Day After	0.5	23.91	0.286	9.31	110.80	7.31	bottom	2.40	gage 4.75
6/30/2023	2023	12:10 PM	Mid-Lake	Post Treatment - Day After	1	23.85	0.286	9.21	110.80	7.21	bottom		
6/30/2023	2023	12:10 PM	Mid-Lake	Post Treatment - Day After	1.5	23.84	0.286	9.40	111.50	7.22	bottom		
6/30/2023	2023	12:10 PM	Mid-Lake	Post Treatment - Day After	2	23.84	0.288	9.38	111.20	7.24	bottom		
6/30/2023	2023	11:54 AM	Station #2	Post Treatment - Day After	0.5	23.91	0.286	9.23	110.50	7.30	bottom	1.88	
6/30/2023	2023	11:54 AM	Station #2	Post Treatment - Day After	1	23.90	0.286	9.37	110.80	7.29	bottom		
6/30/2023	2023	11:54 AM	Station #2	Post Treatment - Day After	1.5	23.91	0.286	9.33	110.60	7.26	bottom		
7/13/2023	2023	11:00 AM	Mid-Lake	2 wk Post Treatment - July Monthly	0.5	23.15	0.297	9.45	111.00	8.24	bottom	2.31	gage 4.48
7/13/2023	2023	11:00 AM	Mid-Lake	2 wk Post Treatment - July Monthly	1	23.14	0.297	9.50	111.50	8.21	bottom		
7/13/2023	2023	11:00 AM	Mid-Lake	2 wk Post Treatment - July Monthly	1.5	23.13	0.297	9.59	112.80	8.20	bottom		
7/13/2023	2023	11:00 AM	Mid-Lake	2 wk Post Treatment - July Monthly	2	22.89	0.296	9.45	110.30	8.15	bottom		
8/15/2023	2023	9:30 AM	Mid-Lake	Monthly Post Treatment	0.5	25.67	0.332	8.71	107.80	8.26	1.70	2.05	gage 3.8 ft; lost about 0.7 m of water depth since July; many fish jumping, no odor, slight green color

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Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	pH	Secchi (m)	Water Depth (m)	Notes
8/15/2023	2023	9:30 AM	Mid-Lake	Monthly Post Treatment	1	25.60	0.332	8.87	109.40	8.30			
8/15/2023	2023	9:30 AM	Mid-Lake	Monthly Post Treatment	1.5	25.46	0.331	9.11	112.10	8.33			
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (HL4)	0.5	20.55	0.346	10.44	116.50	8.72	1.74	1.98	gage 3.33 bottom of lake depth gage; very windy
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (HL4)	1	20.46	0.345	10.76	120.10	8.71			
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (HL4)	1.5	20.28	0.345	10.65	118.80	8.71			
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (MS5)	0.5	20.55	0.319	10.45	115.50	8.59	1.74	1.98	gage 3.33 bottom of lake depth gage; very windy
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (MS5)	1	20.45	0.319	10.46	115.40	8.60			
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (MS5)	1.5	20.31	0.319	10.56	116.30	8.59			
10/11/2023	2023	10:30 AM	Mid-Lake	Monthly Post Treatment (MS5)	0.5	15.80	0.328	10.85	111.10	8.70	0.90	1.86	gage 3.0; raining hard, made secchi disk reading difficult
10/11/2023	2023	10:30 AM	Mid-Lake	Monthly Post Treatment (MS5)	1	15.80	0.328	10.82	110.70	8.72			
10/11/2023	2023	10:30 AM	Mid-Lake	Monthly Post Treatment (MS5)	1.5	15.75	0.327	10.82	110.50	8.72			
12/12/2023	2023	10:18 AM	Mid-Lake	Quarterly Post Treatment (MS5)	0.5	7.17	0.254	13.25	108.50	8.17	0.77	2.35	gage 4.2; water is green, fish jumping, geese on the lake, no smell when picking up anchor; water level much higher, 40 and overcast
12/12/2023	2023	10:18 AM	Mid-Lake	Quarterly Post Treatment (MS5)	1	7.13	0.253	13.26	108.50	8.21			
12/12/2023	2023	10:18 AM	Mid-Lake	Quarterly Post Treatment (MS5)	1.5	7.13	0.253	13.19	108.00	8.24			
12/12/2023	2023	10:18 AM	Mid-Lake	Quarterly Post Treatment (MS5)	2	7.14	0.254	13.19	108.00	8.26			
3/13/2024	2024	9:30	Mid-Lake	Quarterly Post Treatment (MS5)	0.5	7.67	0.202	13.33	109.40	8.73	0.7	2.9	gage 5.68 ft; sunny 40, water is green and cloudy, waterfowl and fish observed, rotten egg smell when pulling up seechi disk and anchor; water leaves hands feeling slimy and sticky
3/13/2024	2024	9:30	Mid-Lake	Quarterly Post Treatment (MS5)	1	7.62	0.203	13.31	109.80	8.76			
3/13/2024	2024	9:30	Mid-Lake	Quarterly Post Treatment (MS5)	1.5	7.59	0.202	13.26	109.20	8.77			
3/13/2024	2024	9:30	Mid-Lake	Quarterly Post Treatment (MS5)	2	7.58	0.202	13.22	108.80	8.77			
3/13/2024	2024	9:30	Mid-Lake	Quarterly Post Treatment (MS5)	2.5	7.48	0.202	13.02	107.20	8.69			
6/27/2024	2024	10:30	Mid-Lake	Quarterly Post Treatment (MS5)	0.5	21.48	0.224	9.06	102.40	7.29	0.85	2.50	gage (big) 4.5 ft; cloudy, very windy, 50-60 deg C, secchi probably affected by choppy water, geese and ducks, kingfisher, sparrows, bald

Return to Agenda

Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	pH	Secchi (m)	Water Depth (m)	Notes
													eagle and osprey observed flying around lake; osprey nest in same location as last year, brownish/green tint to water, feels slimy to touch, slight hydrogen sulfide smell near lily pads on north shore, no odor at middle of lake, buoy is not located at GPS coordinates, samples were collected at GPS coordinates
6/27/2024	2024	10:30	Mid-Lake	Quarterly Post Treatment (MS5)	1	21.49	0.225	8.99	101.70	7.29			
6/27/2024	2024	10:30	Mid-Lake	Quarterly Post Treatment (MS5)	1.5	21.43	0.224	9.11	103.10	7.31			
6/27/2024	2024	10:30	Mid-Lake	Quarterly Post Treatment (MS5)	2	21.24	0.224	9.35	105.40	7.36			

APPENDIX C: LABORATORY DATA REPORTS

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1712538 **PAGE 1**

REPORT DATE: 04/28/20

DATE SAMPLED: 03/23/20 **DATE RECEIVED:** 03/23/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

Four water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
Mid-Lake 1m	0.085	0.005	0.046	0.040	1.55	20.3
Mid-Lake Bottom	0.096	0.004	0.055	0.049	1.78	20.3
Lake #2 1 m	0.090	0.003	0.037	0.052	1.49	17.0
Lake #2 Bottom	0.085	0.003	0.044	0.050	1.80	20.1

SAMPLE ID	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	1.45	0.062	0.028	59	12
Mid-Lake Bottom	<1.00	0.072	0.017	81	16
Lake #2 1 m	<1.00	0.077	0.022	45	12
Lake #2 Bottom	<1.00	0.069	0.021	61	15

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1712538 **PAGE 2**

REPORT DATE: 04/28/20

DATE SAMPLED: 03/23/20 **DATE RECEIVED:** 03/23/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	03/30/20	03/25/20	03/25/20	03/25/20	03/31/20	04/28/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	BATCH	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	BATCH	Lake #2 Bottom
ORIGINAL	<0.002	0.003	0.044	0.050	0.443	20.1
DUPLICATE	<0.002	0.003	0.040	0.045	0.429	20.5
RPD	NC	0.00%	9.52%	10.53%	3.15%	1.97%
SPIKE SAMPLE						
SAMPLE ID	BATCH	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	BATCH	
ORIGINAL	<0.002	0.003	0.044	0.050	0.443	
SPIKED SAMPLE	0.050	0.023	0.248	0.256	1.60	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	100.00%	100.00%	102.00%	103.00%	115.63%	NA
QC CHECK						
FOUND	0.095	0.042	0.328	0.416	0.500	101
TRUE	0.094	0.039	0.324	0.408	0.490	100
% RECOVERY	101.06%	107.69%	101.23%	101.96%	102.04%	101.00%
BLANK	<0.002	<0.001	<0.010	<0.010	<0.050	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1712538 **PAGE 3**

REPORT DATE: 04/28/20

DATE SAMPLED: 03/23/20 **DATE RECEIVED:** 03/23/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.7	EPA 200.7	SM1810200H	SM1810200H
DATE ANALYZED	03/31/20	03/30/20	03/30/20	03/27/20	03/27/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Lake #2 Bottom	BATCH	Lake #2 Bottom	BATCH	BATCH
ORIGINAL	<1.00	<0.003	0.021	7.7	1.0
DUPLICATE	<1.00	<0.003	0.023	7.1	0.9
RPD	NC	NC	9.09%	8.00%	10.53%
SPIKE SAMPLE					
SAMPLE ID	Lake #2 Bottom	BATCH	Lake #2 Bottom		
ORIGINAL	<1.00	<0.003	0.021		
SPIKED SAMPLE	10.3	0.477	0.485		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	103.00%	95.40%	92.80%	NA	NA
QC CHECK					
FOUND	10.5	0.482	0.482		
TRUE	10.0	0.500	0.500		
% RECOVERY	105.00%	96.40%	96.40%	NA	NA
BLANK	<1.00	<0.003	<0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski

Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 712538

Page ___ of ___

Return to Agenda

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REPORT TO:
Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 206-838-6258 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address:
Contact:
Email:
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
❑ Fax ❑ Email ❑ Mail

QC Data Reported
❑ Yes ❑ No

Sample Disposal
❑ Hold ❑ Dispose ❑ Return

Turn Around Time (TAT)*
❑ Next Day ❑ 2 Business Day
❑ 3 Business Da ❑ Standard

Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

SAMPLING

Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Alkalinity	Total Aluminum	Dissolved Aluminum	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Ammonia Nitrogen	Chlorophyll a	Metals Field Filtered (Y/N)	Containers Received	Temp	Lab ID
3/23/20		SW	Mid-Lake 1m	3		X	X	X	X	X	X	X	X	X	N			A1 37791
↓		SW	Mid-Lake Bottom	3		‖	‖	‖	‖	‖	‖	‖	‖	‖	N			A2 37792
		SW	Lake #2 1 m	3		‖	‖	‖	‖	‖	‖	‖	‖	‖	N			A3 37793
↓		SW	Lake #2 Bottom	3		‖	‖	‖	‖	‖	‖	‖	‖	‖	N			AA 37794

LAB USE ONLY
Case File Number

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
Dissolved aluminum and SRP samples not filtered, will need filtration

Sampled By	Date	Time
Iris Lippert	3/23/2020	~~3PM~~
Received By	Date	Time
Relinquished to IAL By (Signature)	Date 3/23/2020	Time 3PM

Shipped By	Shipping Reference
Received at IAL By	Date 3/23/20 Time 3pm

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1712546 **PAGE 1**

REPORT DATE: 04/28/20

DATE SAMPLED: 03/26/20 **DATE RECEIVED:** 03/26/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

Four water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
Mid-Lake 1m	0.011	0.003	0.031	0.025	0.465	10.0
Mid-Lake Bottom	0.008	<0.001	0.031	0.025	0.507	10.1
Lake #2 1 m	0.010	0.003	0.035	0.024	0.468	9.50
Lake #2 Bottom	0.020	<0.001	0.032	0.024	0.443	9.50

SAMPLE ID	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	85.6	0.439	0.037	1.8	<0.1
Mid-Lake Bottom	85.1	0.450	0.038	1.4	<0.1
Lake #2 1 m	81.8	0.701	0.068	0.8	<0.1
Lake #2 Bottom	94.9	0.715	0.044	0.9	<0.1

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1712546 **PAGE 2**

REPORT DATE: 04/28/20

DATE SAMPLED: 03/26/20 **DATE RECEIVED:** 03/26/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	03/30/20	03/27/20	03/27/20	03/27/20	03/31/20	04/08/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	BATCH	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom
ORIGINAL	<0.002	<0.001	0.032	0.024	0.443	9.50
DUPLICATE	<0.002	<0.001	0.033	0.025	0.429	9.90
RPD	NC	NC	3.08%	4.08%	3.15%	4.12%
SPIKE SAMPLE						
SAMPLE ID	BATCH	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	
ORIGINAL	<0.002	<0.001	0.032	0.024	0.443	
SPIKED SAMPLE	0.050	0.022	0.234	0.228	1.60	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	100.00%	110.00%	101.00%	102.00%	115.63%	NA
QC CHECK						
FOUND	0.095	0.042	0.325	0.406	0.500	100
TRUE	0.094	0.039	0.324	0.408	0.490	100
% RECOVERY	101.06%	107.69%	100.31%	99.51%	102.04%	100.00%
BLANK	<0.002	<0.001	<0.010	<0.010	<0.050	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
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IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1712546 **PAGE 3**

REPORT DATE: 04/28/20

DATE SAMPLED: 03/26/20 **DATE RECEIVED:** 03/26/20

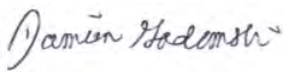
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.7	EPA 200.7	SM1810200H	SM1810200H
DATE ANALYZED	04/01/20	03/30/20	03/30/20	03/27/20	03/27/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Lake #2 Bottom	BATCH	BATCH	BATCH	BATCH
ORIGINAL	94.9	<0.003	0.021	7.7	1.0
DUPLICATE	95.0	<0.003	0.023	7.1	0.9
RPD	0.13%	NC	9.09%	8.00%	10.53%
SPIKE SAMPLE					
SAMPLE ID	Lake #2 Bottom	BATCH	BATCH		
ORIGINAL	94.9	<0.003	0.021		
SPIKED SAMPLE	105	0.477	0.485		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	105.81%	95.40%	92.80%	NA	NA
QC CHECK					
FOUND	10.6	0.482	0.482		
TRUE	10.0	0.500	0.500		
% RECOVERY	106.00%	96.40%	96.40%	NA	NA
BLANK	<1.00	<0.003	<0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 17125546

Page ___ of ___

REPORT TO:
Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 206-838-6258 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address:
Contact:
Email:
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☐ Email ☐ Mail

QC Data Reported
☐ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

SAMPLING			SAMPLE DESCRIPTION	Number of Containers	Total Alkalinity	Total Aluminum	Dissolved Aluminum	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Ammonia Nitrogen	Chlorophyll a	Metals Field Filtered (Y/N)	LAB USE ONLY: Containers Received	LAB USE ONLY: Case File Number – Temp	LAB USE ONLY: Case File Number – Lab ID
Date (mm-dd-yy)	Time	Matrix**	(This Will Appear On The Report)	Analysis Requested														
03-26-2020		SW	Mid-Lake 1m	3	X	X	X	X	X	X	X	X	X	X	N			37824
↓		SW	Mid-Lake Bottom	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	N			37825
		SW	Lake #2 1 m	3											N			37826
		SW	Lake #2 Bottom	3											N			37827

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
Dissolved aluminum and SRP samples not filtered, will need filtration

Sampled By: Iris Lippert	Date: 3/26/20	Time: 12PM
Received By:	Date:	Time:
Relinquished to IAL By (Signature):	Date: 3/26/20	Time: 2PM

Shipped By:	Shipping Reference:	
Received at IAL By: US SAMPLES AS1594	Date: 3-26-2020	Time: 2:00

Return to Agenda

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1712845 **PAGE 1**

REPORT DATE: 04/28/20

DATE SAMPLED: 04/10/20 **DATE RECEIVED:** 04/10/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

Four water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
Mid-Lake 1m	0.012	<0.001	0.094	0.021	0.516	11.8
Mid-Lake Bottom	0.017	<0.001	0.097	0.021	0.529	11.9
Lake #2 1 m	0.012	<0.001	0.091	0.020	0.544	11.9
Lake #2 Bottom	0.015	<0.001	0.095	0.020	0.501	11.7

SAMPLE ID	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	83.0	0.680	0.014	1.6	1.1
Mid-Lake Bottom	83.5	0.584	0.017	2.1	1.4
Lake #2 1 m	81.4	0.545	0.014	2.1	1.0
Lake #2 Bottom	83.0	0.582	0.019	2.1	1.2

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1712845 **PAGE 2**

REPORT DATE: 04/28/20

DATE SAMPLED: 04/10/20 **DATE RECEIVED:** 04/10/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	04/13/20	04/11/20	04/15/20	04/15/20	04/14/20	04/15/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom
ORIGINAL	0.015	<0.001	0.095	0.020	0.501	11.7
DUPLICATE	0.015	<0.001	0.092	0.019	0.492	11.8
RPD	0.26%	NC	2.34%	2.44%	1.88%	0.85%
SPIKE SAMPLE						
SAMPLE ID	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	
ORIGINAL	0.015	<0.001	0.095	0.020	0.501	
SPIKED SAMPLE	0.069	0.020	0.293	0.226	1.48	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	108.73%	100.00%	99.02%	103.21%	97.48%	NA
QC CHECK						
FOUND	0.092	0.042	0.331	0.407	0.508	99.8
TRUE	0.094	0.039	0.324	0.408	0.490	100
% RECOVERY	97.87%	107.69%	102.10%	99.83%	103.67%	99.80%
BLANK	<0.002	<0.001	<0.010	<0.010	<0.050	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1712845 **PAGE 3**

REPORT DATE: 04/28/20

DATE SAMPLED: 04/10/20 **DATE RECEIVED:** 04/10/20

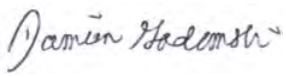
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.7	EPA 200.7	SM1810200H	SM1810200H
DATE ANALYZED	04/16/20	04/13/20	04/13/20	04/13/20	04/13/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Lake #2 Bottom	BATCH	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom
ORIGINAL	83.0	<0.003	0.019	2.1	1.2
DUPLICATE	83.5	<0.003	0.017	2.4	1.4
RPD	0.60%	NC	11.11%	13.33%	9.09%
SPIKE SAMPLE					
SAMPLE ID	Lake #2 Bottom	BATCH	Lake #2 Bottom		
ORIGINAL	83.0	<0.003	0.019		
SPIKED SAMPLE	93.9	0.497	0.517		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	109.00%	99.40%	99.60%	NA	NA
QC CHECK					
FOUND	10.5	0.488	0.488		
TRUE	10.0	0.500	0.500		
% RECOVERY	105.00%	97.60%	97.60%	NA	NA
BLANK	<1.00	<0.003	<0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 712845

Page ___ of ___

Return to Agenda
381

REPORT TO:

Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 206-838-6258 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)

Client: Same
Address:
Contact:
Email:
Phone: Fax:

PROJECT INFORMATION

Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format

☐ Fax ☐ Email ☐ Mail

QC Data Reported

☐ Yes ☐ No

Sample Disposal

☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*

☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard

Specific Date: 4 weeks

*Advanced notice required for Rush Analysis

SAMPLING			SAMPLE DESCRIPTION	Number of Containers	Analysis Requested: Total Alkalinity	Total Aluminum	Dissolved Aluminum	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Ammonia Nitrogen	Chlorophyll a					Metals Field Filtered (Y/N)	LAB USE ONLY: Containers Received	Case File Number: Temp	Lab ID
Date (mm-dd-yy)	Time	Matrix**	(This Will Appear On The Report)																			
4/10/20		SW	Mid-Lake 1m	3	X	X	X	X	X	X	X	X	X	X					N			38614
↓		SW	Mid-Lake Bottom	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					N			38615
		SW	Lake #2 1 m	3															N			38616
		SW	Lake #2 Bottom	3															N			38617

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
Dissolved aluminum and SRP samples not filtered, will need filtration

Sampled By	Date	Time
Iris Lippert	4/10/20	
Received By	Date	Time
Relinquished to IAL By (Signature)	Date	Time
	4/10/20	2:15 PM

Shipped By	Shipping Reference
Received at IAL By	Date / Time
SAMPLES AS 154.7°C	4-10-20 2:20

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1713845**	**PAGE 1**	
REPORT DATE:	**06/15/20**		
DATE SAMPLED:	**05/27/20**	**DATE RECEIVED:**	**05/28/20**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)	ALKALINITY (mgCaCO3/L)	SULFATE (mg/L)
Mid-Lake 1m	0.022	0.450	4.3	2.1	13.2	108

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1713845 **PAGE 2**

REPORT DATE: 06/15/20

DATE SAMPLED: 05/27/20 **DATE RECEIVED:** 05/28/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)	ALKALINITY (mgCaCO3/L)	SULFATE (mg/L)
METHOD	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H	SM18 2320B	EPA 375.4
DATE ANALYZED	06/01/20	05/29/20	06/01/20	06/01/20	05/30/20	06/01/20
DETECTION LIMIT	0.002	0.050	0.1	0.1	1.00	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	Mid-Lake 1m
ORIGINAL	0.007	0.163	3.7	2.1	23.2	108
DUPLICATE	0.007	0.167	3.2	2.0	23.5	107
RPD	1.27%	2.00%	15.38%	3.43%	1.28%	0.93%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH				Mid-Lake 1m
ORIGINAL	0.007	0.163				108
SPIKED SAMPLE	0.056	1.15				120
SPIKE ADDED	0.050	1.00				10.0
% RECOVERY	97.93%	98.32%	NA	NA	NA	120.00%
QC CHECK						
FOUND	0.097	0.500			105	10.6
TRUE	0.094	0.499			100	10.0
% RECOVERY	103.19%	100.20%	NA	NA	105.00%	106.00%
BLANK	<0.002	<0.050	NA	NA	NA	<1.00

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski

Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
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Chain of Custody Form 1713845

Page ___ of ___

REPORT TO:
Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 509-232-4312 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address
Contact: Shannon Brattebo, Harry Gibbons
Email: shannon.brattebo@tetratech.com, Harry.Gibbons@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☐ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

SAMPLING

Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Phosphorus	Total Nitrogen	Chlorophyll a	Sulfate	Alkalinity	Metals Field Filtered (Y/N)	Containers Received	LAB USE ONLY Case File Number: Temp	Lab ID
5/27/20	2:30 PM	SW	Mid-Lake 1m	2	x	x	x	x	X				42065

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:

Sampled By	Date	Time
Iris Lippert	5/27/20	2:30 PM
Received By	Date	Time
Relinquished to IAL By (Signature)	5/28/20	2:50 PM

Shipped By | Shipping Reference

Received at IAL By | Date 5.28.20 | Time 2:50

SAMPLE TEMP IS 23.9°C T-074

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1714341**	**PAGE 1**	
REPORT DATE:	**07/01/20**		
DATE SAMPLED:	**06/18/20**	**DATE RECEIVED:**	**06/18/20**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)	SULFATE (mg/L)	ALKALINITY (mgCaCO3/L)
Mid-Lake 1m	0.022	0.345	3.5	1.0	75.5	14.8

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1714341 **PAGE 2**

REPORT DATE: 07/01/20

DATE SAMPLED: 06/18/20 **DATE RECEIVED:** 06/18/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)	SULFATE (mg/L)	ALKALINITY (mgCaCO3/L)
METHOD	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H	EPA 375.4	SM18 2320B
DATE ANALYZED	06/29/20	06/23/20	06/23/20	06/23/20	06/19/20	06/26/20
DETECTION LIMIT	0.002	0.050	0.1	0.1	1.00	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	<0.002	0.239	2.9	0.2	6.56	57.0
DUPLICATE	<0.002	0.234	2.9	0.2	6.64	57.2
RPD	NC	2.03%	0.00%	0.00%	1.27%	0.35%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH			BATCH	
ORIGINAL	<0.002	0.239			6.56	
SPIKED SAMPLE	0.052	1.27			17.6	
SPIKE ADDED	0.050	1.00			10.0	
% RECOVERY	104.00%	102.78%	NA	NA	110.58%	NA
QC CHECK						
FOUND	0.091	0.478			10.6	102
TRUE	0.094	0.499			10.0	100
% RECOVERY	96.81%	95.79%	NA	NA	106.00%	102.00%
BLANK	<0.002	<0.050	NA	NA	<1.00	NA

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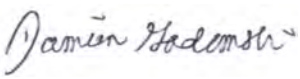
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

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Chain of Custody Form 171434

Page ____ of ____

REPORT TO:
Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 509-232-4312 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address
Contact: Shannon Brattebo, Harry Gibbons
Email: shannon.brattebo@tetratech.com, Harry.Gibbons@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☐ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☒ 3 Business Da ☐ Standard
Specific Date: ~~4 weeks~~
*Advanced notice required for Rush Analysis

LAB USE ONLY
Case File Number

SAMPLING			SAMPLE DESCRIPTION	Number of Containers	Analysis Requested: Total Phosphorus	Total Nitrogen	Chlorophyll a	Sulfate											Metals Field Filtered (Y/N)	Containers Received	Temp	Lab ID
Date (mm-dd-yy)	Time	Matrix**	(This Will Appear On The Report)																			
6/18/20	11:00	SW	Mid-Lake 1m	2	x	x	x	x	✓													43598

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:

	Date	Time			
Sampled By					
Received By			Shipped By	Shipping Reference	
Relinquished to IAL By (Signature)	Date: 6/18/20	Time: 2:40 PM	Received at IAL By: SAMPLE ANALYSIS 22.8°C T-074	Date: 6-18-20	Time: 2:45

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1714921 **PAGE 1**

REPORT DATE: 08/26/20

DATE SAMPLED: 07/13/20 **DATE RECEIVED:** 12/13/01

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

Four water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
Mid-Lake 1m	0.026	<0.001	0.012	<0.010	0.503	20.5
Mid-Lake Bottom	0.031	<0.001	<0.010	<0.010	0.585	20.2
Station #2 1m	0.027	<0.001	<0.010	<0.010	0.463	13.6
Station #2 Bottom	0.034	<0.001	<0.010	<0.010	0.477	14.9

SAMPLE ID	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	82.7	0.833	0.763	2.1	0.1
Mid-Lake Bottom	71.5	0.874	0.764	3.6	1.0
Station #2 1m	69.0	0.828	0.801	3.7	0.6
Station #2 Bottom	95.7	0.899	0.780	5.3	0.9

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1714921 **PAGE 2**

REPORT DATE: 08/26/20

DATE SAMPLED: 07/13/20 **DATE RECEIVED:** 12/13/01

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	07/20/20	07/14/20	07/15/20	07/15/20	07/16/20	07/15/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.008	0.005	0.018	0.054	0.228	70.4
DUPLICATE	0.008	0.005	0.017	0.056	0.213	70.8
RPD	2.55%	1.95%	7.04%	3.42%	6.90%	0.57%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.008	0.005	0.018	0.054	0.228	
SPIKED SAMPLE	0.060	0.023	0.222	0.257	1.24	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	104.63%	91.99%	101.68%	101.80%	100.88%	NA
QC CHECK						
FOUND	0.097	0.039	0.341	0.428	0.508	95.3
TRUE	0.094	0.039	0.324	0.408	0.490	100
% RECOVERY	103.19%	100.00%	105.22%	104.96%	103.67%	95.30%
BLANK	<0.002	<0.001	<0.010	<0.010	<0.050	NA

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OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

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PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1714921 **PAGE 3**

REPORT DATE: 08/26/20

DATE SAMPLED: 07/13/20 **DATE RECEIVED:** 12/13/01

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	07/17/20	07/21/20	07/21/20	07/17/20	07/17/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Station #2 Bottom	BATCH	Station #2 Bottom	BATCH	BATCH
ORIGINAL	95.7	0.019	0.780	5.6	<0.1
DUPLICATE	96.7	0.019	0.777	5.2	<0.1
RPD	1.05%	0.00%	0.39%	7.41%	NC
SPIKE SAMPLE					
SAMPLE ID	Station #2 Bottom	BATCH	Station #2 Bottom		
ORIGINAL	95.7	0.018	0.780		
SPIKED SAMPLE	106	0.547	1.27		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	102.82%	105.80%	97.20%	NA	NA
QC CHECK					
FOUND	10.7	0.492	0.492		
TRUE	10.0	0.500	0.500		
% RECOVERY	107.00%	98.40%	98.40%	NA	NA
BLANK	<1.00	<0.003	<0.003	NA	NA

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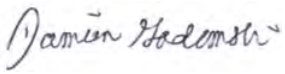
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 1714921

Page ___ of ___

Return to Agenda

REPORT TO:

Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 206-838-6258 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)

Client: Same
Address:
Contact:
Email:
Phone: Fax:

PROJECT INFORMATION

Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format

❑ Fax ☒ Email ❑ Mail

QC Data Reported

❑ Yes ❑ No

Sample Disposal

❑ Hold ❑ Dispose ❑ Return

Turn Around Time (TAT)*

❑ Next Day ❑ 2 Business Day
❑ 3 Business Da ❑ Standard

Specific Date: 4 weeks

*Advanced notice required for Rush Analysis

LAB USE ONLY

Case File Number

Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Alkalinity	Total Aluminum	Dissolved Aluminum	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Ammonia Nitrogen	Chlorophyll a					Metals Field Filtered (Y/N)	Containers Received	Temp	Lab ID
7/13/20	12PM	SW	Mid-Lake 1m	3	x	x	x	x	x	x	x	x	x	x					N			45284
↓	↓	SW	Mid-Lake Bottom	3	x	x	x	x	x	x	x	x	x	x					N			45285
		SW	Station #2 1m	3	x	x	x	x	x	x	x	x	x	x					N			45286
		SW	Station #2 Bottom	3	x	x	x	x	x	x	x	x	x	x					N			45287

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
Dissolved aluminum and SRP samples not filtered, will need filtration

Sampled By: Iris Lippert	Date: 7/13/20	Time
Received By	Date	Time
Relinquished to IAL By (Signature): [signature]	Date: 7/13/20	Time

Shipped By	Shipping Reference
Received at IAL By: [signature] IAL	Date: 3:40P (struck through) / Time: 3:40PM

4 SAMPLES [illegible] 7/13/20

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1715086 **PAGE 1**

REPORT DATE: 08/26/20

DATE SAMPLED: 07/17/20 **DATE RECEIVED:** 07/17/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

Two water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
Mid-Lake 1m	0.005	<0.001	0.036	<0.010	0.260	6.80
Mid-Lake Bottom	0.007	<0.001	0.036	<0.010	0.261	6.40

SAMPLE ID	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	176	0.498	0.021	0.4	<0.1
Mid-Lake Bottom	198	0.482	0.019	0.5	<0.1

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1715086 **PAGE 2**

REPORT DATE: 08/26/20

DATE SAMPLED: 07/17/20 **DATE RECEIVED:** 07/17/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	07/27/20	07/17/20	07/18/20	07/18/20	07/27/20	07/21/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.092	<0.001	<0.010	0.161	0.284	16.3
DUPLICATE	0.093	<0.001	<0.010	0.163	0.282	16.1
RPD	1.43%	NC	NC	1.29%	0.74%	1.23%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.092	<0.001	<0.010	0.161	0.284	
SPIKED SAMPLE	0.144	0.019	0.232	0.360	1.30	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	103.82%	95.00%	115.86%	99.52%	101.28%	NA
QC CHECK						
FOUND	0.097	0.040	0.344	0.404	0.503	98.3
TRUE	0.094	0.039	0.324	0.408	0.490	100
% RECOVERY	103.19%	102.56%	106.17%	99.10%	102.65%	98.30%
BLANK	<0.002	<0.001	<0.010	<0.010	<0.050	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1715086 **PAGE 3**

REPORT DATE: 08/26/20

DATE SAMPLED: 07/17/20 **DATE RECEIVED:** 07/17/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	07/22/20	07/21/20	07/21/20	07/23/20	07/23/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Mid-Lake Bottom	BATCH	BATCH	BATCH	BATCH
ORIGINAL	198	0.023	<0.003	11	2.3
DUPLICATE	200	0.025	<0.003	11	2.4
RPD	0.74%	8.33%	NC	0.00%	4.38%
SPIKE SAMPLE					
SAMPLE ID	Mid-Lake Bottom	BATCH	BATCH		
ORIGINAL	198	0.023	<0.003		
SPIKED SAMPLE	209	0.567	0.521		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	107.52%	108.80%	104.20%	NA	NA
QC CHECK					
FOUND	10.2	0.492	0.492		
TRUE	10.0	0.500	0.500		
% RECOVERY	102.00%	98.40%	98.40%	NA	NA
BLANK	<1.00	<0.003	<0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
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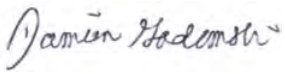
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories

3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 1715080

Page ___ of ___

Return to Agenda

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REPORT TO:
Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 206-838-6258 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address:
Contact:
Email:
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☐ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

LAB USE ONLY
Case File Number

SAMPLING Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Alkalinity	Total Aluminum	Dissolved Aluminum	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Ammonia Nitrogen	Chlorophyll a	Metals Field Filtered (Y/N)	Containers Received	Temp	Lab ID
7/17/20	11 AM	SW	Mid-Lake 1m	3	x	x	x	x	x	x	x	x	x	x	N			45772
7/17/20	11AM	SW	Mid-Lake Bottom	3	x	x	x	x	x	x	x	x	x	x	N			45773
			[redacted]												N			
		SW													N			

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments: Dissolved aluminum and SRP samples not filtered, will need filtration

Sampled By	Date	Time
Iris Lippert	7/17/20	11AM
Received By	Date	Time
Relinquished to IAL By (Signature)	Date	Time
[signature]	7/17/20	2:45 PM

Shipped By	Shipping Reference	
Received at IAL By	Date	Time
[signature]	7/17/20	2:45 PM

(2) Samples

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1715655 **PAGE 1**

REPORT DATE: 08/26/20

DATE SAMPLED: 08/07/20 **DATE RECEIVED:** 08/07/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
Mid-Lake 1m	0.011	<0.001	<0.010	<0.010	0.421	6.50

SAMPLE ID	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	191	0.154	0.066	2.7	1.1

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1715655 **PAGE 2**

REPORT DATE: 08/26/20

DATE SAMPLED: 08/07/20 **DATE RECEIVED:** 08/07/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	AMMONIA (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	08/17/20	08/07/20	08/08/20	08/08/20	08/18/20	08/13/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.005	<0.001	<0.010	0.211	0.372	21.6
DUPLICATE	0.005	<0.001	<0.010	0.212	0.341	21.5
RPD	5.77%	NC	NC	0.31%	8.58%	0.46%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.005	<0.001	<0.010	0.211	0.372	
SPIKED SAMPLE	0.055	0.020	0.185	0.407	1.47	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	99.42%	100.00%	92.32%	97.91%	109.40%	NA
QC CHECK						
FOUND	0.094	0.039	0.329	0.409	0.524	96.5
TRUE	0.094	0.039	0.324	0.408	0.490	100
% RECOVERY	100.00%	100.00%	101.69%	100.33%	106.94%	96.50%
BLANK	<0.002	<0.001	<0.010	<0.010	<0.050	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1715655 **PAGE 3**

REPORT DATE: 08/26/20

DATE SAMPLED: 08/07/20 **DATE RECEIVED:** 08/07/20

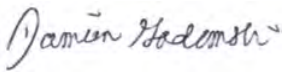
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	08/11/20		08/12/20	08/12/20	08/12/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Mid-Lake 1m	BATCH	Mid-Lake 1m	Mid-Lake 1m	Mid-Lake 1m
ORIGINAL	191	<0.003	0.066	2.7	1.1
DUPLICATE	190	<0.003	0.066	2.3	1.2
RPD	0.30%	NC	0.00%	13.33%	8.96%
SPIKE SAMPLE					
SAMPLE ID	Mid-Lake 1m	BATCH	Mid-Lake 1m		
ORIGINAL	191	<0.003	0.066		
SPIKED SAMPLE	202	0.521	0.528		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	114.38%	104.20%	92.40%	NA	NA
QC CHECK					
FOUND	10.7	0.472	0.472		
TRUE	10.0	0.500	0.500		
% RECOVERY	107.00%	94.40%	94.40%	NA	NA
BLANK	<1.00	<0.003	<0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form

Page ___ of ___ 1715655

Return to Agenda

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REPORT TO:
Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 509-232-4312 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address
Contact: Shannon Brattebo, Harry Gibbons
Email: shannon.brattebo@tetratech.com, Harry.Gibbons@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☐ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

SAMPLING

Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Phosphorus	Total Nitrogen	Chlorophyll a	Sulfate	Alkalinity	Total Aluminum	Dissolved Aluminum	SRP	NO3+NO2-Nitrogen	Ammonia Nitrogen					Metals Field Filtered (Y/N)	Containers Received	Temp	Lab ID
8/7/20	1130 AM	SW	Mid-Lake 1m	3	x	x	x	x	x	x	x	x	x	x					N			47427
		SW																	N			

LAB USE ONLY
Case File Number

Analysis Requested

Containers Received

Metals Field Filtered (Y/N)

Temp

Lab ID

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:

Sampled By	Date	Time
Iris Lippert		
Received By	Date	Time
Relinquished to IAL By (Signature)	Date	Time
	8/7/20	2:40 PM

Shipped By | Shipping Reference

Received at IAL By | Date 8.7.20 | Time 2:40

ISAMPLE As IS 23.8°C T-074

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1716594**	**PAGE 1**	
REPORT DATE:	**09/27/20**		
DATE SAMPLED:	**09/11/20**	**DATE RECEIVED:**	**09/11/20**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
Mid-Lake 1m	0.018	0.421	6.30

SAMPLE ID	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	245	0.407	0.027	4.5	1.9

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1716594 **PAGE 2**

REPORT DATE: 09/27/20

DATE SAMPLED: 09/11/20 **DATE RECEIVED:** 09/11/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)
METHOD	SM18 4500PF	SM204500NC	SM18 2320B
DATE ANALYZED	09/22/20	09/23/20	09/15/20
DETECTION LIMIT	0.002	0.050	1.00
DUPLICATE			
SAMPLE ID	BATCH	BATCH	BATCH
ORIGINAL	0.036	0.777	140
DUPLICATE	0.035	0.773	140
RPD	2.12%	0.53%	0.14%
SPIKE SAMPLE			
SAMPLE ID	BATCH	BATCH	
ORIGINAL	0.036	0.777	
SPIKED SAMPLE	0.090	1.70	
SPIKE ADDED	0.050	1.00	
% RECOVERY	108.38%	92.61%	NA
QC CHECK			
FOUND	0.097	0.495	103
TRUE	0.094	0.490	100
% RECOVERY	103.19%	101.02%	103.00%
BLANK	<0.002	<0.050	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1716594 **PAGE 3**

REPORT DATE: 09/27/20

DATE SAMPLED: 09/11/20 **DATE RECEIVED:** 09/11/20

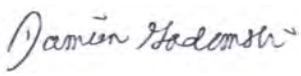
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	09/23/20	09/22/20	09/22/20	09/16/20	09/16/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Mid-Lake 1m	BATCH	Mid-Lake 1m	Mid-Lake 1m	Mid-Lake 1m
ORIGINAL	245	<0.003	0.027	7.5	11
DUPLICATE	245	<0.003	0.027	6.9	12
RPD	0.27%	NC	2.24%	7.41%	4.65%
SPIKE SAMPLE					
SAMPLE ID	Mid-Lake 1m	BATCH	Mid-Lake 1m		
ORIGINAL	245	<0.003	0.027		
SPIKED SAMPLE	254	0.525	0.548		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	92.59%	105.00%	104.18%	NA	NA
QC CHECK					
FOUND	10.6	0.495	0.495		
TRUE	10.0	0.500	0.500		
% RECOVERY	106.00%	99.00%	99.00%	NA	NA
BLANK	<1.00	<0.003	<0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form

Page ___ of ___ 1716594

Return to Agenda

403

REPORT TO:
Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 509-232-4312 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address
Contact: Shannon Brattebo, Harry Gibbons
Email: shannon.brattebo@tetratech.com, Harry.Gibbons@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☐ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

SAMPLING

Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Phosphorus	Total Nitrogen	Chlorophyll a	Sulfate	Alkalinity	Total Aluminum	Dissolved Aluminum	Metals Field Filtered (Y/N)	Containers Received	Temp	Lab ID
9/11/20	11:30 PM	SW	Mid-Lake 1m	3	x	x	x	x	X	X	X	N			500604

Analysis Requested

LAB USE ONLY
Case File Number

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:

Sampled By: Iris Lippert	Date: 9/11/20	Time
Received By	Date	Time
Relinquished to IAL By (Signature)	Date: 9/11/20	Time: 2:30 PM

Shipped By | Shipping Reference

Received at IAL By: SAMPLE TS IS 21.9°C T-074 | Date: 9-11-20 | Time: 2:30

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1718103 **PAGE 1**

REPORT DATE: 12/02/20

DATE SAMPLED: 10/19/20 **DATE RECEIVED:** 10/19/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	DOC (mg/L)
Mid-Lake 1m	0.020	0.438	19.0	4.05

SAMPLE ID	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	211	0.255	0.024	2.5	1.1

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1718103 **PAGE 2**

REPORT DATE: 12/02/20

DATE SAMPLED: 10/19/20 **DATE RECEIVED:** 10/19/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	DOC (mg/L)
METHOD	SM18 4500PF	SM204500NC	SM18 2320B	EPA 415.1
DATE ANALYZED	10/26/20	10/27/20	10/24/20	10/30/20
DETECTION LIMIT	0.002	0.050	1.00	0.250
DUPLICATE				
SAMPLE ID	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.011	0.524	22.3	<0.250
DUPLICATE	0.010	0.529	22.7	<0.250
RPD	7.67%	1.05%	1.78%	NC
SPIKE SAMPLE				
SAMPLE ID	BATCH	BATCH		BATCH
ORIGINAL	0.011	0.524		<0.250
SPIKED SAMPLE	0.067	1.68		4.34
SPIKE ADDED	0.050	1.00		4.50
% RECOVERY	111.35%	115.50%	NA	96.44%
QC CHECK				
FOUND	0.097	0.500	103	4.10
TRUE	0.094	0.490	100	4.00
% RECOVERY	103.19%	102.04%	103.00%	102.50%
BLANK	<0.002	<0.050	NA	<0.250

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1718103 **PAGE 3**

REPORT DATE: 12/02/20

DATE SAMPLED: 10/19/20 **DATE RECEIVED:** 10/19/20

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	10/22/20	10/22/20	10/22/20	10/23/20	10/23/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Mid-Lake 1m	BATCH	BATCH	BATCH	BATCH
ORIGINAL	211	0.023	<0.003	4.7	3.4
DUPLICATE	212	0.024	<0.003	4.5	3.4
RPD	0.45%	3.39%	NC	6.45%	2.62%
SPIKE SAMPLE					
SAMPLE ID	Mid-Lake 1m	BATCH	BATCH		
ORIGINAL	211	0.023	<0.003		
SPIKED SAMPLE	222	0.522	0.485		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	104.94%	99.80%	97.00%	NA	NA
QC CHECK					
FOUND	10.8	0.485	0.485		
TRUE	10.0	0.500	0.500		
% RECOVERY	108.00%	97.00%	97.00%	NA	NA
BLANK	<1.00	<0.003	<0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
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NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski

Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories

3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form

Page ___ of ___

1718103

407

Return to Agenda

REPORT TO:
Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 509-232-4312 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address
Contact: Shannon Brattebo, Harry Gibbons
Email: shannon.brattebo@tetratech.com, Harry.Gibbons@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☐ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

LAB USE ONLY
Case File Number

SAMPLING Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Phosphorus	Total Nitrogen	Chlorophyll a	Sulfate	Alkalinity	Total Aluminum	Dissolved Aluminum	DOC							Metals Field Filtered (Y/N)	Containers Received	Temp	Lab ID
10/19/20	11:30 AM	SW	Mid-Lake 1m	3	x	x	x	x	X	X	x	x										54847

Received @ 15.6°C

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:

Sampled By	Date	Time
Iris Lippert	10/19/20	11:30 AM

Received By	Date	Time	Shipped By	Shipping Reference

Relinquished to IAL By (Signature)	Date	Time	Received at IAL By	Date	Time
	10/19/20	3:20 PM	Kevin Wahlberg	10/19/20	3:19 pm

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1720485**	**PAGE 1**	
REPORT DATE:	**02/23/21**		
DATE SAMPLED:	**01/19/21**	**DATE RECEIVED:**	**01/19/21**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	TOTAL-N (mg/L)	DOC (mg/L)
Mid-Lake 1m	0.012	1.16	4.98

SAMPLE ID	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	140	0.054	0.008	5.5	1.7

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1720485 **PAGE 2**

REPORT DATE: 02/23/21

DATE SAMPLED: 01/19/21 **DATE RECEIVED:** 01/19/21

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	TOTAL-N (mg/L)	DOC (mg/L)
METHOD	SM18 4500PF	SM204500NC	EPA 415.1
DATE ANALYZED	01/25/21	01/26/21	02/10/21
DETECTION LIMIT	0.002	0.050	0.250
DUPLICATE			
SAMPLE ID	BATCH	BATCH	BATCH
ORIGINAL	0.005	0.339	2.49
DUPLICATE	0.005	0.315	2.40
RPD	2.62%	7.30%	3.52%
SPIKE SAMPLE			
SAMPLE ID	BATCH	BATCH	BATCH
ORIGINAL	0.005	0.339	2.49
SPIKED SAMPLE	0.057	1.47	6.83
SPIKE ADDED	0.050	1.00	4.50
% RECOVERY	104.07%	113.11%	96.64%
QC CHECK			
FOUND	0.097	0.494	3.92
TRUE	0.094	0.490	4.00
% RECOVERY	103.19%	100.82%	98.00%
BLANK	<0.002	<0.050	<0.250

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1720485 **PAGE 3**

REPORT DATE: 02/23/21

DATE SAMPLED: 01/19/21 **DATE RECEIVED:** 01/19/21

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	01/27/21	01/21/21	01/21/21	01/21/21	01/21/21
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	13800	<0.003	<0.003	3.2	14
DUPLICATE	13700	<0.003	<0.003	3.7	17
RPD	0.73%	NC	NC	15.38%	15.75%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL		<0.003	<0.003		
SPIKED SAMPLE		0.437	0.492		
SPIKE ADDED		0.500	0.500		
% RECOVERY	OR	87.40%	98.40%	NA	NA
QC CHECK					
FOUND	10.4	0.478	0.478		
TRUE	10.0	0.500	0.500		
% RECOVERY	104.00%	95.60%	95.60%	NA	NA
BLANK	<1.00	<0.003	<0.003	NA	NA

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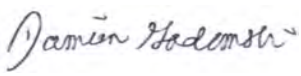
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories

3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form

Page ___ of ___

Return to Agenda

411

REPORT TO:

Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
Contact: Iris Lippert, Shannon Brattebo
Email: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
Phone: 509-232-4312 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)

Client: Same
Address 1720 485
Contact: Shannon Brattebo, Harry Gibbons
Email: shannon.brattebo@tetratech.com, Harry.Gibbons@tetratech.com
Phone: Fax:

PROJECT INFORMATION

Quote No.: ___
Client PO: ___
Client Project: Waughop Lake

Reporting/Invoicing Format

☐ Fax ☒ Email ☐ Mail

QC Data Reported

☐ Yes ☐ No

Sample Disposal

☒ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*

☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☒ Standard

Specific Date: ~~4 weeks~~

*Advanced notice required for Rush Analysis

SAMPLE DESCRIPTION

(This Will Appear On The Report)

SAMPLING

Date (mm-dd-yy)	Time	Matrix**	Sample Description	Number of Containers	Total Phosphorus	Total Nitrogen	Chlorophyll a	Sulfate	Total Aluminum	Dissolved Aluminum	Dissolved Organic Carbon	Metals Field Filtered (Y/N)	Containers Received	Temp	Lab ID
1/19/21	11:30	SW	Mid-Lake 1m	4	x	x	x	x	x	x					61904

Analysis Requested

LAB USE ONLY

Case File Number

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
DOC analysis may be requested, pending TA/DA results.
Please provide Aluminum results and hold samples

Sampled By: Iris Lippert	Date: 1/19/21	Time:
Received By:	Date:	Time:
Relinquished to IAL By (Signature):	Date: 1/19/21	Time: 4:15 PM

Shipped By: 1 sample, 4 bottles @ 11.5°C as is T-0714
Shipping Reference:

Received at IAL By: X
Date: 1/19/21 Time: 4:15

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1722021**	**PAGE 1**	
REPORT DATE:	**03/26/21**		
DATE SAMPLED:	**03/17/21**	**DATE RECEIVED:**	**03/17/21**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	TOTAL-N (mg/L)	DOC (mg/L)	ALKALINITY (mgCaCO3/L)
Mid-Lake 1m	0.014	0.527	3.59	15.3

SAMPLE ID	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	94.7	0.069	0.014	5.6	1.4

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1722021 **PAGE 2**

REPORT DATE: 03/26/21

DATE SAMPLED: 03/17/21 **DATE RECEIVED:** 03/17/21

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	TOTAL-N (mg/L)	DOC (mg/L)	ALKALINITY (mgCaCO3/L)
METHOD	SM18 4500PF	SM204500NC	EPA 415.1	SM18 2320B
DATE ANALYZED	03/22/21	03/22/21	03/23/21	03/25/21
DETECTION LIMIT	0.002	0.050	0.250	1.00
DUPLICATE				
SAMPLE ID	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.004	0.180	2.03	66.8
DUPLICATE	0.004	0.178	1.97	67.8
RPD	0.82%	1.06%	2.95%	1.49%
SPIKE SAMPLE				
SAMPLE ID	BATCH	BATCH	BATCH	
ORIGINAL	0.004	0.180	2.03	
SPIKED SAMPLE	0.055	1.17	6.21	
SPIKE ADDED	0.050	1.00	4.50	
% RECOVERY	102.46%	98.57%	92.80%	NA
QC CHECK				
FOUND	0.094	0.507	3.62	104
TRUE	0.094	0.490	4.00	100
% RECOVERY	100.00%	103.47%	90.50%	104.00%
BLANK	<0.002	<0.050	<0.250	NA

RPD = RELATIVE PERCENT DIFFERENCE.
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IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1722021 **PAGE 3**

REPORT DATE: 03/26/21

DATE SAMPLED: 03/17/21 **DATE RECEIVED:** 03/17/21

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	03/25/21	03/20/21	03/20/21	03/23/21	03/23/21
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	Mid-Lake 1m	BATCH	BATCH
ORIGINAL	143	<0.003	0.014	2.1	0.2
DUPLICATE	142	<0.003	0.013	2.3	0.2
RPD	1.07%	NC	7.41%	8.00%	0.00%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	Mid-Lake 1m		
ORIGINAL	143	<0.003	0.014		
SPIKED SAMPLE	152	0.528	0.546		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	84.66%	105.60%	106.40%	NA	NA
QC CHECK					
FOUND	10.1	0.507	0.507		
TRUE	10.0	0.500	0.500		
% RECOVERY	101.00%	101.40%	101.40%	NA	NA
BLANK	<1.00	<0.003	<0.003	NA	NA

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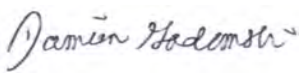
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories

3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 1712021

Page ___ of ___

Return to Agenda

REPORT TO:
Client: Tetra Tech Inc.
Address: 1420 5th Ave, Suite 650
Seattle, WA 98101
C: Iris Lippert, Shannon Brattebo
E: iris.lippert@tetratech.com; shannon.brattebo@tetratech.com
F: 509-232-4312 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address:
Contact: Shannon Brattebo, Harry Gibbons
Email: shannon.brattebo@tetratech.com, Harry.Gibbons@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
x ☒ Email ☐ Mail

QC Data Reported
☐ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
Specific Date: 1 week
*Advanced notice required for Rush Analysis

LAB USE ONLY
Case File Number

SAMPLING			SAMPLE DESCRIPTION	Analysis Requested																Containers Received	Temp	Lab ID
Date (mm-dd-yy)	Time	Matrix**	(This Will Appear On The Report)	Number of Containers	Total Phosphorus	Total Nitrogen	Chlorophyll a	Sulfate	Alkalinity	Total Aluminum	Dissolved Aluminum	DOC							Metals Field Filtered (Y/N)			
3/17/21	2PM	SW	Mid-Lake 1m	3	x	x	x	x	x	x	x	x										65829

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:

	Date	Time
Sampled By: Iris Lippert	3/17/21	2PM
Received By:		
Relinquished to IAL By (Signature):	3/17/21	

Shipped By:
Shipping Reference:
Received at IAL By:
Date: 3.17.21 Time: 5:45

ISAMPLE AS IS 14.3°C T-GU

415

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1740273 **PAGE 1**

REPORT DATE: 06/11/23

DATE SAMPLED: 05/23/23 **DATE RECEIVED:** 05/23/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	DOC (mg/L)	ALKALINITY (mgCaCO3/L)
Mid-Lake 0.5m1	0.047	<0.001	0.011	1.06	8.40	51.1

SAMPLE ID	TOTAL ALUMINUM (mg/L)	HARDNESS (mg/CaCO3/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 0.5m1	0.5693	23.8	28.0	12	6.2

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1740273 **PAGE 2**

REPORT DATE: 06/11/23

DATE SAMPLED: 05/23/23 **DATE RECEIVED:** 05/23/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	TOTAL-N (mg/L)	DOC (mg/L)	ALKALINITY (mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500N03F	SM204500NC	EPA 415.1	SM18 2320B
DATE ANALYZED	05/27/23	05/25/23	05/24/23	05/31/23	06/09/23	05/25/23
DETECTION LIMIT	0.002	0.001	0.010	0.050	0.250	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.023	<0.001	<0.010	0.682	1.18	41.0
DUPLICATE	0.024	<0.001	<0.010	0.716	1.24	41.6
RPD	4.01%	NC	NC	4.86%	4.98%	1.45%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.023	<0.001	<0.010	0.682	1.18	
SPIKED SAMPLE	0.076	0.020	0.194	1.74	5.52	
SPIKE ADDED	0.050	0.020	0.200	1.00	4.50	
% RECOVERY	106.14%	100.00%	96.78%	106.23%	96.49%	NA
QC CHECK						
FOUND	0.094	0.041	0.404	0.499	3.98	100
TRUE	0.094	0.039	0.408	0.499	4.00	100
% RECOVERY	100.00%	105.13%	99.02%	100.00%	99.50%	100.00%
BLANK	<0.002	<0.001	<0.010	<0.050	<0.250	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1740273 **PAGE 3**

REPORT DATE: 06/11/23

DATE SAMPLED: 05/23/23 **DATE RECEIVED:** 05/23/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	HARDNESS (mgCaCO3/l)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 200.8	SM18 2340C	EPA 375.4	SM1810200H	SM1810200H
DATE ANALYZED	06/01/23	05/30/23	05/26/23	05/31/23	05/31/23
DETECTION LIMIT	0.0030	2.00	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	Mid-Lake 0.5m1	BATCH	BATCH
ORIGINAL	0.0051	17.8	28.0	2.3	3.8
DUPLICATE	0.0050	16.6	27.7	2.1	3.7
RPD	0.40%	6.82%	0.89%	8.00%	1.90%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	Mid-Lake 0.5m1		
ORIGINAL	0.0051	17.8	28.0		
SPIKED SAMPLE	0.4983	35.6	37.7		
SPIKE ADDED	0.5000	20.0	10.0		
% RECOVERY	98.65%	88.93%	97.21%	NA	NA
QC CHECK					
FOUND	0.5034	36.9	10.2		
TRUE	0.5000	40.0	10.0		
% RECOVERY	100.68%	92.25%	102.00%	NA	NA
BLANK	<0.0030	<2.00	<1.00	NA	NA

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OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski

Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 1740273

REPORT TO:

Client: Tetra Tech Inc.
Address: 2003 Western Avenue, Suite 700
Seattle, WA 98121
ntact: Shannon Brattebo
nail: shannon.brattebo@tetratech.com
one: 509-979-9672 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)

Client: Same
Address
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: Fax:

PROJECT INFORMATION

Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format

Fax ☒ Email ☐ Mail

QC Data Reported

☐ Yes ☐ No

Sample Disposal

☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*

☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
IN 2 WKS
Specific Date:
*Advanced notice required for Rush Analysis

SAMPLING

Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Alkalinity	Total Hardness	Dissolved Organic Carbon	Total Aluminum	Total Phosphorus	SRP	Total Nitrogen	Nitrate+Nitrite	Chlorophyll a	Sulfate	Field Filtered (Y/N)	Containers Received	Temp	Lab ID
5-23-23	1140	SW	Mid-Lake ~~0.5m~~ SB		x	x	x	x	x	x	x	x	x	x	N			176580

AB 5/23/23

Analysis Requested

LAB USE ONLY

Case File Number

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:

SRP and Chlorophyll a samples need lab filtration

	Date	Time
Sampled By: Adam Bratt	5/23/2023	11:40
Received By: Adam Bratt	5/23/2023	2:45
Relinquished to IAL By (Signature): Sean Sanders	5/23/23	

Shipped By: Sean Sanders
Shipping Reference

Received at IAL By: SAMPLES 16.4°C 5-23-23 2:45
Date Time

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1741068 **PAGE 1**

REPORT DATE: 08/08/23

DATE SAMPLED: 06/27/23 **DATE RECEIVED:** 06/27/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

Two water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Mid-Lake 1m	0.048	0.002	<0.010	9.43	1.17	53.4	7.70
Mid-Lake Bottom	0.047	0.002	<0.010	8.98	1.20	52.7	7.91

SAMPLE ID	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	0.5345	0.4083	4.62	25.7	11	4.9
Mid-Lake Bottom	0.5026	0.4284	4.94	25.2		

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Mid-Lake 1m	5.99	1.12	3.37	28.5	19.6	51.0	<1.00
Mid-Lake Bottom	5.81	0.913	2.92	28.0	18.3	51.1	<1.00

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1741068 **PAGE 2**

REPORT DATE: 08/08/23

DATE SAMPLED: 06/27/23 **DATE RECEIVED:** 06/27/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	07/01/23	06/28/23	06/28/23	07/11/23	07/03/23	06/29/23	06/27/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.009	0.002	0.114	<0.250	0.284	74.8	
DUPLICATE	0.008	0.002	0.121	<0.250	0.295	73.8	
RPD	0.47%	5.48%	5.77%	NC	3.80%	1.35%	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.009	0.002	0.114	<0.250	0.284		
SPIKED SAMPLE	0.060	0.026	0.326	4.24	1.24		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	102.65%	119.05%	106.22%	94.18%	95.30%	NA	NA
QC CHECK							
FOUND	0.095	0.040	0.421	4.25	0.526	96.8	
TRUE	0.094	0.039	0.408	4.00	0.490	100	
% RECOVERY	101.06%	101.52%	103.09%	106.25%	107.35%	96.80%	NA
BLANK	<0.002	<0.001	<0.010	<0.250	<0.050	NA	NA

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IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1741068 **PAGE 3**

REPORT DATE: 08/08/23

DATE SAMPLED: 06/27/23 **DATE RECEIVED:** 06/27/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 200.8	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	07/06/23	07/10/23	06/29/23	07/07/23	07/06/23	07/06/23
DETECTION LIMIT	0.0030	0.0030	0.50	1.00	0.1	0.1
DUPLICATE						
SAMPLE ID	BATCH	BATCH	Mid-Lake Bottom	BATCH	BATCH	BATCH
ORIGINAL	0.0272	0.0507	4.94	17.7	36	9.7
DUPLICATE	0.0255	0.0524	4.94	17.9	37	8.5
RPD	6.62%	3.26%	0.00%	1.17%	3.64%	13.65%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	Mid-Lake Bottom	BATCH		
ORIGINAL	0.0272	0.0507	4.94	17.7		
SPIKED SAMPLE	0.5633	0.5018	14.6	39.4		
SPIKE ADDED	0.5000	0.5000	20.0	20.0		
% RECOVERY	107.20%	90.22%	48.35%	108.34%	NA	NA
QC CHECK						
FOUND	0.5481	0.5220	30.4	9.57		
TRUE	0.5000	0.5000	30.0	10.0		
% RECOVERY	109.62%	104.39%	101.33%	95.70%	NA	NA
BLANK	<0.0030	<0.0030	<0.50	<1.00	NA	NA

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OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1741068 **PAGE 4**

REPORT DATE: 08/08/23

DATE SAMPLED: 06/27/23 **DATE RECEIVED:** 06/27/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	06/30/23	06/30/23	06/30/23	06/30/23	06/30/23	06/29/23	06/29/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	35.8	9.25	2.78	26.4	127		
DUPLICATE	35.8	9.24	2.75	26.5	127		
RPD	0.09%	0.09%	0.81%	0.23%	0.09%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	35.8	9.25	2.78	26.4			
SPIKED SAMPLE	46.4	19.6	13.5	37.5			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	105.80%	103.42%	107.48%	110.76%	NA	NA	NA
QC CHECK							
FOUND	9.79	9.82	10.1	10.2	64.9		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	97.92%	98.16%	101.36%	102.47%	98.07%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.500	<0.700	NA	NA

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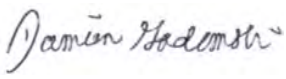
SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 1741068

Return to Agenda

REPORT TO:
Client: Tetra Tech Inc.
Address: 2003 Western Avenue, Suite 700
Seattle, WA 98121
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: 509-979-9672
Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Addres
Contac Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone:
Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☒ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard

Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

LAB USE ONLY
Case File Number

Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Alkalinity	Total Aluminum	Dissolved Aluminum	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Dissolved Organic Carbon	Chlorophyll a	Total Hardness	Chloride	Bicarbonate	Carbonate	Total Calcium	Total Magnesium	Sodium	Potassium	pH	Field Filtered (Y/N)	Containers Received	Temp	Lab ID
06-27-23	1230	SW	Mid-Lake 1m		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	N			129282
06-27-23	1240	SW	Mid-Lake Bottom		x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	N			129283

OK

ATB 06/27/23

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
Dissolved aluminum, SRP, DOC, and chlorophyll samples not filtered, will need filtration

	Date	Time
Sampled By: Adam Bryant	6/27/23	12:40
Received By		
Relinquished to IAL By (Signature): Adam B	6/27/23	3:35

Shipped By: 2 SAMPLES AS CS 5.8 °C T044

Shipping Reference

Received at IAL By	Date	Time
[signature]	06/27/23	15:34

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1741118**	**PAGE 1**	
REPORT DATE:	**08/08/23**		
DATE SAMPLED:	**06/29/23**	**DATE RECEIVED:**	**06/29/23**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

Three water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)
Mid-Lake 1m	1.50	0.0414
Mid-Lake 0.5m from bottom	1.85	0.0392
West Shore	1.51	0.0306

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1741118**	**PAGE 2**	
REPORT DATE:	**08/08/23**		
DATE SAMPLED:	**06/29/23**	**DATE RECEIVED:**	**06/29/23**

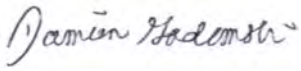
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)
METHOD	EPA 200.8	EPA 200.8
DATE ANALYZED	07/06/23	07/10/23
DETECTION LIMIT	0.0030	0.0030
DUPLICATE		
SAMPLE ID	BATCH	BATCH
ORIGINAL	0.0272	0.0507
DUPLICATE	0.0255	0.0524
RPD	6.62%	3.26%
SPIKE SAMPLE		
SAMPLE ID	BATCH	BATCH
ORIGINAL	0.0272	0.0507
SPIKED SAMPLE	0.5633	0.5018
SPIKE ADDED	0.5000	0.5000
% RECOVERY	107.20%	90.22%
QC CHECK		
FOUND	0.5481	0.5220
TRUE	0.5000	0.5000
% RECOVERY	109.62%	104.39%
BLANK	<0.0030	<0.0030

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 174118

REPORT TO:
Client: Tetra Tech Inc.
Address: 2003 Western Avenue, Suite 700
Seattle, WA 98121
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: 509-979-9672 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address:
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☒ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

LAB USE ONLY
Case File Number
Containers Received

SAMPLING Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Analysis Requested: Total Aluminum	Analysis Requested: Dissolved Aluminum	Field Filtered (Y/N)	Temp	Lab ID
06/29/23	13:20	SW	Mid-Lake 1m		x	x	N		129595
06/29/23	13:25	SW	Mid-lake 0.5m from bottom		x	x	N		129596
06/29/23	13:05	SW	West shore		x	x	N		129597

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments: Dissolved aluminum not filtered, will need filtration

Sampled By: Adam Bryant	Date: 06/29/23	Time: 3:45 PM
Received By:	Date:	Time:
Relinquished to IAL By (Signature): Adam Bryant	Date: 06/29/23	Time: 1616

Shipped By:
Shipping Reference:
Received at IAL By: 3 Samples
Date: 6-29-23 Time: 4:19

06/29/23
ATB

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1741155 **PAGE 1**

REPORT DATE: 08/08/23

DATE SAMPLED: 06/30/23 **DATE RECEIVED:** 06/30/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

Two water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Mid-Lake 1m	0.009	0.003	0.019	5.94	0.569	38.1	7.10
Mid-Lake Bottom	0.009	0.002	0.017	6.01	0.580	37.2	7.02

SAMPLE ID	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	0.4539	0.0614	4.73	89.5	0.7	1.2
Mid-Lake Bottom	0.4839	0.0507	4.41	91.9		

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Mid-Lake 1m	5.84	0.804	2.73	48.8	17.9	32.3	<1.00
Mid-Lake Bottom	5.82	0.816	2.71	48.5	17.9	30.6	<1.00

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CASE FILE NUMBER: 1741155 **PAGE 2**

REPORT DATE: 08/08/23

DATE SAMPLED: 06/30/23 **DATE RECEIVED:** 06/30/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	07/10/23	07/01/23	07/01/23	07/11/23	07/08/23	07/10/23	07/01/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.090	0.017	0.446	<0.250	0.397	166	
DUPLICATE	0.092	0.017	0.449	<0.250	0.444	164	
RPD	2.75%	1.20%	0.56%	NC	11.18%	1.01%	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.090	0.017	0.446	<0.250	0.397		
SPIKED SAMPLE	0.135	0.037	0.657	4.24	1.49		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	90.60%	100.50%	105.29%	94.18%	109.10%	NA	NA
QC CHECK							
FOUND	0.094	0.039	0.417	4.25	0.499	96.8	
TRUE	0.094	0.039	0.408	4.00	0.490	100	
% RECOVERY	100.00%	98.98%	102.28%	106.25%	101.84%	96.80%	NA
BLANK	<0.002	<0.001	<0.010	<0.250	<0.050	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
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OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

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3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

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CASE FILE NUMBER: 1741155 **PAGE 3**

REPORT DATE: 08/08/23

DATE SAMPLED: 06/30/23 **DATE RECEIVED:** 06/30/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 200.8	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	07/06/23	07/10/23	07/05/23	07/11/23	07/06/23	07/06/23
DETECTION LIMIT	0.0030	0.0030	0.50	1.00	0.1	0.1
DUPLICATE						
SAMPLE ID	BATCH	Mid-Lake Bottom	BATCH	Mid-Lake Bottom	BATCH	BATCH
ORIGINAL	0.0272	0.0507	20.0	91.9	8.5	2.7
DUPLICATE	0.0255	0.0524	19.3	95.0	8.5	2.7
RPD	6.62%	3.26%	3.21%	3.24%	0.00%	0.00%
SPIKE SAMPLE						
SAMPLE ID	BATCH	Mid-Lake Bottom	BATCH	Mid-Lake Bottom		
ORIGINAL	0.0272	0.0507	20.0	91.9		
SPIKED SAMPLE	0.5633	0.5018	38.9	103		
SPIKE ADDED	0.5000	0.5000	20.0	10.0		
% RECOVERY	107.20%	90.22%	94.60%	109.51%	NA	NA
QC CHECK						
FOUND	0.5481	0.5220	30.2	9.98		
TRUE	0.5000	0.5000	30.0	10.0		
% RECOVERY	109.62%	104.39%	100.67%	99.80%	NA	NA
BLANK	<0.0030	<0.0030	<0.50	<1.00	NA	NA

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1741155 **PAGE 4**

REPORT DATE: 08/08/23

DATE SAMPLED: 06/30/23 **DATE RECEIVED:** 06/30/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	07/06/23	07/06/23	07/06/23	07/06/23	07/06/23	07/10/23	07/10/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	35.3	8.92	2.52	25.2	125		
DUPLICATE	35.3	8.92	2.56	25.1	125		
RPD	0.23%	0.02%	1.54%	0.13%	0.16%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	35.3	8.92	2.52	25.2			
SPIKED SAMPLE	45.5	19.1	12.7	35.8			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	102.06%	101.47%	102.13%	106.36%	NA	NA	NA
QC CHECK							
FOUND	9.93	9.68	9.88	10.2	64.7		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	99.33%	96.85%	98.80%	101.53%	97.78%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.500	<0.700	NA	NA

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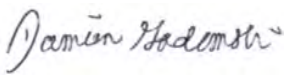
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 1741155

Return to Agenda

REPORT TO:
Client: Tetra Tech Inc.
Address: 2003 Western Avenue, Suite 700
Seattle, WA 98121
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: 509-979-9672 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Addres
Contac Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☒ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

LAB USE ONLY
Case File Number

SAMPLING			SAMPLE DESCRIPTION	Number of Containers	Analysis Requested																		Containers Received	Temp	Lab ID
Date (mm-dd-yy)	Time	Matrix**	(This Will Appear On The Report)		Total Alkalinity	Total Aluminum	Dissolved Aluminum	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Dissolved Organic Carbon	Chlorophyll a	Total Hardness	Chloride	Bicarbonate	Carbonate	Total Calcium	Total Magnesium	Sodium	Potassium	pH	Field Filtered (Y/N)			
06/30/23	12:20	SW	Mid-Lake 1m		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	N			129701
06/30/23	12:35	SW	Mid-Lake Bottom		x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	N			129702

06/30/23
ATB

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
Dissolved aluminum, SRP, DOC, and chlorophyll samples not filtered, will need filtration

Sampled By	Date	Time
Adam Bryant	06/30/23	12:20

Received By	Date	Time

Relinquished to IAL By (Signature)	Date	Time
Adam Bryant	06/30/23	4:05

Shipped By: 2 SAMPLE SAS <5 8.9°C T-079
Shipping Reference:

Received at IAL By: JDH
Date: 6/30
Time: 16:00

432

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1741377 **PAGE 1**

REPORT DATE: 09/14/23

DATE SAMPLED: 07/13/23 **DATE RECEIVED:** 07/13/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

Two water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Mid-Lake 1m	0.015	<0.001	<0.010	6.21	0.650	38.0	7.94
Mid-Lake Bottom	0.016	<0.001	<0.010	5.97	0.620	39.2	7.93

SAMPLE ID	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	0.9611	0.8458	3.99	94.8	3.6	1.5
Mid-Lake Bottom	0.9689	0.8219	3.99	97.6		

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Mid-Lake 1m	6.36	0.876	3.05	50.5	19.5	36.9	<1.00
Mid-Lake Bottom	6.47	0.896	2.98	50.8	19.8	38.0	<1.00

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1741377 **PAGE 2**

REPORT DATE: 09/14/23

DATE SAMPLED: 07/13/23 **DATE RECEIVED:** 07/13/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	07/17/23	07/14/23	07/13/23	07/24/23	07/17/23	07/25/23	07/14/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.151	<0.001	<0.010	<0.250	0.545	158	
DUPLICATE	0.151	<0.001	<0.010	<0.250	0.539	158	
RPD	0.04%	NC	NC	NC	1.11%	0.00%	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.151	<0.001	<0.010	<0.250	0.545		
SPIKED SAMPLE	0.201	0.020	0.208	4.22	1.54		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	99.31%	100.00%	104.24%	93.84%	99.20%	NA	NA
QC CHECK							
FOUND	0.094	0.039	0.418	4.14	0.528	102	
TRUE	0.094	0.039	0.408	4.00	0.490	100	
% RECOVERY	100.00%	98.98%	102.45%	103.43%	107.76%	102.00%	NA
BLANK	<0.002	<0.001	<0.010	<0.250	<0.050	NA	NA

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FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 200.8	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	08/09/23	08/09/23	07/19/23	07/14/23	07/19/23	07/19/23
DETECTION LIMIT	0.0030	0.0030	0.50	1.00	0.1	0.1
DUPLICATE						
SAMPLE ID	BATCH	Mid-Lake 1m	Mid-Lake Bottom	Mid-Lake Bottom	BATCH	BATCH
ORIGINAL	<0.0030	0.8458	3.99	97.6	4.0	0.9
DUPLICATE	<0.0030	0.8164	4.52	94.8	4.0	0.9
RPD	NC	3.54%	12.35%	2.94%	0.00%	0.00%
SPIKE SAMPLE						
SAMPLE ID	BATCH	Mid-Lake 1m	Mid-Lake Bottom	Mid-Lake Bottom		
ORIGINAL	<0.0030	0.8458	3.99	97.6		
SPIKED SAMPLE	0.4590	1.300	14.8	109		
SPIKE ADDED	0.5000	0.5000	10.0	10.0		
% RECOVERY	91.80%	90.84%	108.26%	115.34%	NA	NA
QC CHECK						
FOUND	0.4760	0.5220	30.5	9.84		
TRUE	0.5000	0.5000	30.0	10.0		
% RECOVERY	95.21%	104.39%	101.67%	98.40%	NA	NA
BLANK	<0.0030	<0.0030	<0.50	<1.00	NA	NA

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CASE FILE NUMBER: 1741377 **PAGE 4**

REPORT DATE: 09/14/23

DATE SAMPLED: 07/13/23 **DATE RECEIVED:** 07/13/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	07/18/23	07/18/23	07/18/23	07/18/23	07/18/23	07/25/23	07/25/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	34.6	8.67	2.73	24.8	122		
DUPLICATE	34.5	8.65	2.68	25.0	122		
RPD	0.18%	0.29%	1.90%	0.42%	0.21%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	34.6	8.67	2.73	24.8			
SPIKED SAMPLE	44.9	18.5	12.7	35.9			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	103.17%	97.80%	99.85%	110.89%	NA	NA	NA
QC CHECK							
FOUND	9.73	9.49	9.98	10.1	63.4		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	97.26%	94.89%	99.75%	100.86%	95.78%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.500	<0.700	NA	NA

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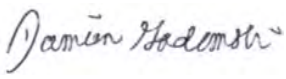
SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories

3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 1741377

Return to Agenda

REPORT TO:
Client: Tetra Tech Inc.
Address: 2003 Western Avenue, Suite 700
Seattle, WA 98121
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: 509-979-9672 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Addres
Contac Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☒ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard

Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

LAB USE ONLY
Case File Number

SAMPLING			SAMPLE DESCRIPTION	Number of Containers	Analysis Requested																		Field Filtered (Y/N)	Containers Received	Temp	Lab ID
Date (mm-dd-yy)	Time	Matrix**	(This Will Appear On The Report)		Total Alkalinity	Total Aluminum	Dissolved Aluminum	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Dissolved Organic Carbon	Chlorophyll a	Total Hardness	Chloride	Bicarbonate	Carbonate	Total Calcium	Total Magnesium	Sodium	Potassium	pH				
7-13-23	1100	SW	Mid-Lake 1m		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	N			130336
7-13-23	1115	SW	Mid-Lake Bottom		x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	N			130337

7/13/23

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
Dissolved aluminum, SRP, DOC, and chlorophyll samples not filtered, will need filtration

Sampled By: Adam Bryant	Date: 7/13/23	Time: ~~1100~~ 1100	Shipped By:		Shipping Reference
Received By:	Date: 7/13/23	Time: 11:00 2100			
Relinquished to IAL By (Signature): Adam Bryant	Date: 7/13/23	Time: 1400	Received at IAL By: 2 SAMPLES NS IS 18.2C TOTH	7-13-23	Time: 2:00

437

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1742078 **PAGE 1**

REPORT DATE: 10/16/23

DATE SAMPLED: 08/15/23 **DATE RECEIVED:** 08/15/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Mid-Lake 1m	0.028	0.001	<0.010	7.70	0.769	37.4	7.94

SAMPLE ID	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	1.043	0.9953	4.52	108	6.7	3.4

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Mid-Lake 1m	6.74	0.998	4.81	56.6	20.9	36.3	<1.00

IEH ANALYTICAL LABORATORIES

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3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1742078 **PAGE 2**

REPORT DATE: 10/16/23

DATE SAMPLED: 08/15/23 **DATE RECEIVED:** 08/15/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	08/25/23	08/16/23	08/17/23	08/17/23	08/22/23	08/21/23	08/15/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.005	<0.001	0.091	<0.250	0.179	79.5	
DUPLICATE	0.005	<0.001	0.091	<0.250	0.191	78.5	
RPD	5.60%	NC	0.60%	NC	6.49%	1.27%	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.005	<0.001	0.091	<0.250	0.179		
SPIKED SAMPLE	0.053	0.022	0.298	4.07	1.36		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	96.66%	110.00%	103.44%	90.38%	117.60%	NA	NA
QC CHECK							
FOUND	0.093	0.040	0.414	4.02	0.510	101	
TRUE	0.094	0.039	0.408	4.00	0.490	100	
% RECOVERY	98.94%	101.52%	101.47%	100.50%	104.08%	101.00%	NA
BLANK	<0.002	<0.001	<0.010	<0.250	<0.050	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1742078 **PAGE 3**

REPORT DATE: 10/16/23

DATE SAMPLED: 08/15/23 **DATE RECEIVED:** 08/15/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 200.8	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	08/17/23	08/17/23	08/23/23	08/18/23	08/22/23	08/22/23
DETECTION LIMIT	0.0030	0.0030	0.50	1.00	0.1	0.1
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.1001	0.0148	2.31	23.5	6.4	2.4
DUPLICATE	0.1001	0.0141	2.52	23.3	6.4	2.0
RPD	0.00%	4.70%	8.70%	0.76%	0.00%	17.07%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.1001	0.0148	2.31	23.5		
SPIKED SAMPLE	0.6313	0.5418	12.6	33.2		
SPIKE ADDED	0.5000	0.5000	10.0	10.0		
% RECOVERY	106.24%	105.41%	103.01%	97.11%	NA	NA
QC CHECK						
FOUND	0.5373	0.5369	30.9	9.86		
TRUE	0.5000	0.5000	30.0	10.0		
% RECOVERY	107.46%	107.38%	103.00%	98.60%	NA	NA
BLANK	<0.0030	<0.0030	<0.50	<1.00	NA	NA

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3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1742078 **PAGE 4**

REPORT DATE: 10/16/23

DATE SAMPLED: 08/15/23 **DATE RECEIVED:** 08/15/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	08/21/23	08/21/23	08/21/23	08/21/23	08/21/23	08/21/23	08/21/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	8.47	1.06	0.565	2.39	26		
DUPLICATE	8.54	1.05	0.575	2.40	26		
RPD	0.82%	0.83%	1.76%	0.57%	0.54%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	8.47	1.06	0.565	2.39			
SPIKED SAMPLE	19.0	11.6	11.1	13.4			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	105.37%	105.45%	105.38%	110.56%	NA	NA	NA
QC CHECK							
FOUND	10.3	10.4	10.4	10.9	68.6		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	102.88%	104.21%	104.21%	109.40%	103.71%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.500	<0.700	NA	NA

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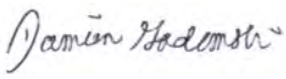
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 1742078

Return to Agenda

REPORT TO:
Client: Tetra Tech Inc.
Address: 2003 Western Avenue, Suite 700
Seattle, WA 98121
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: 509-979-9672 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Addres
Contac Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☒ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard

Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

LAB USE ONLY
Case File Number

Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Alkalinity	Total Aluminum	Dissolved Aluminum	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Dissolved Organic Carbon	Chlorophyll a	Total Hardness	Chloride	Bicarbonate	Carbonate	Total Calcium	Total Magnesium	Sodium	Potassium	pH	Field Filtered (Y/N)	Containers Received	Temp	Lab ID
08-15-23	0945	SW	Mid-Lake 1m		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	N			132972
~~[struck]~~	~~[struck]~~	~~SW~~	~~Mid-Lake Bottom~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~N~~			

8/15/23

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
Dissolved aluminum, SRP, DOC, and chlorophyll samples not filtered, will need filtration

Sampled By: Adam Bryant	Date: 0945	Time: 8/15/23
Received By	Date	Time
Relinquished to IAL By (Signature): [signature]	Date: 1330	Time: 8/15/23

Shipped By: [signature]
Shipping Reference

Received at IAL By: 1 SAMPLE AS IS 22.3° T074 | Date: 8-15-23 | Time: 1:30

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1742786 **PAGE 1**

REPORT DATE: 10/16/23

DATE SAMPLED: 09/14/23 **DATE RECEIVED:** 09/14/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Mid-Lake 1m	0.031	<0.001	<0.010	9.70	1.06	37.6	8.09

SAMPLE ID	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	1.676	5.15	108	10	4.5

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Mid-Lake 1m	6.98	1.06	3.46	62.8	21.8	36.7	<1.00

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1742786 **PAGE 2**

REPORT DATE: 10/16/23

DATE SAMPLED: 09/14/23 **DATE RECEIVED:** 09/14/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	09/25/23	09/15/23	09/15/23	10/10/23	09/19/23	09/21/23	09/15/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.062	0.002	0.019	1.11	0.565	86.4	
DUPLICATE	0.062	0.002	0.016	1.17	0.540	87.2	
RPD	0.32%	2.40%	12.10%	5.62%	4.52%	0.92%	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.062	0.002	0.019	1.11	0.565		
SPIKED SAMPLE	0.110	0.022	0.191	5.40	1.56		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	95.79%	103.46%	86.33%	95.51%	99.70%	NA	NA
QC CHECK							
FOUND	0.095	0.041	0.402	4.26	0.461	98.8	
TRUE	0.094	0.039	0.408	4.00	0.490	100	
% RECOVERY	101.06%	104.06%	98.53%	106.50%	94.08%	98.80%	NA
BLANK	<0.002	<0.001	<0.010	<0.250	<0.050	NA	NA

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IEH ANALYTICAL LABORATORIES

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FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	09/25/23	09/21/23	09/22/23	09/29/23	09/29/23
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.0241	1.37	21.1	8.0	3.7
DUPLICATE	0.0239	1.37	21.5	7.7	3.5
RPD	0.61%	0.00%	1.59%	4.26%	3.70%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL	0.0241	1.37	21.1		
SPIKED SAMPLE	0.5328	11.9	31.5		
SPIKE ADDED	0.5000	10.0	10.0		
% RECOVERY	101.74%	105.11%	104.05%	NA	NA
QC CHECK					
FOUND	0.5276	31.3	9.93		
TRUE	0.5000	30.0	10.0		
% RECOVERY	105.52%	104.33%	99.35%	NA	NA
BLANK	<0.0030	<0.50	<1.00	NA	NA

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IEH ANALYTICAL LABORATORIES

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3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1742786 **PAGE 4**

REPORT DATE: 10/16/23

DATE SAMPLED: 09/14/23 **DATE RECEIVED:** 09/14/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	09/30/23	09/30/23	09/30/23	09/30/23	09/30/23	09/30/23	09/30/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	35.6	9.60	2.49	27.4	128		
DUPLICATE	35.7	9.62	2.52	27.5	129		
RPD	0.29%	0.15%	1.25%	0.21%	0.25%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	35.6	9.60	2.49	27.4			
SPIKED SAMPLE	45.6	19.9	12.8	37.1			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	99.77%	102.89%	103.58%	96.48%	NA	NA	NA
QC CHECK							
FOUND	9.85	10.1	10.3	10.3	66.3		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	98.50%	101.23%	102.54%	102.58%	100.20%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.500	<0.700	NA	NA

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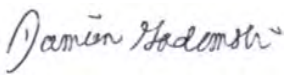
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
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Chain of Custody Form 1792786

Page ___ of ___

Return to Agenda

REPORT TO:
Client: Tetra Tech Inc.
Address: 2003 Western Avenue, Suite 700
Seattle, WA 98121
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: 509-979-9672 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address:
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.: 447
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☒ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard

Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

LAB USE ONLY
Case File Number

SAMPLING			SAMPLE DESCRIPTION	Number of Containers	Analysis Requested																				Containers Received	Temp	Lab ID
Date (mm-dd-yy)	Time	Matrix**	(This Will Appear On The Report)		Total Alkalinity	Total Aluminum	pH	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Dissolved Organic Carbon	Chlorophyll a	Total Hardness	Chloride	Bicarbonate	Carbonate	Total Calcium	Total Magnesium	Sodium	Potassium	TSS Total Suspended Solids	Field Filtered (Y/N)			
09/14/23	10:27	SW	Mid-Lake 1m	6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	N		135337
																						ATB 9/14/23				

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
SRP, DOC, and chlorophyll samples not filtered, will need filtration

Sampled By	Date	Time
Adam Bryant	09/14/23	1545
Received By	Date	Time
Relinquished to IAL By (Signature)	Date	Time
Adam Bryant	09/14/23	1545

Shipped By	Shipping Reference	
Received at IAL By	Date	Time
Alex Hansen / Sample KG 3°C AS IS T-074	9/14/23	3:45

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1743346 **PAGE 1**

REPORT DATE: 11/09/23

DATE SAMPLED: 10/11/23 **DATE RECEIVED:** 10/11/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Mid-Lake 1m	0.043	0.001	0.014	11.6	0.962	34.8	7.60

SAMPLE ID	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	1.35	4.62	74.7	32	11

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Mid-Lake 1m	6.43	1.03	3.51	58.1	20.3	32.9	<1.00

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1743346 **PAGE 2**

REPORT DATE: 11/09/23

DATE SAMPLED: 10/11/23 **DATE RECEIVED:** 10/11/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	10/16/23	10/12/23	10/13/23	10/12/23	10/17/23	10/18/23	10/11/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.080	0.018	0.012	<0.250	0.391	58.4	
DUPLICATE	0.081	0.017	0.012	<0.250	0.387	58.8	
RPD	0.98%	0.58%	1.70%	NC	1.03%	0.68%	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.080	0.018	0.012	<0.250	0.391		
SPIKED SAMPLE	0.130	0.038	0.201	3.89	1.35		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	100.25%	101.06%	94.47%	86.44%	96.30%	NA	NA
QC CHECK							
FOUND	0.094	0.040	0.408	3.91	0.441	102	
TRUE	0.094	0.039	0.408	4.00	0.469	100	
% RECOVERY	100.00%	101.52%	99.88%	97.63%	94.03%	102.00%	NA
BLANK	<0.002	<0.001	<0.010	<0.250	<0.050	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1743346 **PAGE 3**

REPORT DATE: 11/09/23

DATE SAMPLED: 10/11/23 **DATE RECEIVED:** 10/11/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	10/18/23	10/20/23	10/18/23	10/17/23	10/17/23
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.0155	31.4	6.29	0.5	1.6
DUPLICATE	0.0160	31.7	6.46	0.5	1.6
RPD	3.60%	1.00%	2.71%	0.00%	0.00%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL	0.0155	31.4	6.29		
SPIKED SAMPLE	0.4859	53.6	16.6		
SPIKE ADDED	0.5000	20.0	10.0		
% RECOVERY	94.09%	110.89%	103.18%	NA	NA
QC CHECK					
FOUND	0.4542	31.3	9.86		
TRUE	0.5000	30.0	10.0		
% RECOVERY	90.83%	104.33%	98.62%	NA	NA
BLANK	<0.0030	<0.50	<1.00	NA	NA

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IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1743346 **PAGE 4**

REPORT DATE: 11/09/23

DATE SAMPLED: 10/11/23 **DATE RECEIVED:** 10/11/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	10/26/23	10/26/23	10/26/23	10/26/23	10/26/23	10/26/23	10/26/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	36.1	9.50	2.72	26.9	129		
DUPLICATE	37.9	9.98	2.85	28.2	136		
RPD	4.82%	4.94%	4.70%	4.66%	4.85%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	36.1	9.50	2.72	26.9			
SPIKED SAMPLE	46.5	19.8	13.4	38.2			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	103.75%	103.46%	106.61%	112.72%	NA	NA	NA
QC CHECK							
FOUND	10.1	9.97	10.3	10.2	66.3		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	101.01%	99.69%	102.54%	102.43%	100.19%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.500	<0.700	NA	NA

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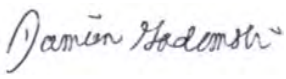
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 1743346

Page ___ of ___

REPORT TO:
Client: Tetra Tech Inc.
Address: 2003 Western Avenue, Suite 700
Seattle, WA 98121
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: 509-979-9672 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Return to Agenda

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☒ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard

Specific Date: 4 weeks

*Advanced notice required for Rush Analysis

Analysis Requested

Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Alkalinity	Total Aluminum	Dissolved Aluminum	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Dissolved Organic Carbon	Chlorophyll a	Total Hardness	Chloride	Bicarbonate	Carbonate	Total Calcium	Total Magnesium	Sodium	Potassium	pH	Field Filtered (Y/N)	Containers Received	Temp	Lab ID
10/11/23	10:30	SW	Mid-Lake 1m		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	N			137068
~~10/11/23~~		~~SW~~	~~Mid-Lake Bottom~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~N~~			

AB 10/11/23

LAB USE ONLY
Case File Number

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
Dissolved aluminum, SRP, DOC, and chlorophyll samples not filtered, will need filtration

Sampled By	Date	Time
Adam Bryant	10/11/23	1332
Received By	Date	Time
Relinquished to IAL By (Signature)	Date	Time

Shipped By	Shipping Reference	
[signature]		
Received at IAL By	Date	Time
[signature] 12.6 T-074	10-11-23	1:30

452

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1744586 **PAGE 1**

REPORT DATE: 12/26/23

DATE SAMPLED: 12/12/23 **DATE RECEIVED:** 12/12/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Mid-Lake 1m	0.041	0.002	0.034	10.7	1.04	28.5	7.47

SAMPLE ID	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	0.406	4.62	98.6	54	7.4

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Mid-Lake 1m	5.74	0.940	3.07	45.0	18.2	26.5	<1.00

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1744586 **PAGE 2**

REPORT DATE: 12/26/23

DATE SAMPLED: 12/12/23 **DATE RECEIVED:** 12/12/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	12/16/23	12/12/23	12/13/23	12/22/23	12/19/23	12/15/23	12/12/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.038	0.002	0.504	<0.250	0.851	33.2	
DUPLICATE	0.041	0.002	0.488	<0.250	0.827	32.7	
RPD	8.20%	0.42%	3.12%	NC	2.86%	1.52%	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.038	0.002	0.504	<0.250	0.851		
SPIKED SAMPLE	0.084	0.021	0.717	3.99	1.81		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	93.01%	97.74%	106.54%	88.67%	95.50%	NA	NA
QC CHECK							
FOUND	0.095	0.040	0.432	3.92	0.441	99.3	
TRUE	0.094	0.039	0.408	4.00	0.469	100	
% RECOVERY	101.06%	101.52%	105.88%	98.08%	94.03%	99.30%	NA
BLANK	<0.002	<0.001	<0.010	<0.250	<0.050	NA	NA

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IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1744586 **PAGE 3**

REPORT DATE: 12/26/23

DATE SAMPLED: 12/12/23 **DATE RECEIVED:** 12/12/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	12/14/23	12/13/23	12/13/23	12/19/23	12/19/23
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	Mid-Lake 1m	BATCH	BATCH	BATCH
ORIGINAL	0.0166	4.62	30.5	17	3.3
DUPLICATE	0.0184	4.52	31.3	19	3.5
RPD	10.19%	2.30%	2.58%	9.35%	5.88%
SPIKE SAMPLE					
SAMPLE ID	BATCH	Mid-Lake 1m	BATCH		
ORIGINAL	0.0166	4.62	30.5		
SPIKED SAMPLE	0.5563	14.7	41.5		
SPIKE ADDED	0.5000	20.0	10.0		
% RECOVERY	107.94%	50.45%	109.67%	NA	NA
QC CHECK					
FOUND	0.4954	30.9	9.70		
TRUE	0.5000	30.0	10.0		
% RECOVERY	99.08%	103.00%	97.00%	NA	NA
BLANK	<0.0030	<0.50	<1.00	NA	NA

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IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1744586 **PAGE 4**

REPORT DATE: 12/26/23

DATE SAMPLED: 12/12/23 **DATE RECEIVED:** 12/12/23

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	12/14/23	12/14/23	12/14/23	12/14/23	12/14/23	12/15/23	12/15/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	42.1	13.4	1.86	141	160		
DUPLICATE	44.8	12.2	1.93	136	162		
RPD	6.21%	9.21%	3.57%	3.31%	1.17%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	42.1	13.4	1.86	141			
SPIKED SAMPLE	50.8	25.0	12.4	151			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	87.00%	116.20%	105.09%	104.15%	NA	NA	NA
QC CHECK							
FOUND	10.4	10.2	10.3	10.6	68.2		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	103.93%	102.50%	102.68%	105.71%	103.04%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.500	<0.700	NA	NA

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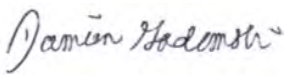
SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH

IEH Analytical Laboratories

3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 1744586

457

Return to Agenda

REPORT TO:

Client: Tetra Tech Inc.
Address: 2003 Western Avenue, Suite 700
Seattle, WA 98121
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: 509-979-9672 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)

Client: Same
Address:
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: Fax:

PROJECT INFORMATION

Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format

☐ Fax ☒ Email ☐ Mail

QC Data Reported

☒ Yes ☐ No

Sample Disposal

☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*

☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard

Specific Date: 4 weeks

*Advanced notice required for Rush Analysis

SAMPLING

Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Alkalinity	Total Aluminum	pH	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Dissolved Organic Carbon	Chlorophyll a	Total Hardness	Chloride	Bicarbonate	Carbonate	Total Calcium	Total Magnesium	Sodium	Potassium	Field Filtered (Y/N)	Containers Received	Temp	Lab ID
12-12-23	1018	SW	Mid-Lake 1m	3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	N			141092

LAB USE ONLY
Case File Number

BA 12/12/2023

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

	Date	Time
Sampled By: Adam Bryant	12/12/23	1347
Received By		
Relinquished to IAL By (Signature): Adam Bryant	12/12/23	1347

Comments:

SRP, DOC, and chlorophyll samples not filtered, will need filtration

Shipped By

Shipping Reference

Received at IAL By	Date	Time
[signature] ISMUACAS 15 8.8°C	12-12-23	1:50

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1746394 **PAGE 1**

REPORT DATE: 03/27/24

DATE SAMPLED: 03/13/24 **DATE RECEIVED:** 03/13/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Mid-Lake 1m	0.041	<0.001	<0.010	13.4	1.17	26.5	7.84

SAMPLE ID	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	0.3773	5.36	56.2	67	9.9

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Mid-Lake 1m	5.92	0.902	2.77	34.7	18.5	25.6	<1.00

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1746394 **PAGE 2**

REPORT DATE: 03/27/24

DATE SAMPLED: 03/13/24 **DATE RECEIVED:** 03/13/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	03/18/24	03/13/24	03/15/24	03/19/24	03/18/24	03/14/24	03/13/24
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	BATCH	BATCH	Mid-Lake 1m	BATCH	BATCH	Mid-Lake 1M	
ORIGINAL	0.013	0.074	<0.010	<0.250	0.689	26.5	
DUPLICATE	0.013	0.072	<0.010	<0.250	0.698	26.7	
RPD	3.21%	1.97%	NC	NC	1.30%	0.75%	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	Mid-Lake 1m	BATCH	BATCH		
ORIGINAL	0.013	0.074	<0.010	<0.250	0.689		
SPIKED SAMPLE	0.062	0.093	0.240	4.67	1.64		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	98.18%	95.65%	119.88%	103.78%	95.20%	NA	NA
QC CHECK							
FOUND	0.093	0.040	0.423	3.83	0.445	102	
TRUE	0.094	0.039	0.408	4.00	0.469	100	
% RECOVERY	98.94%	101.52%	103.60%	95.78%	94.88%	102.00%	NA
BLANK	<0.002	<0.001	<0.010	<0.250	<0.050	NA	NA

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NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1746394 **PAGE 3**

REPORT DATE: 03/27/24

DATE SAMPLED: 03/13/24 **DATE RECEIVED:** 03/13/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	03/25/24	03/20/24	03/18/24	03/15/24	03/15/24
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	Mid-Lake 1m	Mid-Lake 1m	BATCH	BATCH
ORIGINAL	0.0647	5.36	56.2	4.0	1.4
DUPLICATE	0.0666	5.15	56.9	3.7	1.6
RPD	2.93%	4.00%	1.32%	8.70%	15.61%
SPIKE SAMPLE					
SAMPLE ID	BATCH		Mid-Lake 1m		
ORIGINAL	0.0647		56.2		
SPIKED SAMPLE	0.6518		155		
SPIKE ADDED	0.5000		100		
% RECOVERY	117.42%	NA	99.13%	NA	NA
QC CHECK					
FOUND	0.5379	31.7	9.69		
TRUE	0.5000	30.0	10.0		
% RECOVERY	107.59%	105.81%	96.90%	NA	NA
BLANK	<0.0030	<0.50	<1.00	NA	NA

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IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1746394 **PAGE 4**

REPORT DATE: 03/27/24

DATE SAMPLED: 03/13/24 **DATE RECEIVED:** 03/13/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	03/23/24	03/23/24	03/23/24	03/23/24	03/23/24	03/14/24	03/14/24
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	29.7	6.38	2.32	16.2	100		
DUPLICATE	29.5	6.32	2.31	16.0	100		
RPD	0.72%	0.92%	0.70%	0.95%	0.77%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	29.7	6.38	2.32	16			
SPIKED SAMPLE	39.9	16.4	13.1	27			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	102.05%	100.70%	107.73%	106.46%	NA	NA	NA
QC CHECK							
FOUND	10.3	10.2	10.8	10.8	67.9		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	103.04%	102.50%	108.00%	108.00%	102.70%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.500	<0.700	NA	NA

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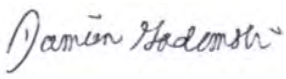
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories
3927 Aurora Ave N • Seattle • WA • 98103
P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 17463944

Page 1 of 1

Return to Agenda

REPORT TO:
Client: Tetra Tech Inc.
Address: 2003 Western Avenue, Suite 700
Seattle, WA 98121
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: 509-979-9672 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address:
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.: 492
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☒ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
~~3A~~ ~~☒ Next Day~~ ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
~~Specific Date: 4 weeks~~ 2 weeks 3A
*Advanced notice required for Rush Analysis

SAMPLING

Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Alkalinity	Total Aluminum	pH	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Dissolved Organic Carbon	Chlorophyll a	Total Hardness	Chloride	Bicarbonate	Carbonate	Total Calcium	Total Magnesium	Sodium	Potassium	Field Filtered (Y/N)	Containers Received	Temp	Lab ID
3/13/24	1000	SW	Mid-Lake 1m	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	N			146538

Analysis Requested

LAB USE ONLY
Case File Number

3/13/24 3A

*Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
SRP, DOC, and chlorophyll samples not filtered, will need filtration

Sampled By: Adam Brymt	Date: ~~3/13~~ 03/13/24	Time: 1335
Received By:	Date:	Time:
Relinquished to IAL By (Signature): Adam Brymt	Date: 03/13/24	Time: 1335

Shipped By:
Shipping Reference:
Received at IAL By: ISMECK AS IS 13.4° Date: 3-13-24 Time: 1:35

T-074

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1748847 **PAGE 1**

REPORT DATE: 08/02/24

DATE SAMPLED: 06/27/24 **DATE RECEIVED:** 06/27/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Mid-Lake 1m	0.120	0.001	<0.010	12.7	1.72	44.4	6.46

SAMPLE ID	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Mid-Lake 1m	1.78	4.52	39.4	21	12

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Mid-Lake 1m	7.23	1.08	3.16	37.1	22.5	25.0	<1.00

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1748847 **PAGE 2**

REPORT DATE: 08/02/24

DATE SAMPLED: 06/27/24 **DATE RECEIVED:** 06/27/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	N03+N02 (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	07/06/24	06/28/24	06/28/24	07/08/24	07/02/24	07/02/24	06/27/24
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	Mid-Lake 1m	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.120	<0.001	0.233	<0.250	0.302	60.2	
DUPLICATE	0.121	<0.001	0.231	<0.250	0.304	60.0	
RPD	1.24%	NC	0.91%	NC	0.66%	0.33%	NA
SPIKE SAMPLE							
SAMPLE ID	Mid-Lake 1m	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.120	<0.001	0.233	<0.250	0.302		
SPIKED SAMPLE	0.170	0.019	0.446	4.03	0.768		
SPIKE ADDED	0.050	0.020	0.200	4.50	0.500		
% RECOVERY	100.80%	93.00%	106.29%	89.64%	93.20%	NA	NA
QC CHECK							
FOUND	0.095	0.037	0.370	3.76	0.442	96.3	
TRUE	0.094	0.039	0.408	4.00	0.469	100	
% RECOVERY	101.06%	93.91%	90.67%	94.00%	94.24%	96.30%	NA
BLANK	<0.002	<0.001	<0.010	<0.250	<0.050	NA	NA

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IEH ANALYTICAL LABORATORIES

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3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

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CASE FILE NUMBER: 1748847 **PAGE 3**

REPORT DATE: 08/02/24

DATE SAMPLED: 06/27/24 **DATE RECEIVED:** 06/27/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	07/02/24	07/15/24	07/16/24	07/12/24	07/12/24
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	Mid-Lake 1m	Mid-Lake 1m	BATCH	BATCH
ORIGINAL	0.0646	4.52	27.0	15	6.7
DUPLICATE	0.0729	4.83	27.6	16	8.0
RPD	12.09%	6.74%	2.17%	6.90%	17.27%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	Mid-Lake 1m		
ORIGINAL	0.0646	4.52	27.0		
SPIKED SAMPLE	0.5909	15.1	37.5		
SPIKE ADDED	0.5000	10.0	10.0		
% RECOVERY	105.26%	106.16%	104.56%	NA	NA
QC CHECK					
FOUND	0.5490	30.4	9.66		
TRUE	0.5000	30.0	10.0		
% RECOVERY	109.80%	101.33%	96.60%	NA	NA
BLANK	<0.0030	<0.50	<1.00	NA	NA

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PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1748847 **PAGE 4**

REPORT DATE: 08/02/24

DATE SAMPLED: 06/27/24 **DATE RECEIVED:** 06/27/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM TETRA TECH INC.

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SODIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	07/02/24	07/02/24	07/02/24	07/02/24	07/02/24	07/02/24	07/02/24
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	29.2	6.56	2.24	15.9	100		
DUPLICATE	28.3	6.30	2.21	16.0	96.7		
RPD	3.24%	4.00%	0.97%	0.61%	3.44%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	29.2	6.56	2.24	15.9			
SPIKED SAMPLE	38.4	16.4	12.8	26.8			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	91.57%	98.70%	105.88%	109.10%	NA	NA	NA
QC CHECK							
FOUND	10.3	10.5	10.6	10.6	69.1		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	102.98%	105.39%	105.76%	105.59%	104.48%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.500	<0.700	NA	NA

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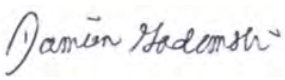
SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH Analytical Laboratories

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P: 206-632-2715 F: 206-632-2417

Chain of Custody Form 17458847

Page ____ of ____

Return to Agenda

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REPORT TO:
Client: Tetra Tech Inc.
Address: 2003 Western Avenue, Suite 700
Seattle, WA 98121
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: 509-979-9672 Fax

INVOICE TO: (IF DIFFERENT FROM REPORT)
Client: Same
Address:
Contact: Shannon Brattebo
Email: shannon.brattebo@tetratech.com
Phone: Fax:

PROJECT INFORMATION
Quote No.:
Client PO:
Client Project: Waughop Lake

Reporting/Invoicing Format
☐ Fax ☒ Email ☐ Mail

QC Data Reported
☒ Yes ☐ No

Sample Disposal
☐ Hold ☐ Dispose ☐ Return

Turn Around Time (TAT)*
☐ Next Day ☐ 2 Business Day
☐ 3 Business Da ☐ Standard
Specific Date: 4 weeks
*Advanced notice required for Rush Analysis

LAB USE ONLY
Case File Number

SAMPLING Date (mm-dd-yy)	Time	Matrix**	SAMPLE DESCRIPTION (This Will Appear On The Report)	Number of Containers	Total Alkalinity	Total Aluminum	pH	Sulfate	Total Phosphorus	SRP	Total Nitrogen	NO3+NO2-Nitrogen	Dissolved Organic Carbon	Chlorophyll a	Total Hardness	Chloride	Bicarbonate	Carbonate	Total Calcium	Total Magnesium	Sodium	Potassium	Field Filtered (Y/N)	Containers Received Temp	Lab ID
06/27/24	10:45	SW	Mid-Lake 1m	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	N		15S062

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater

Comments:
SRP, DOC, and chlorophyll samples not filtered, will need filtration

	Date	Time
Sampled By: Adam Bryant	06/27/24	1415
Received By:		
Relinquished to IAL By (Signature): Adam Bryant	06/27/24	1415

Shipped By:
Received at IAL By: SAMPLE AS IS 12.8°C
Shipping Reference
Date: 6-26-24 Time: 2:15

T-074 27

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Tetra Tech, Inc.
Shannon Brattebo
2003 Western Ave Suite 700
Seattle, WA 98121

RE: Waughop Lake Alum
Work Order Number: 2306470

July 05, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 6/27/2023 for the analyses presented in the following report.

Sulfide by SM 4500-S2-F

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *07/05/2023*

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum
Work Order: 2306470

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2306470-001	Mid-Lake 1 m	06/27/2023 12:30 PM	06/27/2023 3:45 PM
2306470-002	Mid-Lake Bottom	06/27/2023 12:40 PM	06/27/2023 3:45 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2306470**
Date: **7/5/2023**

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2306470**
Date Reported: **7/5/2023**

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Fremont Analytical
An Alliance Technical Group Company

Analytical Report

Work Order: **2306470**
Date Reported: **7/5/2023**

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

Lab ID: 2306470-001 **Collection Date:** 6/27/2023 12:30:00 PM
Client Sample ID: **Mid-Lake 1 m** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F				Batch ID: R85056		Analyst: SS
Sulfide	1.60	0.500		mg/L	1	7/3/2023 11:22:17 AM

Lab ID: 2306470-002 **Collection Date:** 6/27/2023 12:40:00 PM
Client Sample ID: **Mid-Lake Bottom** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F				Batch ID: R85056		Analyst: SS
Sulfide	2.80	0.500		mg/L	1	7/3/2023 11:22:17 AM

Work Order: 2306470
CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

QC SUMMARY REPORT

Sulfide by SM 4500-S2-F

Sample ID: **MB-R85056**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **7/3/2023**	RunNo: **85056**
Client ID: **MBLKW**	Batch ID: **R85056**		Analysis Date: **7/3/2023**	SeqNo: **1775518**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.500									

Sample ID: **LCS-R85056**	SampType: **LCS**	Units: **mg/L**	Prep Date: **7/3/2023**	RunNo: **85056**
Client ID: **LCSW**	Batch ID: **R85056**		Analysis Date: **7/3/2023**	SeqNo: **1775519**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	2.40	0.500	2.000	0	120	45.6	120				

Sample ID: **2306470-001ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **7/3/2023**	RunNo: **85056**
Client ID: **Mid-Lake 1 m**	Batch ID: **R85056**		Analysis Date: **7/3/2023**	SeqNo: **1775521**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	2.40	0.500						1.600	40.0	30	R

NOTES:
R - High RPD observed.

Sample ID: **2306536-002AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **7/3/2023**	RunNo: **85056**
Client ID: **BATCH**	Batch ID: **R85056**		Analysis Date: **7/3/2023**	SeqNo: **1776234**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	4.00	0.500	2.000	1.200	140	21.5	190				

Fremont Analytical
An Alliance Technical Group Company

Sample Log-In Check List

Client Name:	TETRAS	Work Order Number:	2306470
Logged by:	Clare Griggs	Date Received:	6/27/2023 3:45:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☐	No ☑	NA ☐
		Unknown prior to receipt.		
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☐	No ☐	NA ☑
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16.	Was client notified of all discrepancies with this order?	Yes ☐	No ☐	NA ☑

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	17.3

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Chain of Custody Record & Laboratory Services Agreement

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Date: 6/27/2023 Page: 1 of: 1

Laboratory Project No (internal): 2306470

Project Name: Waughop Lake Alum

Project No: 100-RCE-T39045

Collected by: Adam Bryant

Location: Waughop Lake, Lakewood, WA

Report To (PM): Shannon Brattebo, Tetra Tech

Special Remarks:
Bill to City of Lakewood
Attn: Weston Ott
wott@cityoflakewood.us
253-983-7725
6000 Main St. SW
Lakewood, WA 98499-5027

Disposal: Samples will be disposed in 30 days unless otherwise requested.
☐ Retain volume (specify above) ☐ Return to client

Client: Tetra Tech, Inc.
Address: 2003 Western Ave. Suite 700
City, State, Zip: Seattle, WA 98121
Telephone: 206-728-9655
Email(s): shannon.brattebo@tetratech.com

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8) Total (T) | Dissolved (D)	Anions (IC)***	EDB (8011)	SULFIDES			Comments
1	Mid-Lake 1 m	6/27/23	1230	W													X			
2	Mid-Lake Bottom	6/27/23	1240	W													X			
3																				
4																				
5																				
6																				
7																				
8																				
9														ATB 06/27/23						
10																				

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Tl Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☒ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day ☐ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x Adam Bryant	Adam Bryant	6/27/23 3:40	x Ashley Salvemini	Ashley Salvemini	6/27/23 1545
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Tetra Tech, Inc.
Shannon Brattebo
2003 Western Ave Suite 700
Seattle, WA 98121

RE: Waughop Lake Alum
Work Order Number: 2306536

July 07, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 6/30/2023 for the analyses presented in the following report.

Sulfide by SM 4500-S2-F

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *07/07/2023*

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum
Work Order: 2306536

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2306536-001	Mid-Lake 1 M	06/30/2023 12:20 PM	06/30/2023 4:12 PM
2306536-002	Mid-Lake Bottom	06/30/2023 12:35 PM	06/30/2023 4:12 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2306536**

Date: **7/7/2023**

CLIENT: Tetra Tech, Inc.

Project: Waughop Lake Alum

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2306536**
Date Reported: **7/7/2023**

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **2306536**
Date Reported: **7/7/2023**

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

Lab ID: 2306536-001 **Collection Date:** 6/30/2023 12:20:00 PM
Client Sample ID: **Mid-Lake 1 M** **Matrix:** Water

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F				Batch ID: R85056		Analyst: SS
Sulfide	4.00	0.500		mg/L	1	7/3/2023 11:22:17 AM

Lab ID: 2306536-002 **Collection Date:** 6/30/2023 12:35:00 PM
Client Sample ID: **Mid-Lake Bottom** **Matrix:** Water

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F				Batch ID: R85056		Analyst: SS
Sulfide	1.20	0.500		mg/L	1	7/3/2023 11:22:17 AM

Work Order: 2306536
CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

QC SUMMARY REPORT

Sulfide by SM 4500-S2-F

Sample ID: **MB-R85056**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **7/3/2023**	RunNo: **85056**
Client ID: **MBLKW**	Batch ID: **R85056**		Analysis Date: **7/3/2023**	SeqNo: **1775518**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.500									

Sample ID: **LCS-R85056**	SampType: **LCS**	Units: **mg/L**	Prep Date: **7/3/2023**	RunNo: **85056**
Client ID: **LCSW**	Batch ID: **R85056**		Analysis Date: **7/3/2023**	SeqNo: **1775519**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	2.40	0.500	2.000	0	120	45.6	120				

Sample ID: **2306470-001ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **7/3/2023**	RunNo: **85056**
Client ID: **BATCH**	Batch ID: **R85056**		Analysis Date: **7/3/2023**	SeqNo: **1775521**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	2.40	0.500						1.600	40.0	30	R

NOTES:
R - High RPD observed.

Sample ID: **2306536-002AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **7/3/2023**	RunNo: **85056**
Client ID: **Mid-Lake Bottom**	Batch ID: **R85056**		Analysis Date: **7/3/2023**	SeqNo: **1776234**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	4.00	0.500	2.000	1.200	140	21.5	190				

Fremont Analytical
An Alliance Technical Group Company

Sample Log-In Check List

Client Name:	TETRAS	Work Order Number:	2306536
Logged by:	Morgan Wilson	Date Received:	6/30/2023 4:20:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☐	No ☑	NA ☐
		Unknown prior to receipt.		
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☐	No ☐	NA ☑
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16.	Was client notified of all discrepancies with this order?	Yes ☐	No ☐	NA ☑

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	19.8

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Chain of Custody Record & Laboratory Services Agreement

Fremont Analytical
an Alliance Technical Group Company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Date: 06/30/23 Page: 1 of: 1

Laboratory Project No (internal): 2306536

Project Name: Waughop Lake Alum

Project No: 100-RCE-T39045

Collected by:

Location: Waughop Lake, Lakewood, WA

Report To (PM): Shannon Brattebo, Tetra Tech

Special Remarks:
Bill to City of Lakewood
Attn: Weston Ott
wott@cityoflakewood.us
253-983-7725
6000 Main St. SW
Lakewood, WA 98499-5027

Disposal: Samples will be disposed in 30 days unless otherwise requested.
☐ Retain volume (specify above) ☐ Return to client

Client: Tetra Tech, Inc.

Address: 2003 Western Ave. Suite 700

City, State, Zip: Seattle, WA 98121

Telephone: 206-728-9655

Email(s): shannon.brattebo@tetratech.com

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8) Total (T)	Dissolved (D)	Anions (IC)***	EDB (8011)	SULFIDES	Comments
1	Mid-Lake 1 m	06/30/23	12:20	W														X	
2	Mid-Lake Bottom	06/30/23	12:35	W														X	
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

06/30/23 ATB

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☒ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day ☐ _____ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x Adam Bryant	Adam Bryant	06/30/23 16:14	x	Nathan Keller	6/30/23 1614
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Tetra Tech, Inc.
Shannon Brattebo
2003 Western Ave Suite 700
Seattle, WA 98121

RE: Waughop Lake Alum
Work Order Number: 2307159

July 20, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 7/13/2023 for the analyses presented in the following report.

Sulfide by SM 4500-S2-F

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *07/20/2023*

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum
Work Order: 2307159

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2307159-001	Mid-Lake 1 M	07/13/2023 11:00 AM	07/13/2023 2:09 PM
2307159-002	Mid-Lake Bottom	07/13/2023 11:15 AM	07/13/2023 2:09 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2307159**
Date: **7/20/2023**

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2307159**
Date Reported: **7/20/2023**

Qualifiers:

* - Associated LCS is outside of control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Method Detection Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Fremont Analytical
An Alliance Technical Group Company

Analytical Report

Work Order: **2307159**
Date Reported: **7/20/2023**

Client: Tetra Tech, Inc.
Collection Date: 7/13/2023 11:00:00 AM
Project: Waughop Lake Alum
Lab ID: 2307159-001
Matrix: Water
Client Sample ID: Mid-Lake 1 M

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F				Batch ID: R85352			Analyst: AM
Sulfide	0.800	0.500	0.128		mg/L	1	07/17/23 16:30:46

Client: Tetra Tech, Inc.
Collection Date: 7/13/2023 11:15:00 AM
Project: Waughop Lake Alum
Lab ID: 2307159-002
Matrix: Water
Client Sample ID: Mid-Lake Bottom

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F				Batch ID: R85352			Analyst: AM
Sulfide	2.40	0.500	0.128		mg/L	1	07/17/23 16:30:46

Work Order: 2307159
CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

QC SUMMARY REPORT

Sulfide by SM 4500-S2-F

Sample ID: **MB-R85352**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **7/17/2023**	RunNo: **85352**
Client ID: **MBLKW**	Batch ID: **R85352**		Analysis Date: **7/17/2023**	SeqNo: **1780883**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.500									

Sample ID: **LCS-R85352**	SampType: **LCS**	Units: **mg/L**	Prep Date: **7/17/2023**	RunNo: **85352**
Client ID: **LCSW**	Batch ID: **R85352**		Analysis Date: **7/17/2023**	SeqNo: **1780884**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	2.00	0.500	2.000	0	100	45.6	120				

Sample ID: **2307159-001ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **7/17/2023**	RunNo: **85352**
Client ID: **Mid-Lake 1 M**	Batch ID: **R85352**		Analysis Date: **7/17/2023**	SeqNo: **1780887**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.800	0.500						0.8000	0	30	

Sample ID: **2307159-002AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **7/17/2023**	RunNo: **85352**
Client ID: **Mid-Lake Bottom**	Batch ID: **R85352**		Analysis Date: **7/17/2023**	SeqNo: **1780889**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	4.80	0.500	2.000	2.400	120	21.5	190				

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An Alliance Technical Group Company

Sample Log-In Check List

Client Name:	TETRAS	Work Order Number:	2307159
Logged by:	Morgan Wilson	Date Received:	7/13/2023 2:09:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☐	No ☑	NA ☐
		Unknown prior to receipt.		
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☐	No ☐	NA ☑
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16.	Was client notified of all discrepancies with this order?	Yes ☐	No ☐	NA ☑

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	21.4

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Chain of Custody Record & Laboratory Services Agreement

Date: 7/13/23 Page: 1 of: 1

Laboratory Project No (internal): 2307159

Project Name: Waughop Lake Alum

Project No: 100-RCE-T39045

Collected by: Zach Skelton (TT)

Location: Waughop Lake, Lakewood, WA

Report To (PM): Shannon Brattebo, Tetra Tech

Special Remarks:
Bill to City of Lakewood
Attn: Weston Ott
wott@cityoflakewood.us
253-983-7725
6000 Main St. SW
Lakewood, WA 98499-5027

Disposal: Samples will be disposed in 30 days unless otherwise requested.
☐ Retain volume (specify above) ☐ Return to client

Client: Tetra Tech, Inc.

Address: 2003 Western Ave. Suite 700

City, State, Zip: Seattle, WA 98121

Telephone: 206-728-9655

Email(s): shannon.brattebo@tetratech.com

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8)	Total (T) | Dissolved (D)	Anions (IC)***	EDB (8011)	SULFIDES			Comments
1	Mid-Lake 1 m	7/13/23	1100	W	1													X			
2	Mid-Lake Bottom	7/13/23	1115	W	1													X			
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10				7/13/23																	

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Tl Ti V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☒ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day ☐ _____ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x Adam Bryant	Adam Bryant	7/13/23 1410	x	7/13/23	1409
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Tetra Tech, Inc.
Shannon Brattebo
2003 Western Ave Suite 700
Seattle, WA 98121

RE: Waughop Lake Alum
Work Order Number: 2308209

August 22, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 8/15/2023 for the analyses presented in the following report.

Sulfide by SM 4500-S2-F

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *08/22/2023*

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum
Work Order: 2308209

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2308209-001	Mid-Lake 1 m	08/15/2023 9:45 AM	08/15/2023 1:35 PM
2308209-002	Mid-Lake Bottom	08/15/2023 10:00 AM	08/15/2023 1:35 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2308209**
Date: **8/22/2023**

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2308209**
Date Reported: **8/22/2023**

Qualifiers:

* - Associated LCS is outside of control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Method Detection Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Fremont Analytical
An Alliance Technical Group Company

Analytical Report

Work Order: **2308209**
Date Reported: **8/22/2023**

Client: Tetra Tech, Inc.
Collection Date: 8/15/2023 9:45:00 AM
Project: Waughop Lake Alum
Lab ID: 2308209-001
Matrix: Water
Client Sample ID: Mid-Lake 1 m

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F				Batch ID: R86063			Analyst: SS
Sulfide	0.600	0.500	0.128		mg/L	1	08/22/23 14:17:17

Client: Tetra Tech, Inc.
Collection Date: 8/15/2023 10:00:00 AM
Project: Waughop Lake Alum
Lab ID: 2308209-002
Matrix: Water
Client Sample ID: Mid-Lake Bottom

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F				Batch ID: R86063			Analyst: SS
Sulfide	ND	0.500	0.128		mg/L	1	08/22/23 14:17:17

Work Order: 2308209
CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

QC SUMMARY REPORT

Sulfide by SM 4500-S2-F

Sample ID: **MB-R86063**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **8/22/2023**	RunNo: **86063**
Client ID: **MBLKW**	Batch ID: **R86063**		Analysis Date: **8/22/2023**	SeqNo: **1795802**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.500									

Sample ID: **LCS-R86063**	SampType: **LCS**	Units: **mg/L**	Prep Date: **8/22/2023**	RunNo: **86063**
Client ID: **LCSW**	Batch ID: **R86063**		Analysis Date: **8/22/2023**	SeqNo: **1795803**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	1.40	0.500	2.000	0	70.0	45.6	120				

Sample ID: **LCSD-R86063**	SampType: **LCSD**	Units: **mg/L**	Prep Date: **8/22/2023**	RunNo: **86063**
Client ID: **LCSW02**	Batch ID: **R86063**		Analysis Date: **8/22/2023**	SeqNo: **1795804**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	1.40	0.500	2.000	0	70.0	45.6	120	1.400	0	20	

Sample ID: **2308209-001ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **8/22/2023**	RunNo: **86063**
Client ID: **Mid-Lake 1 m**	Batch ID: **R86063**		Analysis Date: **8/22/2023**	SeqNo: **1795806**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.500						0.6000	200	30	R

NOTES:
R - High RPD observed.

Sample ID: **2308209-002AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **8/22/2023**	RunNo: **86063**
Client ID: **Mid-Lake Bottom**	Batch ID: **R86063**		Analysis Date: **8/22/2023**	SeqNo: **1795808**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	5.60	0.500	2.000	0	280	21.5	190				S

NOTES:
S - Outlying spike recoveries were associated with this sample.

Fremont Analytical
An Alliance Technical Group Company

Sample Log-In Check List

Client Name:	TETRAS	Work Order Number:	2308209
Logged by:	Clare Griggs	Date Received:	8/15/2023 1:35:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☐	No ☑	NA ☐
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☐	No ☐	NA ☑
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	19.4

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Chain of Custody Record & Laboratory Services Agreement

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Date: Page: 1 of: 1

Laboratory Project No (internal): 23082099

Client: Tetra Tech, Inc.
Address: 2003 Western Ave. Suite 700
City, State, Zip: Seattle, WA 98121
Telephone: 206-728-9655
Email(s): shannon.brattebo@tetratech.com

Project Name: Waughop Lake Alum
Project No: 100-RCE-T39045
Collected by:
Location: Waughop Lake, Lakewood, WA
Report To (PM): Shannon Brattebo, Tetra Tech

Special Remarks:
Bill to City of Lakewood
Attn: Weston Ott
wott@cityoflakewood.us
253-983-7725
6000 Main St. SW
Lakewood, WA 98499-5027

Disposal: Samples will be disposed in 30 days unless otherwise requested.
☐ Retain volume (specify above) ☐ Return to client

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (Dx)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8)	Total (T) | Dissolved (D)	Anions (IC)***	EDB (8011)	SULFIDES			Comments
1	Mid-Lake 1 m	8/15/23	0945	W	1													X			
2	Mid-Lake Bottom	8/15/23	1000	W	1													X			
3																					
4																					
5																					
6																					
7																					
8																					
9		BA																			
10		8/15/23																			

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☒ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x Adam Bryant	Adam Bryant	08/15/23 1335	x EMT	Emma Twelt	8/15/23 13:35
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Tetra Tech, Inc.
Shannon Brattebo
2003 Western Ave Suite 700
Seattle, WA 98121

RE: Waughop Lake Alum
Work Order Number: 2309168

September 21, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 9/14/2023 for the analyses presented in the following report.

Toal Sulfide by SM 4500-S2-D

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *09/21/2023*

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum
Work Order: 2309168

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2309168-001	Mid-Lake 1 m	09/14/2023 10:27 AM	09/14/2023 3:52 PM
2309168-002	Mid-Lake Bottom	09/14/2023 10:37 AM	09/14/2023 3:52 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2309168**
Date: **9/21/2023**

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2309168**
Date Reported: **9/21/2023**

Qualifiers:

* - Associated LCS is outside of control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Method Detection Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Fremont Analytical
An Alliance Technical Group Company

Analytical Report

Work Order: **2309168**
Date Reported: **9/21/2023**

Client: Tetra Tech, Inc.
Collection Date: 9/14/2023 10:27:00 AM
Project: Waughop Lake Alum
Lab ID: 2309168-001
Matrix: Water
Client Sample ID: **Mid-Lake 1 m**

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Toal Sulfide by SM 4500-S2-D				Batch ID: R86639			Analyst: FG
Sulfide	ND	0.0500	0.0138		mg/L	1	09/21/23 9:39:01

Client: Tetra Tech, Inc.
Collection Date: 9/14/2023 10:37:00 AM
Project: Waughop Lake Alum
Lab ID: 2309168-002
Matrix: Water
Client Sample ID: **Mid-Lake Bottom**

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Toal Sulfide by SM 4500-S2-D				Batch ID: R86639			Analyst: FG
Sulfide	0.0139	0.0500	0.0138	J	mg/L	1	09/21/23 9:39:01

Work Order: 2309168
CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

QC SUMMARY REPORT

Toal Sulfide by SM 4500-S2-D

Sample ID: **LCS-R86639**	SampType: **LCS**	Units: **mg/L**	Prep Date: **9/21/2023**	RunNo: **86639**
Client ID: **LCSW**	Batch ID: **R86639**		Analysis Date: **9/21/2023**	SeqNo: **1807644**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.0997	0.0500	0.1000	0	99.7	80	120				

Sample ID: **MB-R86639**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **9/21/2023**	RunNo: **86639**
Client ID: **MBLKW**	Batch ID: **R86639**		Analysis Date: **9/21/2023**	SeqNo: **1807645**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500									

Sample ID: **2309168-001ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **9/21/2023**	RunNo: **86639**
Client ID: **Mid-Lake 1 m**	Batch ID: **R86639**		Analysis Date: **9/21/2023**	SeqNo: **1807704**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500						0	0	20	

Sample ID: **2309168-001AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **9/21/2023**	RunNo: **86639**
Client ID: **Mid-Lake 1 m**	Batch ID: **R86639**		Analysis Date: **9/21/2023**	SeqNo: **1807705**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.103	0.0500	0.1000	0	103	80	120				

Sample ID: **2309168-001AMSD**	SampType: **MSD**	Units: **mg/L**	Prep Date: **9/21/2023**	RunNo: **86639**
Client ID: **Mid-Lake 1 m**	Batch ID: **R86639**		Analysis Date: **9/21/2023**	SeqNo: **1807706**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.114	0.0500	0.1000	0	114	80	120	0.1030	10.1	20	

Fremont Analytical
An Alliance Technical Group Company

Sample Log-In Check List

Client Name:	**TETRAS**	Work Order Number:	**2309168**
Logged by:	**Lyann Rivera**	Date Received:	**9/14/2023 3:52:00 PM**

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☐	No ☑	NA ☐
		Unknown prior to receipt		
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☐	No ☐	NA ☑
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16.	Was client notified of all discrepancies with this order?	Yes ☐	No ☐	NA ☑

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	14.7

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Chain of Custody Record & Laboratory Services Agreement

Date: | Page: 1 of: 1 | Laboratory Project No (internal): 2309168

Client: Tetra Tech, Inc.
Address: 2003 Western Ave. Suite 700
City, State, Zip: Seattle, WA 98121
Telephone: 206-728-9655
Email(s): shannon.brattebo@tetratech.com

Project Name: Waughop Lake Alum
Project No: 100-RCE-T39045
Collected by: Adam Bryant
Location: Waughop Lake, Lakewood, WA
Report To (PM): Shannon Brattebo, Tetra Tech

Special Remarks:
Bill to City of Lakewood
Attn: Weston Ott
wott@cityoflakewood.us
253-983-7725
6000 Main St. SW
Lakewood, WA 98499-5027

Disposal: Samples will be disposed in 30 days unless otherwise requested.
☐ Retain volume (specify above) ☐ Return to client

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8) Total (T) | Dissolved (D)	Anions (IC)***	EDB (8011)	SULFIDES				Comments
1	Mid-Lake 1 m	09/14/23	10:27	W	1												X				
2	Mid-Lake Bottom	09/14/23	10:37	W	1												X				
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☒ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day ☐ _____ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x Adam Bryant	Adam Bryant	1550	x	Britton Stone	9/14/23 15:52
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Tetra Tech, Inc.
Shannon Brattebo
2003 Western Ave Suite 700
Seattle, WA 98121

RE: Waughop Lake Alum
Work Order Number: 2310163

October 18, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 1 sample(s) on 10/11/2023 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *10/18/2023*

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum
Work Order: 2310163

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2310163-001	Mid-Lake 1 m	10/11/2023 12:00 AM	10/11/2023 1:39 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2310163**
Date: **10/18/2023**

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2310163**
Date Reported: **10/18/2023**

Qualifiers:

* - Associated LCS is outside of control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Method Detection Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Fremont Analytical
An Alliance Technical Group Company

Analytical Report

Work Order: **2310163**
Date Reported: **10/18/2023**

Client: Tetra Tech, Inc.
Collection Date: 10/11/2023
Project: Waughop Lake Alum
Lab ID: 2310163-001
Matrix: Water
Client Sample ID: **Mid-Lake 1 m**

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R87181			Analyst: FG
Sulfide	ND	0.0500	0.0138		mg/L	1	10/17/23 11:00:00

Work Order: 2310163
CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

QC SUMMARY REPORT

Total Sulfide by SM 4500-S2-D

Sample ID: **MB-R87181**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **10/17/2023**	RunNo: **87181**
Client ID: **MBLKW**	Batch ID: **R87181**		Analysis Date: **10/17/2023**	SeqNo: **1819888**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500									

Sample ID: **LCS-R87181**	SampType: **LCS**	Units: **mg/L**	Prep Date: **10/17/2023**	RunNo: **87181**
Client ID: **LCSW**	Batch ID: **R87181**		Analysis Date: **10/17/2023**	SeqNo: **1819889**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.188	0.0500	0.2000	0	93.9	80	120				

Sample ID: **2310163-001ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **10/17/2023**	RunNo: **87181**
Client ID: **Mid-Lake 1 m**	Batch ID: **R87181**		Analysis Date: **10/17/2023**	SeqNo: **1819891**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500						0	0	20	

Sample ID: **2310163-001AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **10/17/2023**	RunNo: **87181**
Client ID: **Mid-Lake 1 m**	Batch ID: **R87181**		Analysis Date: **10/17/2023**	SeqNo: **1819892**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.192	0.0500	0.2000	0	96.2	80	120				

Sample ID: **2310163-001AMSD**	SampType: **MSD**	Units: **mg/L**	Prep Date: **10/17/2023**	RunNo: **87181**
Client ID: **Mid-Lake 1 m**	Batch ID: **R87181**		Analysis Date: **10/17/2023**	SeqNo: **1819893**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.198	0.0500	0.2000	0	99.1	80	120	0.1924	2.97	20	

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Sample Log-In Check List

Client Name:	TETRAS	Work Order Number:	2310163
Logged by:	Morgan Wilson	Date Received:	10/11/2023 1:39:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☐	No ☑	NA ☐
		Unknown prior to receipt.		
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☐	No ☐	NA ☑
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	14.5

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Fremont Analytical
An Alliance Technical Group company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Chain of Custody Record & Laboratory Services Agreement

Date: | Page: 1 of: 1 | Laboratory Project No (internal): 2310163

Client: Tetra Tech, Inc.
Address: 2003 Western Ave. Suite 700
City, State, Zip: Seattle, WA 98121
Telephone: 206-728-9655
Email(s): shannon.brattebo@tetratech.com

Project Name: Waughop Lake Alum
Project No: 100-RCE-T39045
Collected by:
Location: Waughop Lake, Lakewood, WA
Report To (PM): Shannon Brattebo, Tetra Tech

Special Remarks:
Bill to City of Lakewood
Attn: Weston Ott
wott@cityoflakewood.us
253-983-7725
6000 Main St. SW
Lakewood, WA 98499-5027

Disposal: Samples will be disposed in 30 days unless otherwise requested.
☐ Retain volume (specify above) ☐ Return to client

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8) Total (T) | Dissolved (D)	Anions (IC)***	EDB (8011)	SULFIDES	Comments
1	Mid-Lake 1 m			W													X	
2	~~Mid-Lake Bottom~~ BA	10/11/23		W													X	
3																		
4																		
5																		
6																		
7																		
8																		
9	BA 10/11/23																	
10																		

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☒ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day ☐ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x Adam Bryant	Adam Bryant	10/11/2023 1339	x	Nathan Koffler	10/11/23 1339
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Tetra Tech, Inc.
Shannon Brattebo
2003 Western Ave Suite 700
Seattle, WA 98121

RE: Waughop Lake Alum
Work Order Number: 2312294

December 19, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 12/12/2023 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *12/19/2023*

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum
Work Order: 2312294

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2312294-001	Mid-Lake 1 m	12/12/2023 10:18 AM	12/12/2023 1:56 PM
2312294-002	Mid-Lake Bottom	12/12/2023 10:25 AM	12/12/2023 1:56 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2312294**
Date: **12/19/2023**

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2312294**
Date Reported: **12/19/2023**

Qualifiers:

* - Associated LCS is outside of control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Method Detection Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Fremont Analytical
An Alliance Technical Group Company

Analytical Report

Work Order: **2312294**
Date Reported: **12/19/2023**

Client: Tetra Tech, Inc. **Collection Date:** 12/12/2023 10:18:00 AM
Project: Waughop Lake Alum
Lab ID: 2312294-001 **Matrix:** Water
Client Sample ID: **Mid-Lake 1 m**

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R88428			Analyst: AM
Sulfide	0.0336	0.0500	0.0138	J	mg/L	1	12/19/23 10:01:31

Client: Tetra Tech, Inc. **Collection Date:** 12/12/2023 10:25:00 AM
Project: Waughop Lake Alum
Lab ID: 2312294-002 **Matrix:** Water
Client Sample ID: **Mid-Lake Bottom**

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R88428			Analyst: AM
Sulfide	0.0383	0.0500	0.0138	J	mg/L	1	12/19/23 10:01:31

Work Order: 2312294
CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

QC SUMMARY REPORT

Total Sulfide by SM 4500-S2-D

Sample ID: **CCB-R88428**	SampType: **CCB**			Units: **mg/L**		Prep Date: **12/19/2023**		RunNo: **88428**		
Client ID: **CCB**	Batch ID: **R88428**					Analysis Date: **12/19/2023**		SeqNo: **1846585**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500									

Sample ID: **LCS-R88428**	SampType: **LCS**			Units: **mg/L**		Prep Date: **12/19/2023**		RunNo: **88428**		
Client ID: **LCSW**	Batch ID: **R88428**					Analysis Date: **12/19/2023**		SeqNo: **1846586**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.163	0.0500	0.2000	0	81.7	80	120				

Sample ID: **2312338-001FDUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **12/19/2023**		RunNo: **88428**		
Client ID: **BATCH**	Batch ID: **R88428**					Analysis Date: **12/19/2023**		SeqNo: **1847024**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.0359	0.0500						0.02900	21.4	20	J

Sample ID: **2312338-001FMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **12/19/2023**		RunNo: **88428**		
Client ID: **BATCH**	Batch ID: **R88428**					Analysis Date: **12/19/2023**		SeqNo: **1847025**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.210	0.0500	0.2000	0.02900	90.4	80	120				

Sample ID: **2312338-001FMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **12/19/2023**		RunNo: **88428**		
Client ID: **BATCH**	Batch ID: **R88428**					Analysis Date: **12/19/2023**		SeqNo: **1847026**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.205	0.0500	0.2000	0.02900	88.1	80	120	0.2098	2.23	20	

Fremont Analytical
An Alliance Technical Group Company

Sample Log-In Check List

Client Name:	TETRAS	Work Order Number:	2312294
Logged by:	Lyann Rivera	Date Received:	12/12/2023 1:56:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☐	No ☑	NA ☐
		Unknown Prior to Receipt		
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☐	No ☐	NA ☑
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16.	Was client notified of all discrepancies with this order?	Yes ☐	No ☐	NA ☑

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	10.5

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Chain of Custody Record & Laboratory Services Agreement

Date: | Page: 1 of: 1 | Laboratory Project No (internal): 2312294

Client: Tetra Tech, Inc.
Address: 2003 Western Ave. Suite 700
City, State, Zip: Seattle, WA 98121
Telephone: 206-728-9655
Email(s): shannon.brattebo@tetratech.com

Project Name: Waughop Lake Alum
Project No: 100-RCE-T39045
Collected by:
Location: Waughop Lake, Lakewood, WA
Report To (PM): Shannon Brattebo, Tetra Tech

Special Remarks:
Bill to City of Lakewood
Attn: Weston Ott
wott@cityoflakewood.us
253-983-7725
6000 Main St. SW
Lakewood, WA 98499-5027

Disposal: Samples will be disposed in 30 days unless otherwise requested.
☐ Retain volume (specify above) ☐ Return to client

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8) Total (T) | Dissolved (D)	Anions (IC)***	EDB (8011)	SULFIDES			Comments
1	Mid-Lake 1 m	12/12/23	1018	W	1												X			
2	Mid-Lake Bottom	12/12/23	1025	W	1												X			
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10	3A	12/12/23																		

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☒ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day _____ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x Adam Bryant	Adam Bryant	12/12/23 1355	x	12/12/23 1556	
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Tetra Tech, Inc.
Shannon Brattebo
2003 Western Ave Suite 700
Seattle, WA 98121

RE: Waughop Lake Alum
Work Order Number: 2403233

March 18, 2024

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 3/13/2024 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *03/18/2024*

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum
Work Order: 2403233

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2403233-001	Mid-Lake 1 m	03/13/2024 10:00 AM	03/13/2024 1:43 PM
2403233-002	Mid-Lake Bottom	03/13/2024 10:10 AM	03/13/2024 1:43 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Case Narrative

WO#: **2403233**
Date: **3/18/2024**

CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2403233**
Date Reported: **3/18/2024**

Qualifiers:

* - Associated LCS is outside of control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Method Detection Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Fremont Analytical
An Alliance Technical Group Company

Analytical Report

Work Order: **2403233**
Date Reported: **3/18/2024**

Client: Tetra Tech, Inc.
Collection Date: 3/13/2024 10:00:00 AM
Project: Waughop Lake Alum
Lab ID: 2403233-001
Matrix: Water
Client Sample ID: Mid-Lake 1 m

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R90250			Analyst: SLL
Sulfide	0.0232	0.0500	0.0138	J	mg/L	1	03/15/24 11:41:09

Client: Tetra Tech, Inc.
Collection Date: 3/13/2024 10:10:00 AM
Project: Waughop Lake Alum
Lab ID: 2403233-002
Matrix: Water
Client Sample ID: Mid-Lake Bottom

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R90250			Analyst: SLL
Sulfide	0.107	0.0500	0.0138		mg/L	1	03/15/24 11:41:09

Work Order: 2403233
CLIENT: Tetra Tech, Inc.
Project: Waughop Lake Alum

QC SUMMARY REPORT

Total Sulfide by SM 4500-S2-D

Sample ID: **MB-R90250**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **3/15/2024**		RunNo: **90250**			
Client ID: **MBLKW**	Batch ID: **R90250**					Analysis Date: **3/15/2024**		SeqNo: **1882557**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500									

Sample ID: **LCS-R90250**	SampType: **LCS**			Units: **mg/L**		Prep Date: **3/15/2024**		RunNo: **90250**			
Client ID: **LCSW**	Batch ID: **R90250**					Analysis Date: **3/15/2024**		SeqNo: **1882558**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.181	0.0500	0.2000	0	90.4	80	120				

Sample ID: **2403151-004HDUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **3/15/2024**		RunNo: **90250**			
Client ID: **BATCH**	Batch ID: **R90250**					Analysis Date: **3/15/2024**		SeqNo: **1882560**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.0151	0.0500						0	200	20	J

Sample ID: **2403151-004HMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **3/15/2024**		RunNo: **90250**			
Client ID: **BATCH**	Batch ID: **R90250**					Analysis Date: **3/15/2024**		SeqNo: **1882561**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.206	0.0500	0.2000	0	103	80	120				

Sample ID: **2403151-004HMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **3/15/2024**		RunNo: **90250**			
Client ID: **BATCH**	Batch ID: **R90250**					Analysis Date: **3/15/2024**		SeqNo: **1882562**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.213	0.0500	0.2000	0	107	80	120	0.2063	3.31	20	

Fremont Analytical
An Alliance Technical Group Company

Sample Log-In Check List

Client Name:	TETRAS	Work Order Number:	2403233
Logged by:	Morgan Wilson	Date Received:	3/13/2024 1:43:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☐	No ☑	NA ☐
		Unknown prior to receipt.		
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☐	No ☐	NA ☑
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	11.9

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Return to Agenda

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Fremont Analytical

An Alliance Technical Group Company

3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Chain of Custody Record & Laboratory Services Agreement

Date: 3/13/24 Page: 1 of: 1

Laboratory Project No (internal): 2403233

Project Name: Waughop Lake Alum

Project No: 100-RCE-T39045

Collected by:

Location: Waughop Lake, Lakewood, WA

Report To (PM): Shannon Brattebo, Tetra Tech

Special Remarks:
Bill to City of Lakewood
Attn: Weston Ott
wott@cityoflakewood.us
253-983-7725
6000 Main St. SW
Lakewood, WA 98499-5027

Disposal: Samples will be disposed in 30 days unless otherwise requested.
☐ Retain volume (specify above) ☐ Return to client

Client: Tetra Tech, Inc.

Address: 2003 Western Ave. Suite 700

City, State, Zip: Seattle, WA 98121

Telephone: 206-728-9655

Email(s): shannon.brattebo@tetratech.com

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8)	Total (T)	Dissolved (D)	Anions (IC)***	EDB (8011)	SULFIDES			Comments
1	Mid-Lake 1 m	3/13/24	1000	W	1														X			
2	Mid-Lake Bottom	3/13/24	1010	W	1														X			
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

3/13/24

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
~~Standard~~ ~~Next Day~~
☐ 3 Day ☐ Same Day
☐ 2 Day 2 weeks (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x Adam Bryant	Adam Bryant	1342	x	Brianna Ballard	3/13 1:43PM
Relinquished (Signature) x	Print Name	Date/Time	Received (Signature) x	Print Name	Date/Time

3600 Fremont Ave N
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Tetra Tech, Inc.
Shannon Brattebo
2003 Western Ave Suite 700
Seattle, WA 98121

RE: Waughlop Lake Alum, 100-RCE-T39045
Work Order Number: 2406500

July 02, 2024

Attention Shannon Brattebo:

Fremont Analytical, Inc, an Alliance Technical Group company, received 2 sample(s) on 6/27/2024 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes
Project Manager

Date: *07/02/2024*

CLIENT: Tetra Tech, Inc.
Project: Waughlop Lake Alum
Work Order: 2406500

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2406500-001	Mid-Lake 1 m	06/27/2024 10:45 AM	06/27/2024 2:25 PM
2406500-002	Mid-Lake Bottom	06/27/2024 11:00 AM	06/27/2024 2:25 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2406500**

Date: **7/2/2024**

CLIENT: Tetra Tech, Inc.

Project: Waughlop Lake Alum

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2406500**
Date Reported: **7/2/2024**

Qualifiers:

* - Associated LCS is outside of control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Method Detection Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **2406500**
Date Reported: **7/2/2024**

Client: Tetra Tech, Inc. **Collection Date:** 6/27/2024 10:45:00 AM
Project: Waughlop Lake Alum
Lab ID: 2406500-001 **Matrix:** Water
Client Sample ID: Mid-Lake 1 m

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R92755			Analyst: JH
Sulfide	0.0508	0.0500	0.0138		mg/L	1	07/01/24 10:10:59

Client: Tetra Tech, Inc. **Collection Date:** 6/27/2024 11:00:00 AM
Project: Waughlop Lake Alum
Lab ID: 2406500-002 **Matrix:** Water
Client Sample ID: Mid-Lake Bottom

Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R92755			Analyst: JH
Sulfide	0.117	0.0500	0.0138		mg/L	1	07/01/24 10:10:59

Work Order: 2406500
CLIENT: Tetra Tech, Inc.
Project: Waughlop Lake Alum

QC SUMMARY REPORT

Total Sulfide by SM 4500-S2-D

Sample ID: **MB-R92755**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **7/1/2024**	RunNo: **92755**
Client ID: **MBLKW**	Batch ID: **R92755**		Analysis Date: **7/1/2024**	SeqNo: **1935777**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500									

Sample ID: **LCS-R92755**	SampType: **LCS**	Units: **mg/L**	Prep Date: **7/1/2024**	RunNo: **92755**
Client ID: **LCSW**	Batch ID: **R92755**		Analysis Date: **7/1/2024**	SeqNo: **1935778**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.185	0.0500	0.2000	0	92.4	80	120				

Sample ID: **2406500-001AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **7/1/2024**	RunNo: **92755**
Client ID: **Mid-Lake 1 m**	Batch ID: **R92755**		Analysis Date: **7/1/2024**	SeqNo: **1935780**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.256	0.0500	0.2000	0.05076	102	80	120				

Sample ID: **2406500-001AMSD**	SampType: **MSD**	Units: **mg/L**	Prep Date: **7/1/2024**	RunNo: **92755**
Client ID: **Mid-Lake 1 m**	Batch ID: **R92755**		Analysis Date: **7/1/2024**	SeqNo: **1935781**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.282	0.0500	0.2000	0.05076	116	80	120	0.2557	9.71	20	

Sample ID: **2406500-001ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **7/1/2024**	RunNo: **92755**
Client ID: **Mid-Lake 1 m**	Batch ID: **R92755**		Analysis Date: **7/1/2024**	SeqNo: **1935782**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.0595	0.0500						0.05076	15.8	20	

Return to Agenda

Sample Log-In Check List

Client Name:	TETRAS	Work Order Number:	2406500
Logged by:	Morgan Wilson	Date Received:	6/27/2024 2:25:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☐	No ☑	NA ☐
		Unknown prior to receipt.		
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☐	No ☐	NA ☑
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	17.4

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Chain of Custody Record & Laboratory Services Agreement

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Date: Page: 1 of: 1

Laboratory Project No (internal): 2406500

Project Name: Waughop Lake Alum

Project No: 100-RCE-T39045

Collected by:

Location: Waughop Lake, Lakewood, WA

Report To (PM): Shannon Brattebo, Tetra Tech

Special Remarks:
Bill to City of Lakewood
Attn: Weston Ott
wott@cityoflakewood.us
253-983-7725
6000 Main St. SW
Lakewood, WA 98499-5027

Disposal: Samples will be disposed in 30 days unless otherwise requested.
☐ Retain volume (specify above) ☐ Return to client

Client: Tetra Tech, Inc.

Address: 2003 Western Ave. Suite 700

City, State, Zip: Seattle, WA 98121

Telephone: 206-728-9655

Email(s): shannon.brattebo@tetratech.com

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8) Total (T) | Dissolved (D)	Anions (IC)***	EDB (8011)	SULFIDES			Comments
1	Mid-Lake 1 m	06/27/24	10:45	W	1												X			
2	Mid-Lake Bottom	06/27/24	11:00	W	1												X			
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☒ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day ____ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x Adam Bryant	Adam Bryant	06/27/24 1425	x	Nathan Walker	6/27/24 1425
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

APPENDIX D: PCD ANNUAL DATA REPORTS & 2024 LABORATORY DATA REPORTS

City of Lakewood
Volunteer Lake Monitoring Program
2021 Season Report

Introduction

The City of Lakewood initiated a volunteer lake monitoring program in 2000 with the goals of promoting lake stewardship through citizen participation in the monitoring program, and to provide water quality data to assist in tracking and better understanding of conditions of American, Gravelly, Louise, Carp, Steilacoom (added in 2004), and Waughop (added in 2011) lakes and make appropriate management decisions. Carp Lake and Steilacoom Lake no longer participate in the volunteer lake program.

While conditions may vary from year to year, long-term data collection is the key to tracking trends in water quality over time. This report summarizes the data collected during the 2021 lake monitoring season on American, Gravelly, Louise and Waughop lakes.

Lake Descriptions

The monitored lakes vary in size and depth – American Lake is the largest at 1,100 acres and 90 feet at maximum depth, Gravelly Lake is 160 acres and 55 feet maximum depth, Lake Louise is 39 acres and 35 feet at maximum depth, and Waughop Lake at 33 acres and 14 feet at maximum depth. These lakes are in the Chambers-Clover Watershed within the city limits of Lakewood.

Eleven volunteers participated in the 2021 monitoring program and contributed a total of 111 hours of volunteer time.

Sampling Program

Water chemistry and physical characteristics of lakes vary both seasonally and with depth. Lake volunteers record observations and collect physical data (secchi depth, lake stage, weather conditions); record temperature and dissolved oxygen profile measurements; and measure pH on a monthly basis beginning in May and ending in late October with an additional late fall/early winter session conducted on American and Gravelly Lakes. This year the final October session on Louise and the additional late fall/early winter session on Gravelly were not completed due to rough weather conditions.

Samples for pH measurement were collected from one meter (shallow sample) below the surface of the lakes at each monitoring session. Three times during the monitoring season (May, August, October) an additional sample for pH measurement was collected at one meter above the lake bottom (deep sample) from American, Gravelly, and Louise lakes; Waughop is a shallow, well-mixed lake and no additional deep sample was collected. Monitoring data for 2021 can be found in Table 1 at the end of the report.

In Spring 2021, American Lake volunteers received training and a loan of equipment from Washington Fish and Wildlife Department to conduct additional monitoring for invasive mussel presence in American Lake. They deployed an artificial substrate at American Lake Park boat launch. Each month they completed a plankton tow to collect a sample and photographed the substrate to submit to WDFW for determination of presence or absence of invasive mussels.

Additional monitoring was conducted on Waughop to track post alum treatment conditions. This added sampling included monthly sample collection for lab analysis for total phosphorus, soluble reactive phosphorus, total nitrogen, chlorophyll *a*, and phaeophytin *a.* Three times during the season (May, Aug, Oct) additional samples were collected for analysis for sulfate, alkalinity, and total aluminum. Observations of algal scum and aquatic plant coverage were also recorded at 6 locations around the lake. The results of this additional monitoring can be found in Table 2 at the end of the report.

Dissolved Oxygen and Water Temperature Profiles

Dissolved oxygen and temperature are important attributes of a lake ecosystem and both are critically important to determining the types of aquatic life found in lakes. The amount of oxygen dissolved in water is affected by the water temperature – all other factors being equal, cold water holds more oxygen than warm water. The amount of dissolved oxygen present in water will determine where in the lake plants and animals can live.

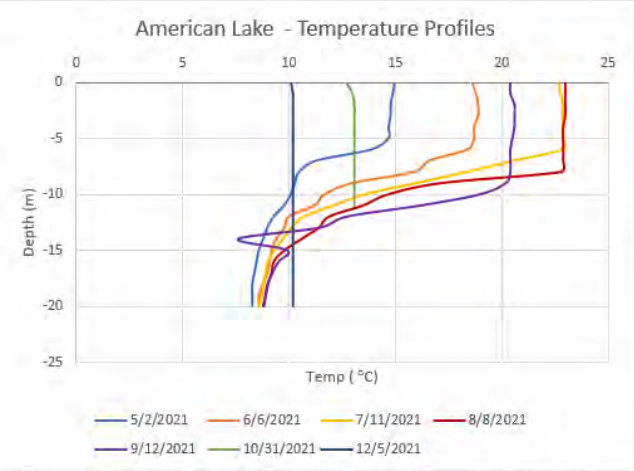
With the onset of warmer weather in spring and early summer, deep lakes will begin to separate into a warmer, low-density layer at the surface, known as the epilimnion, and a cooler, high-density layer at the bottom, known as the hypolimnion. Between the epilimnion and the hypolimnion is a layer of rapidly changing temperature called the thermocline. This process is called thermal stratification. Once this condition is fully developed in deeper lakes, usually in summer, there is no vertical mixing of the upper and lower layers because of their density differences. Shallower lakes may also separate into these layers although the layers may not remain separate throughout the entire summer. These shallower lakes will mix on windy or stormy days.

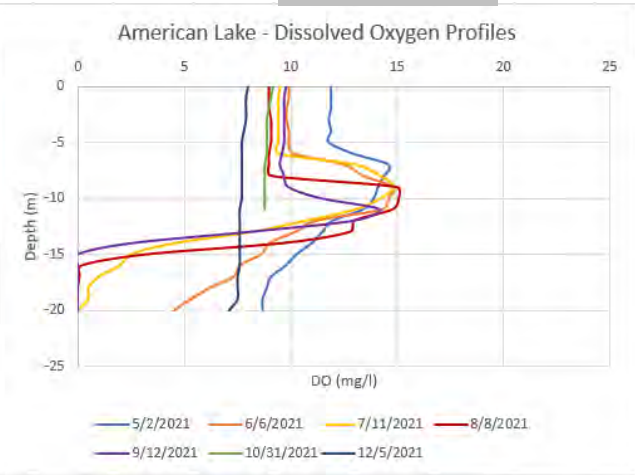
With the arrival of cooler weather in the fall, the thermal stratification begins to break down and the shallow and deep layers of water begin to mix vertically once again. This phenomenon is usually called turnover.

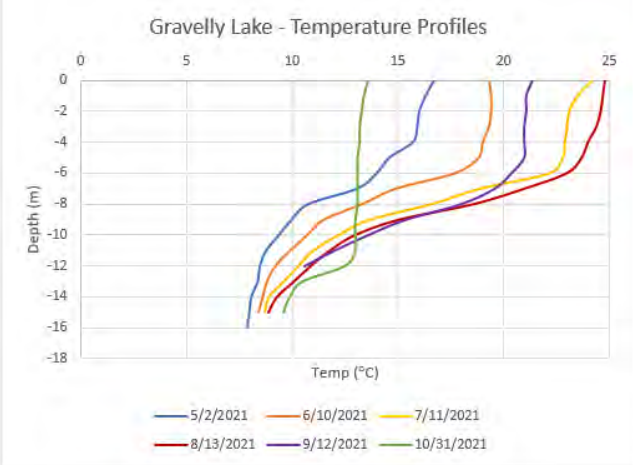
The 2021 temperature profiles for American and Gravelly Lakes indicate that stratification was well underway in May and remained strongly stratified until turnover in the fall. Lake Louise shows very little thermal stratification in May, June and July, and no stratification August and September. Waughop Lake did not show any stratification in 2021.

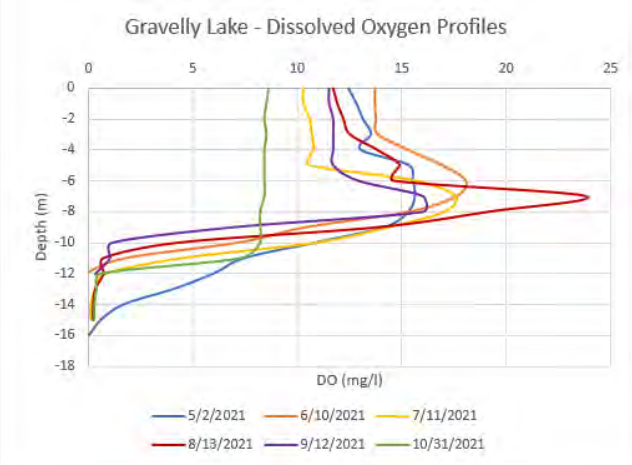
Like temperature profiles, dissolved oxygen levels vary with depth and over time. The upper layer of water (epilimnion) has abundant oxygen as a result of the diffusion of oxygen from the atmosphere and the presence of algae that produce oxygen as a byproduct of photosynthesis. Meanwhile, as spring and summer progresses oxygen levels decline in the lower layer (hypolimnion). This is the result of decomposition of organic matter that settles into that layer, no diffusion of oxygen from the atmosphere, and not enough sunlight to support oxygen-producing plant life. These low oxygen conditions will remain until the lake mixes again at the time of fall turnover. These conditions occur even though the general rule is cold water can hold more dissolved oxygen than warm water.

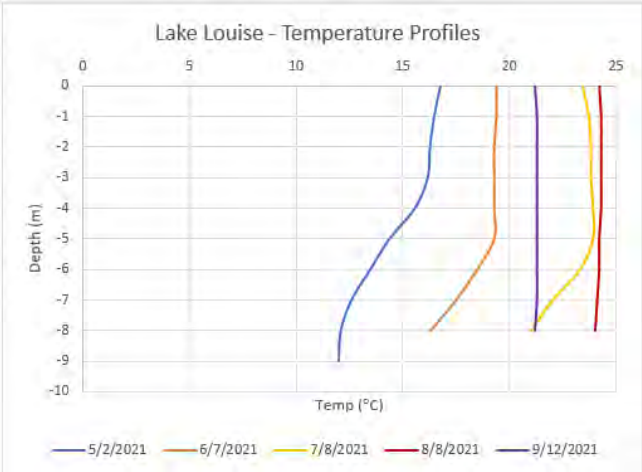
The 2021 dissolved oxygen profiles for American and Gravelly Lakes are similar to their temperature profiles showing stratification in May and remaining stratified until after the fall turn-over. Both lakes also showed a mid-depth increase in oxygen due to the presence of algae undergoing photosynthesis at that depth. Dissolved oxygen profiles for Louise displayed a decline in oxygen near the lake bottom May through September. The dissolved oxygen profiles for Waughop while like its temperature profiles, did show a decrease in oxygen levels every month except in August. Individual lake temperature and dissolved oxygen profiles are displayed below in Figure 1.

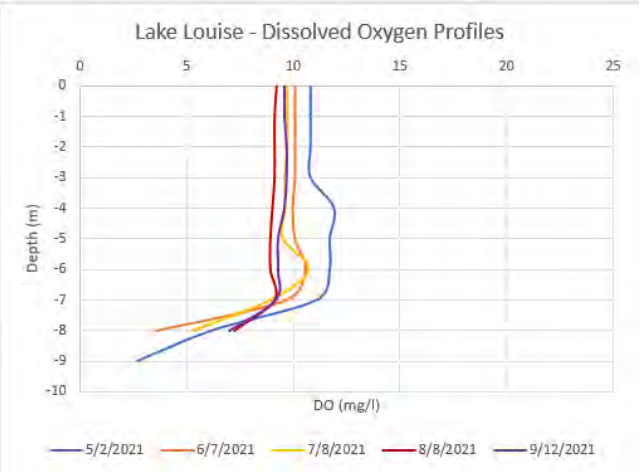

American Lake - Temperature Profiles
Depth (m)
Temp (°C)
5/2/2021
6/6/2021
7/11/2021
8/8/2021
9/12/2021
10/31/2021
12/5/2021


American Lake - Dissolved Oxygen Profiles
Depth (m)
DO (mg/l)
5/2/2021
6/6/2021
7/11/2021
8/8/2021
9/12/2021
10/31/2021
12/5/2021


Gravelly Lake - Temperature Profiles
Depth (m)
Temp (°C)
5/2/2021
6/10/2021
7/11/2021
8/13/2021
9/12/2021
10/31/2021


Gravelly Lake - Dissolved Oxygen Profiles
Depth (m)
DO (mg/l)
5/2/2021
6/10/2021
7/11/2021
8/13/2021
9/12/2021
10/31/2021


Lake Louise - Temperature Profiles
Depth (m)
Temp (°C)
5/2/2021
6/7/2021
7/8/2021
8/8/2021
9/12/2021


Lake Louise - Dissolved Oxygen Profiles
Depth (m)
DO (mg/l)
5/2/2021
6/7/2021
7/8/2021
8/8/2021
9/12/2021

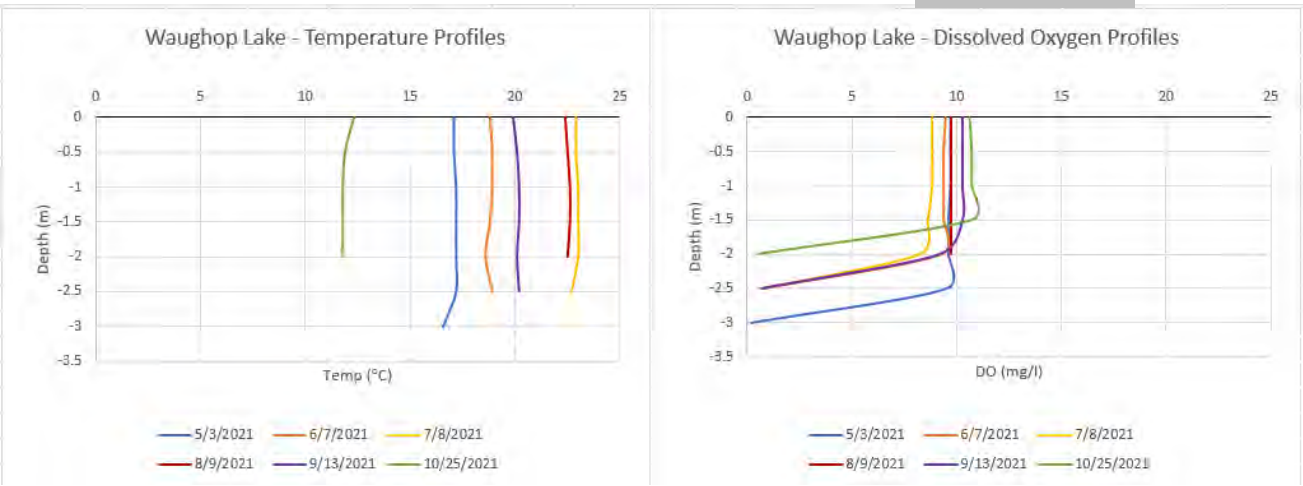


Figure 1.

Lake Stage

Lake stage, water surface level in the lake, varies seasonally and year to year. While precipitation and evaporation are the main causes of fluctuating lake levels, water levels are also affected by watershed area, land uses in the watershed, vegetation types and cover, presence of wetlands, geology, surface and subterranean hydrology, and type of outflow structure (if present). The source, amount, and composition of the water flowing into a lake also impact the water quality of that lake.

Lake monitors recorded lake stage from staff gauges (calibrated in feet) located on American, Gravelly, Louise, and Waughop each sampling session. The staff gauges on American, Gravelly, and Louise have been surveyed so that elevation above sea level is known. While there is a gauge on Waughop, its actual elevation with respect to sea level is unknown; therefore, the data presented for that lake reflects relative changes only.

The lakes showed a typical lake stage fluctuation pattern of declining through the summer to a seasonal low in fall. Precipitation data is collected for the Lakewood area at Joint Base Lewis-McChord, and total recorded precipitation for water year (Oct-Sept) 2021 was 30.06 inches. Annual precipitation since 2000 is displayed in Figure 2 below for comparison. Lake stage data was collected May through October for Waughop, American, and Gravelly lakes with an additional reading in December for American Lake. Lake stage data for Lake Louise were collected May through September for Louise. Recorded lake stage this year fluctuated 2.6 feet in American Lake, 3.48 feet in Gravelly Lake, 1.50 feet in Louise Lake, and 2.24 feet in Waughop. The individual lake level graphs can be found in Appendix 1 at the end of the report.

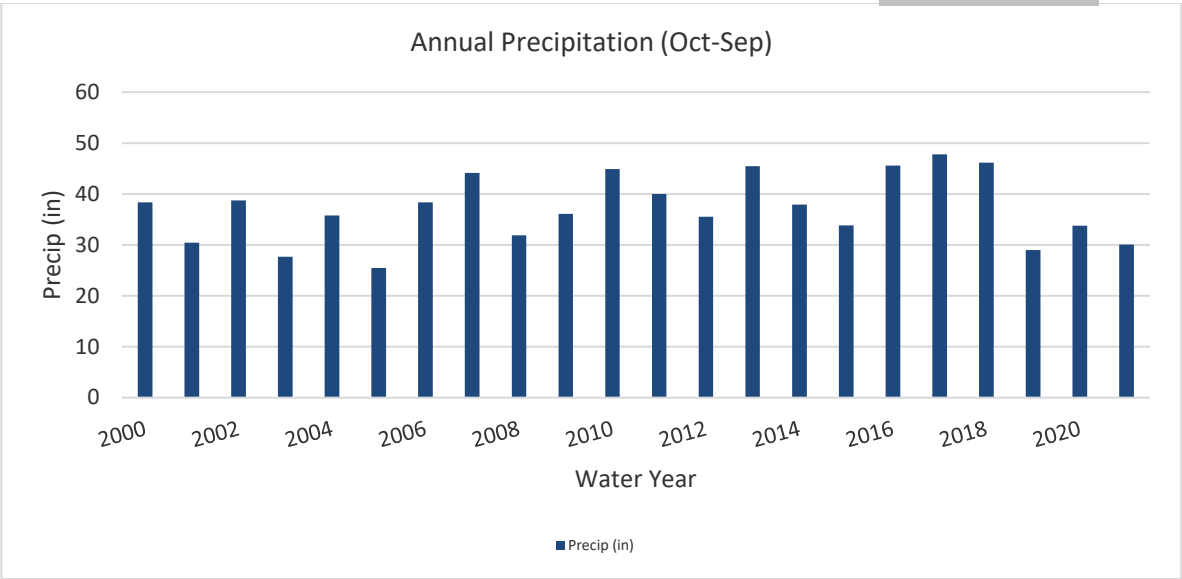


Figure 2.

Water Transparency

Water transparency is measured with an eight-inch diameter, black and white secchi disk and is traditionally reported as secchi depth, in meters (1 meter = 3.3 feet). Transparency is influenced by several factors such as dissolved substances, algae, and sediment particles. Transparency readings can also be affected by waves, wind, and glare at the water surface. Deeper secchi depth readings indicate clearer water (more transparent) while shallower secchi depth readings indicate more turbid water. Clear water allows more light to penetrate deeper into the lake, allowing photosynthesis in aquatic plants and algae to occur; this leads to higher levels of dissolved oxygen during the day. A decrease in transparency is often seen with an increase in algal density, or an influx of sediment and detritus due to a major storm event in the watershed. Secchi depth is used primarily as an approximate indicator of algal abundance.

Secchi depth measurements in 2021 for American Lake ranged from 6.25 meters to 8.9 meters with greater transparency occurring mid-summer. The summer averages for secchi depths in American Lake over all the years of data collection are shown below in Figure 3.

Note: The 2020 secchi depth average was calculated with only 4 monthly readings for American, Louise, and Waughop lakes while in previous years 7-8 monthly readings were used to calculate the averages. Lake monitoring was not conducted in Gravelly Lake in 2020 due to COVID restrictions.

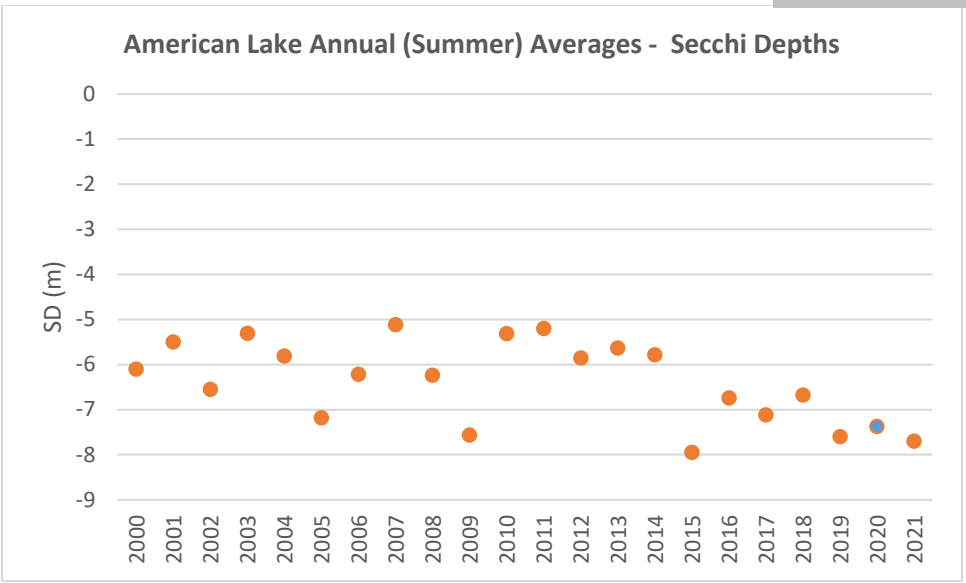


Figure 3.

Secchi depth measurements in Gravelly Lake varied from 3.0 meters to 8.0 meters with greater transparency occurring in the fall. Summer averages for secchi depths in Gravelly Lake are displayed below in Figure 4.

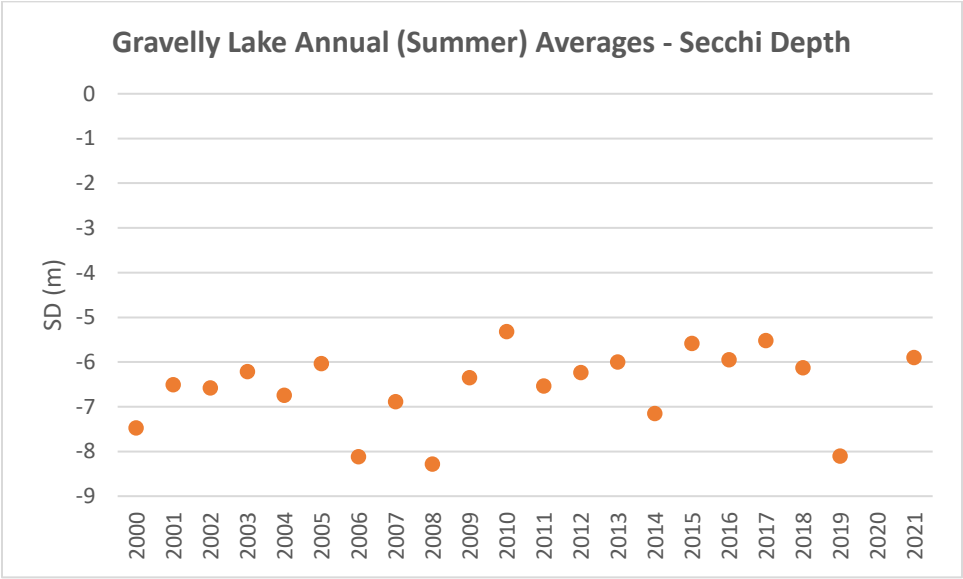


Figure 4.

Secchi depth measurements in Lake Louise ranged from 4.5 meters to 9.5 meters with greater transparency occurring earlier in the season. Summer averages for secchi depths in Lake Louise are displayed below in Figure 5.

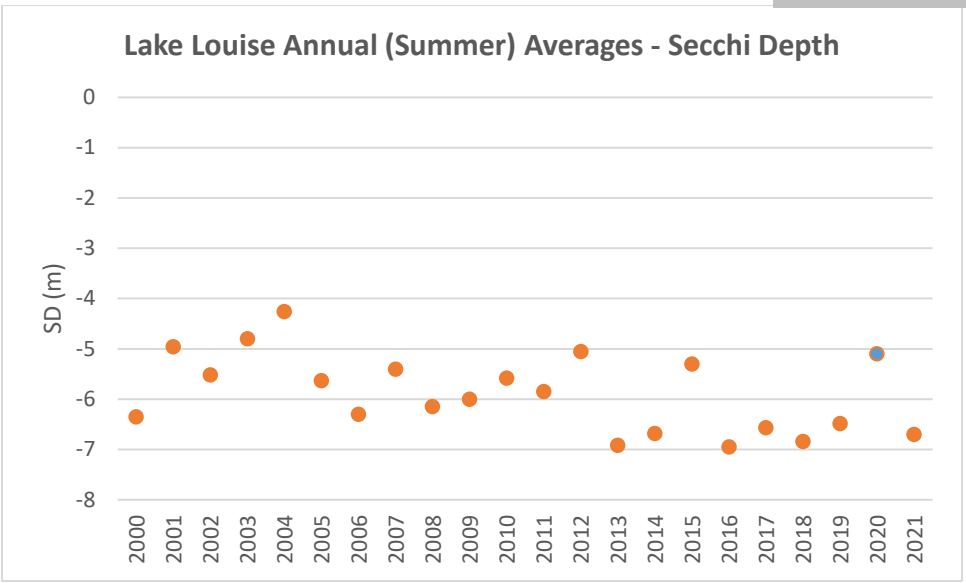


Figure 5.

Waughop Lake, the shallowest lake, had secchi depths that varied from 0.9 meters to 1.5 meters. Transparency was greatest in June, and lowest in October. Summer averages for secchi depth in Waughop Lake are found below in Figure. 6.

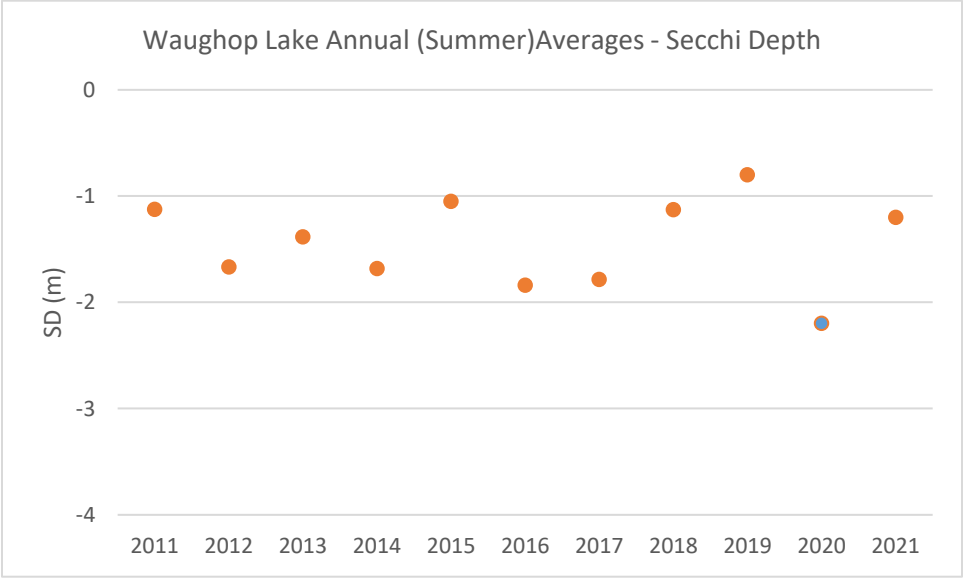


Figure 5.

Graphs of secchi depths for all years in the lakes are displayed in Appendix 1 at the end of the report.

pH

pH is a measure of the hydrogen ion concentrations in water and indicates whether water is acidic, basic, or neutral. The pH scale goes from 0 to 14 with 7 being neutral. pH above 7 is considered basic and pH below 7 is considered neutral. The pH scale is logarithmic, meaning that a change of one whole number on the scale is a tenfold change in acidity. pH determines the solubility and biological availability of chemical constituents such as nutrients and heavy metals in the water.

Volunteers measured pH levels at one-meter below the surface each month and at depth (one-meter above the bottom) in May, August, and October. An additional pH measurement (shallow and deep) was collected in American and Gravelly Lakes after the fall turnover. Results of the shallow pH measurement for the lakes varied from near neutral to basic (in Gravelly lake) (pH range = 6.6 to 9.0), see Figure 6 below. The pH levels for Waughop were not as high (basic) as seen in previous years. The deeper pH results ranged from near neutral to more acidic (pH range = 7.5 to 6.2). At the time of the fall turnover in American Lake there was no difference between shallow and deep pH results. pH results for the lakes are in Table 1.

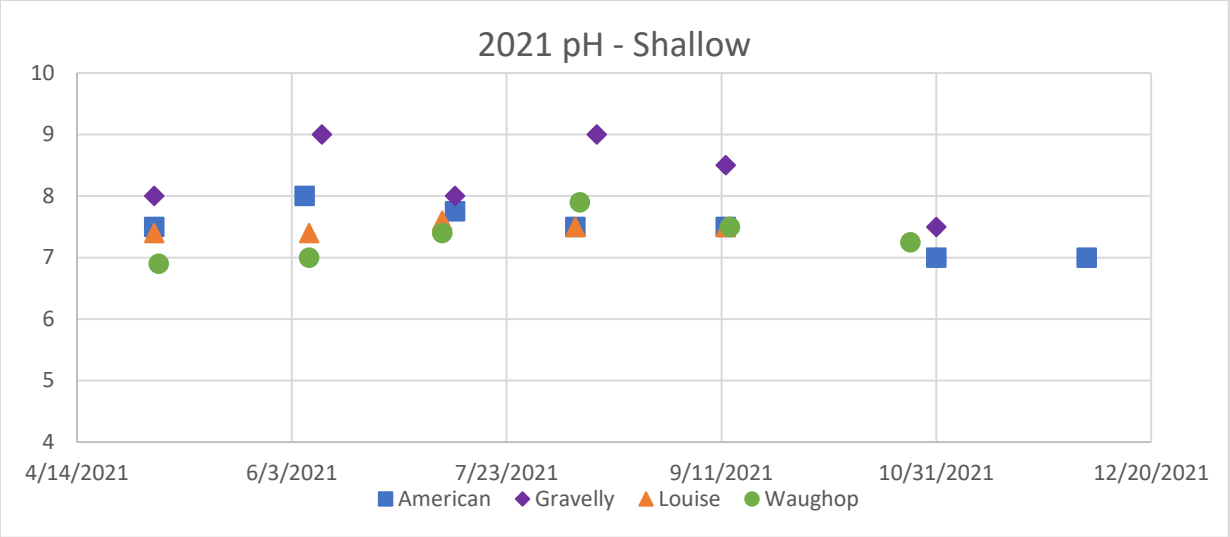


Figure 6.

Graphs of pH results for all the years of collection can be found in Appendix 1.

Algae

For the last several years the Tacoma Pierce County Health Department has not routinely monitored algae in Lakewood. However, they do encourage lake homeowners to report suspected toxic algae blooms to Washington State Department of Ecology. While there were no reported algal toxin levels exceeding state guidelines for these lakes in 2021, cyanobacteria bloom presence was noted in American and Waughop Lakes in fall.

Summary

Lake monitor volunteers collected data monthly May through October for Waughop, American, and Gravelly lakes; with one final monitoring session in December for American Lake. Data was collected monthly for Lake Louise May through September. The data are summarized as follows:

- Temperature and dissolved oxygen stratification were already established in American and Gravelly lakes in May at the time of the first monitoring session. Lake Louise showed very little

thermal stratification in May, June, and July and none in August and September. Waughop did not thermally stratify; however, the dissolved oxygen profiles showed low oxygen levels at depth during all months except August.

- Precipitation in 2021 was lower than 2020; and lake levels were similar to 2019 and 2020 levels.

- Secchi depths were generally shallower (cloudier water) as the season progressed into fall, except for Gravelly Lake which had its deepest secchi depths occurring in October.

- Shallow pH in the lakes ranged from 6.9 to 9.0 pH units. Deep pH results for American, Gravelly, and Louise lakes ranged from 6.0 to 7.4 pH units. pH in Waughop was similar to 2020 pH results.

Lake conditions vary from year to year with the change in seasons, weather patterns, and climate conditions. Long-term lake monitoring helps us to understand how our lakes are doing and if they are degrading over time. Additional graphs displaying the data collected for the lakes for all monitored years are in Appendix 1.

Recommendations

Lakes reflect their watershed. They receive water, dissolved substances carried in water, and sediment from its watershed. Lakes also receive particulates and gases from the atmosphere, and energy from the sun and wind. The condition of a lake at any one time is determined by what is already in the lake, and by what is coming into the lake – attesting to the fact that lakes are complex ecosystems.

Lake management is a complicated job that takes the combined efforts of local government, community groups, individuals, and landowners. To be effective lake management is a long-term commitment and investment.

Many lakes suffer from too many nutrients (phosphorus and nitrogen), entering a lake with stormwater, soil erosion, or groundwater from the surrounding watershed. When it rains nutrients wash into ditches and down storm drains eventually ending up in the lake. This can lead to problems such as excessive aquatic plant growth, nuisance and/or toxic algae blooms, lower water clarity, stressed fish and wildlife, and lower property values.

Here are some voluntary actions that can be taken to protect the health of the lake:

- Avoid fertilizer. If you do fertilize choose phosphorus-free products.
- Scoop pet waste, bag it and toss it in the trash.
- Divert runoff from roofs and driveways into stable vegetated areas.
- If you have a septic system, schedule routine inspections.
- Cover bare soil area with mulch or plants.
- Fix eroding areas in the yard, driveway, and parking areas.
- Maintain existing natural shorelines – these areas provide additional wildlife benefits for birds, turtles, frogs and other aquatic life.

- If you are a boater or angler prevent the spread of aquatic invasive species in your lake using the Clean/Drain/Dry method recommended by Washington State Department of Fish & Wildlife. Check here for more information: https://wdfw.wa.gov/ais/youcanhelp.html.

Table 1. Lakewood Lake Data 2021

Lake	Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae	pH (1 m)	pH (deep)	Comments/Observations
American	5/2/2021	10:45 AM	26.5	-7.25	20.6	15	11.9	8.3	8.7	232	light, small cellular in the water column	7.5	7	Wind cond: light; weather: partly cloudy; water surface: ripples; light cond: strong sunlight. No water odor. 7 boats, 10 people fishing, 1 swimmer/wader.
	6/6/2021	10:30am	25.8	-6.25	12.6	18.6	9.9	8.6	4.5	231.6	none	8		Wind cond: light, SSW; weather: rain; water surface: ripples; Light cond: overcast. No water odor. 2 swimmers. Eagles, swallows
	7/11/2021	10:00 AM	24	-8.2	24.6	22.7	9.5	8.6	0	231	Light, very clear	7.75		Wind cond: light; weather: overcast; water surface cond: ripples; light cond: overcast. No water odor. 10boats, 14 people fishing, 2 swimmers/waders. Osprey.
	8/8/2021	10:00 AM	22	-8.9	27.6	23	9	8.8	0	230.2	Light, water column	7.5	6.5	Wind cond: Light, SSW; weather: partly cloudy; water surface cond: ripples; light cond: hazy sunlight. No water odor; 2 boats, 1 swimmer/wader.
	9/12/2021	10:30 AM	26	-8.5	18.6	20.4	9.8	8.8	0	229.4	Light, tiny scattered balls in water column	7.5		Wind cond: calm; weaterh: overcast; water surface cond: ripples; light cond: overcast. Water odor not noted; geese; recreational lake use not noted. Air temp correction factor is 0.6 not 6. Lake level was below bottom of gauge (230') and was estimated.
	10/31/2021	11:00am	27	-7.7	11.6	12.7	9.2	13.1*	8.8*	230	light, clumpy, in water column	7	6	Wind cond: calm; weather: clear; water surface cond: calm; light cond: strong sunlight. Rotten egg odor noticed for first time this season. 70+ gulls, eagles, mud hens. 5 boats, 4 fishing, 0 swimmers/waders. *Meter battery died at 11 meters.
	12/5/2021	10:15am	26.5	-7	3.9	10.1	8	10.2	7.1	230.3	chunky HAB blobs over surface, heavy in water column & surface	7	7	Wind cond: light, N; weather: overcast; water surface cond: calm; light cond: bright cloud conditions. No water odor. Waterfowl: coots, eagle. 3 boats; 3 people fishing. Air thermometer had a broken column, air temperature from cell phone. Lots of floating cyanobacteria.

Return to Agenda

Lake	Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae	pH (1 m)	pH (deep)	Comments/Observations
Gravelly	5/2/2021	4:26PM	16.6	-6.1	18.0	16.7	12.4	7.9	0.2	5.48	None	8		Wind cond: light, WNW; weather: clear; water surface cond: ripples; light cond: strong sunlight. 3 ducks; 3 boats (2 kayaks, 1 paddle board). No water odor
	6/10/2021	2:34pm	16.0	-3.0	19.0	19.3	13.7	8.4	-2.4	4.80	None	9		Wind cond: light/strong, SW; weather: partly cloudy, rain, storm; water surface cond: ripples, small waves: light: strong sunlight, overcast. No water odor. 1 boat. 3 geese.
	7/11/2021	3:28PM	16.2	-7.8	25.0	24.2	10.3	8.7	0.1	4.22	Light, small dots in water column	8		Wind cond: calm; weather: clear; water surface cond: calm; Light cond:strong sunlight. No water odor. Eagle. 4 boats, 0 fishing, 1 swimmer/wader
	8/13/2021	10:15 AM	16.0	-5.0	29.0	24.8	11.7	8.9	0.2	3.40	light, spots	9		Wind cond: calm; weather: clear, haze (smoke); water surface cond: calm; light cond: hazy sunlight. No water odor. 0 waterfowl; 0 boats, 0 fishing, 0 swimmers/waders. Clover Creek is dry.
	9/12/2021	3:55 PM	14.3	-5.6	21.0	21.4	11.5	10.6	0.3	2.25	Light, small spots in water column	8.5		Wind cond: light; weather: partly cloudy; water surface cond: ripples; light cond: strong sunlight. No water odor. Waterfowl - 1, geese. No boats, fishing or waders/swimmers.
	10/31/2021	3:30pm	15.8	-8.0	18.0	13.6	8.6	9.6	0.3	2.00	none	7.5	6.5	Wind cond: breezy; weather: clear; water surface cond: ripples; light cond: strong sunlight. No water odor; 8 ducks; 3 boats, 0 fishing, 0 swimming/wading.

Return to Agenda

Lake	Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae	pH (1 m)	pH (deep)	Comments/Observations
Louise	5/2/2021	1:00PM	9.5	-9.5	23.1	16.8	10.8	12	2.7	-0.92	None	7.4	6.5	Wind cond: light, NW; weather: partly cloudy; water surface cond: ripples; light cond: strong sunlight. No water odor. Waterfowl - mallard with clutch of 7; 3 boats, 5 people fishing. Monitor noted that he had never seen the water so clear - secchi disk was on the bottom.
	6/7/2021	11:15 AM	9.4	-6.7	16.6	19.4	10.1	16.3	3.6	-1.12	Light, small specks	7.4		Wind cond: light, S; weather: partly cloudy; water surface: ripples; light cond: bright cloud conditions. No water odor. No boats, fishing, swimming/wading.
	7/8/2021	11:20am	9.2	-7.8	18.6	23.4	9.7	21	5.3	-1.38	None	7.6		Wind cond: light, NW; weather: overcast; water surface cond: ripples; light cond: overcast. No water odor. 4 geese, bald eagle. 2 boats, 2 people fishing, 1 swimmer/wader.
	8/8/2021	1:30 PM	9.1	-5.2	23.6	24.2	9.2	24	7.2	-1.92	Moderate, big flakes in the water column	7.5	7.4	Wind cond: breezy, SE; weather: partly cloudy; water surf cond: ripples; light cond: bright cloud conditions. No water odor. No boats, fishing, or waders/swimmers.
	9/12/2021	12:55Pm	8.7	-4.5	19.4	21.2	9.6	21.2	7	-2.42	Light, very light algae in spite of low SD	7.5		Wind cond: light, NE; weather: partly cloudy; water surface cond: ripples; Light cond: bright cloud conditions. No water odor. 0 waterfowl; No boats, fishing, or waders/swimmers. .

Return to Agenda

Lake	Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae	pH (1 m)	pH (surface)	Comments/Observations
Waughop	5/3/2021	9:15am	3.2	-1.1	13.5	17.1	9.7	16.6	2.7	5.8	small dots, moderate, brown in color	6.9	7	Wind cond: light, SW; Weather: overcast; water surface cond: ripples; light conditions: overcast. No odor. 5 mallards, 3 families of geese with young, 0 boats, 0 fishing, 0 swimming/wading.
	6/7/2021	9:08am	2.9	-1.5	16.1	18.8	9.5	18.9	0.8	5.32	heavy, cloud-like	7	7	Wind conditons - light, SW; weather - partly cloudy; water surface - ripples; light conditions - strong sunlight. No water odor; waterfowl - 2 mallards, geese - 3 pairs with ~ 20 goslings. 0 boats; 8 people fishing; no swimmers/waders.
	7/8/2021	8:56 AM	3	-1.1	17.6	22.9	8.8	22.7	0.7	4.76	substantial cloudiness	7.4	7.5	Wind cond: calm; weather: overcast; water surface cond: ripples; light conditions: overcast. Water odor - slight rotten egg odor. ~40 geese, mallard. 0 boats; 1 person fishing; no swimmers/waders.
	8/9/2021	9:06 AM	2.5	-1.3	21.6	22.4	9.7	22.5	9.7	4.08	heavy, cloudy, murky	7.9	8	Wind cond: calm; weather: partly cloudy; water surface cond: calm; light cond: bright cloud conditions. No water odor. Waterfowl - 5, geese, mallard and youg; no boats, 2 fishing, no swimmers/waders.
	9/13/2021	9:07am	2.3	-1.3	16.2	19.9	10.3	20.2	0.7	3.56	little dots plus pea-sized globules (new)	7.5		Wind cond: calm; weather: overcast; water surface cond: calm; light cond: overcast. No water odor. Waterfowl - 2 mallards, kingfisher, heron, 4 sandpiper or plover. No boats, fishing, or swimmers/waders. The turbidity of the algae was worse on the north and east sides, more than just from wind blowing effect. I noticed it when checking the staff gauge, that the water just looked a lot thicker than in the shallower areas over on the west side by the college.
	10/25/2021	10:10 AM	2.4	-0.9	13.1	12.3	10.6	11.8	0.5	3.57	Heavy amount of small dots	7.25	7.25	Wind cond: breezy, S; weather: overcast; water surface cond: ripples; light cond: bright cloud cond. No water odor. 6 ducks. 0 boats, 0 fishing; 0 swimmers/waders.

Return to Agenda

Table 2. Waughop Lake Additional Monitoring Results

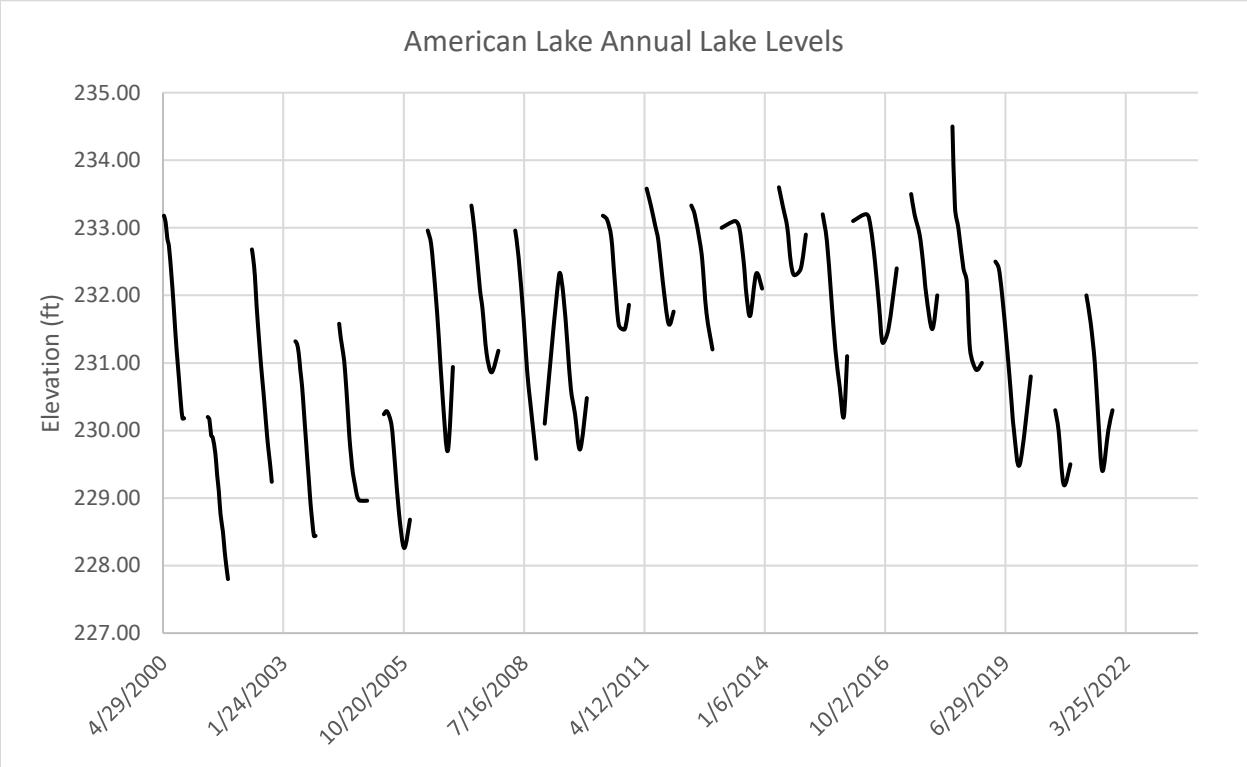
Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae	pH (1 m)	pH (surface)	TP (mg/l)	SRP (mg/l)	TN (mg/l)	Chla (ug/l)	Phaeo a(ug/l)	Sulfate (mg/l)	Alkalinity (mg CaCO3/l)	Total Aluminum (mg/l)
5/3/2021	9:15am	3.2	-1.1	13.5	17.1	9.7	16.6	2.7	5.8	small dots, moderate, brown in color	6.9	7	0.037	0.001	0.425	5	1.7	22.1	15.8	0.363
6/7/2021	9:08am	2.9	-1.5	16.1	18.8	9.5	18.9	0.8	5.32	heavy, cloud-like	7	7	0.026	0.002	0.442	8	1.7			
7/8/2021	8:56 AM	3	-1.1	17.6	22.9	8.8	22.7	0.7	4.76	substantial cloudiness	7.4	7.5	0.032	0.002	0.956	9.8	0.8			
8/9/2021	9:06 AM	2.5	-1.3	21.6	22.4	9.7	22.5	9.7	4.08	heavy, cloudy, murky	7.9	8	0.044	<0.001	0.78	6.5	0.9	133	23	0.579
9/13/2021	9:07am	2.3	-1.3	16.2	19.9	10.3	20.2	0.7	3.56	little dots plus pea-sized globules (new)	7.5		0.026	<0.001	0.206	5.1	2.8			
10/25/2021	10:10 AM	2.4	-0.9	13.1	12.3	10.6	11.8	0.5	3.57	Heavy amount of small dots	7.25	7.25	0.042	0.001	0.961	33	9.1	111	38.7	0.317

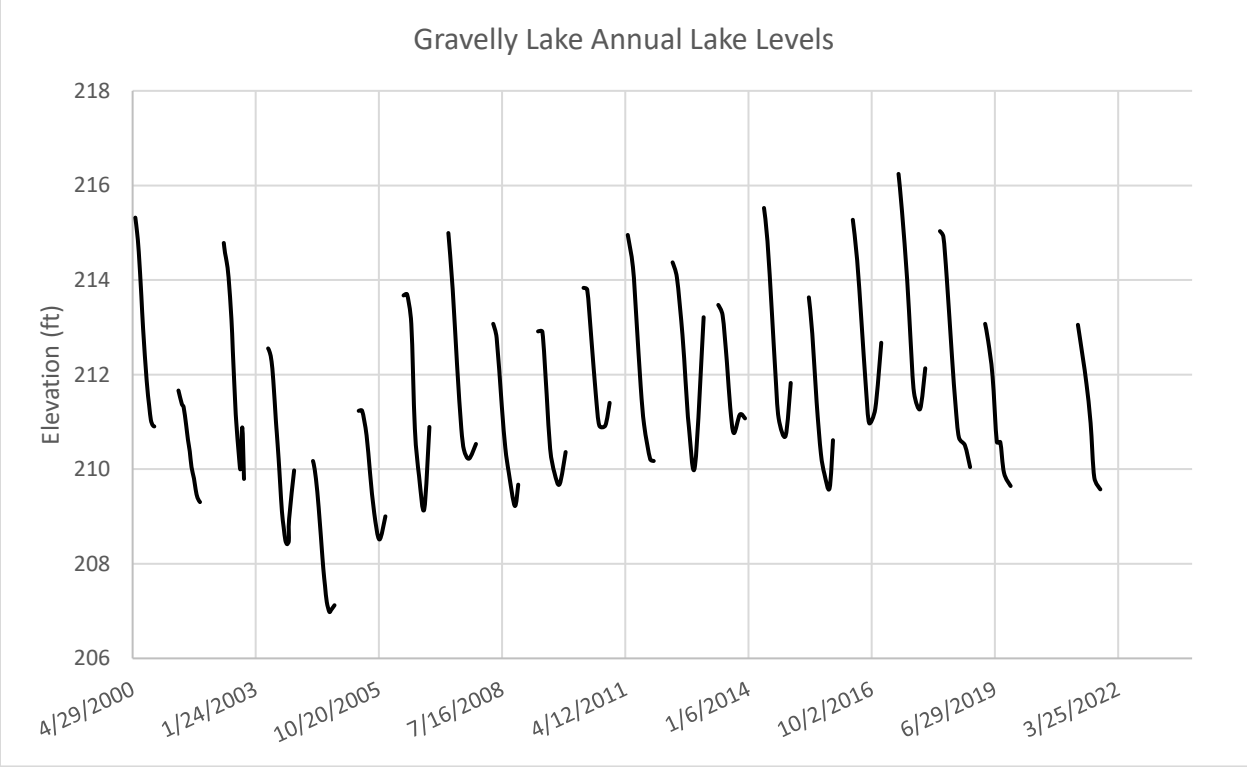
Return to Agenda

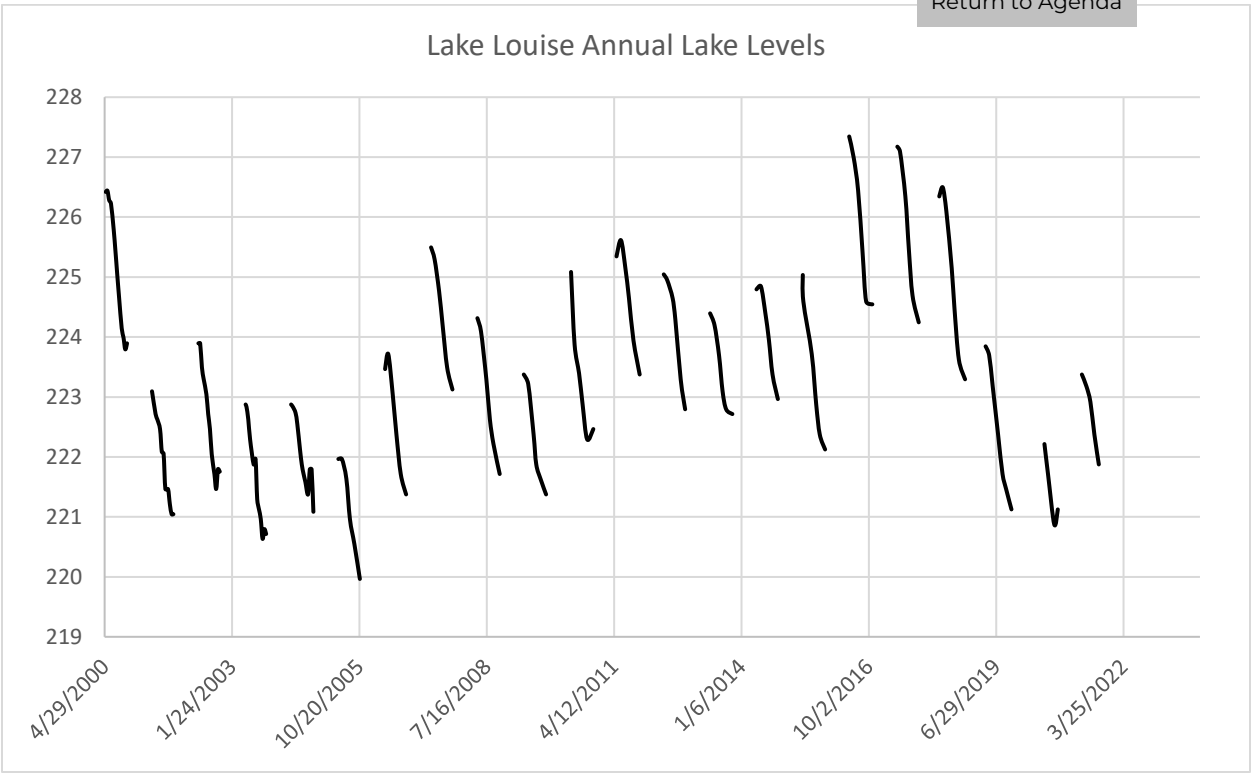
Shoreline Observations						
	5/3/2021	6/7/2021	7/8/2021	8/9/2021	9/13/2021	10/25/2021
Site 1 (beach for boats)	No scum; 0% bottom coverage by plants	No scum, white foam; 0% bottom coverage by plants	No algae scum; 0% bottom coverage by plants	No algae scum, some bits of foam. 0% bottom coverage by aquatic plants	No surface algal scum; brown algae coating the lake bottom. 0% plant coverage on bottom	No algal scum; 0% plant coverage on bottom
Site 2: SE corner	No scum; 0% bottom coverage by plants	No scum. 0% bottom coverage by plants	No algae scum; 0% bottom coverage by plants	Some algae scum; 0% bottom coverage by aquatic plants	No surface algal scum; brown algae coating the lake bottom. 0% plant coverage on bottom	No algal scum; algae on lake bottom. 0% plant coverage of bottom
Site 3: South by trash can	No scum; 10% pads coverage - spatterdock, cattail	No scum. Brown sediment. 50% bottom coverage with spatterdock	No algae scum; 60% bottom coverage with spatterdock on west side of area; cattails present too	Some algae scum present, brown algae on lake bottom; 70 % bottom coverage on west side of area with spatterdock	No surface algal scum; brown algae coating the lake bottom. 70% plant coverage on bottom - spatterdock now out of water due to lake receding.	No algal scum; algae on lake bottom. 0% plant coverage on bottom.
Site 4: Dock	No scum; too cloudy to see any plants in water	No scum, brown and green algae growing on bottom close to shore. Probable Ludwigia palustris (water purslane) close to shore; 80% spatterdock coverage out from dock	No algae scum; 85% bottom coverage-spatterdock out from dock	Water has receded about 40' from the dock; 85% coverage where water is present with spatterdock.	Water has receded to far from dock.	Water receded from dock. No algal scum present. 80% spatterdock where water receded.
Site 5: By college outfall	No scum; 5% plant coverage; spatterdock	No scum, algae on bottom. 2% probable Ludwigia palustris (water purslane), 40% spatterdock	No algae scum; couldn't clearly see bottom; 50 % bottom coverage - spatterdock out from shore edge	Water has receded here too. Brown algae on lake bottom; 50% bottom coverage with spatterdock	No surface algal scum; brown algae coating the lake bottom. 60% bottom coverage - spatterdock.	No algal scum; other scum present - vegetative debris. Water partially receded. 60% spatterdock coverage.
Site 6: N. fishing spot	White bubbles present; 0% bottom coverage	No scum; foam present. 0% bottom plant coverage	No algae scum, looked like pollen on water; 0% plant coverage	No algae scum, 0% plant coverage	No surface algal scum; brown algae coating the lake bottom. 0% coverage	No algal scum; 0% plant coverage on bottom.

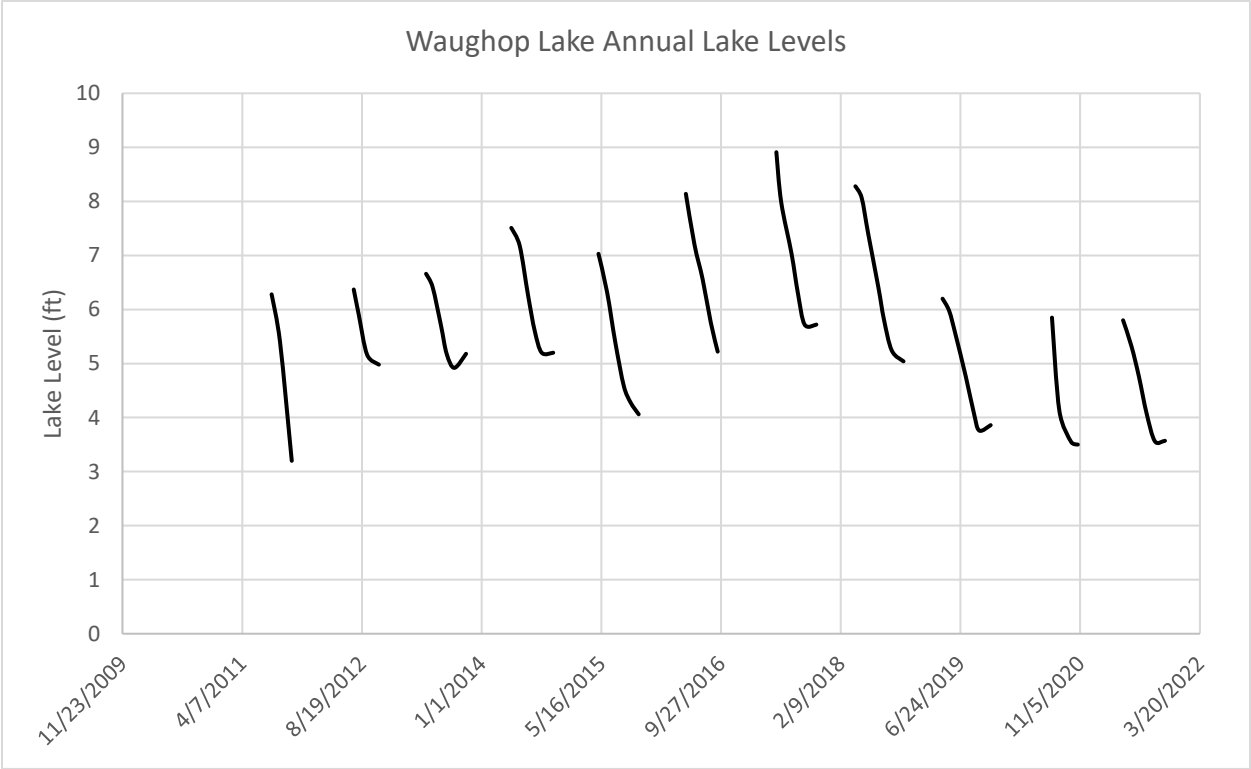
Return to Agenda

Appendix 1. Lake Data

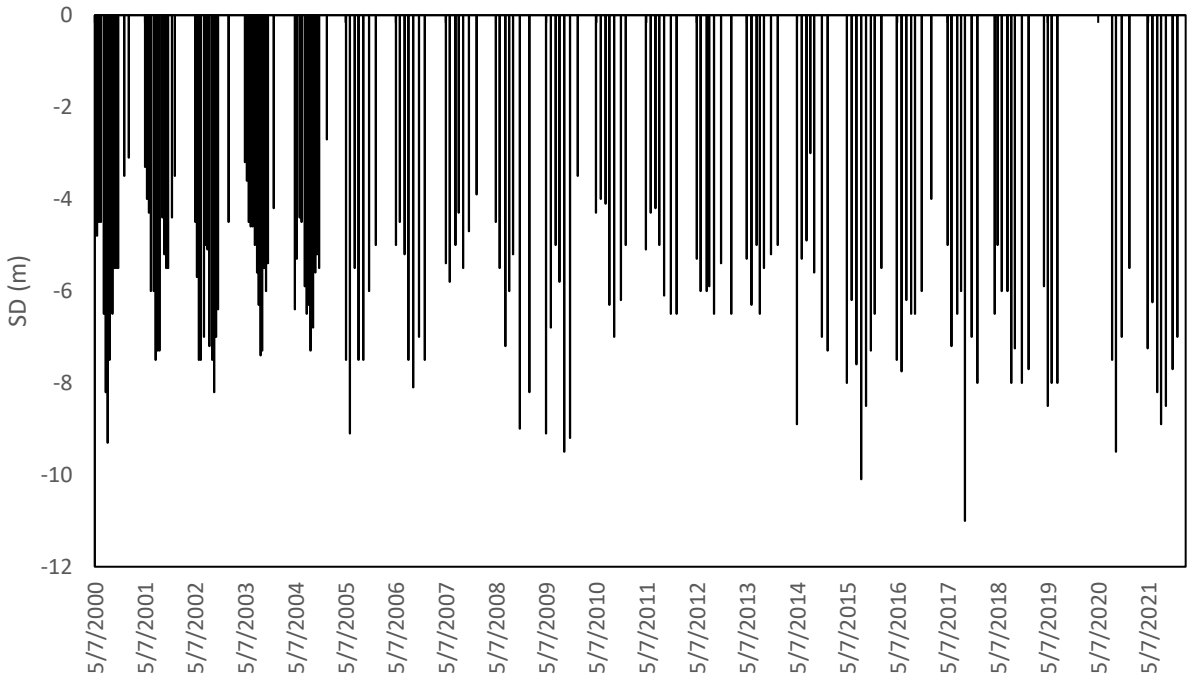




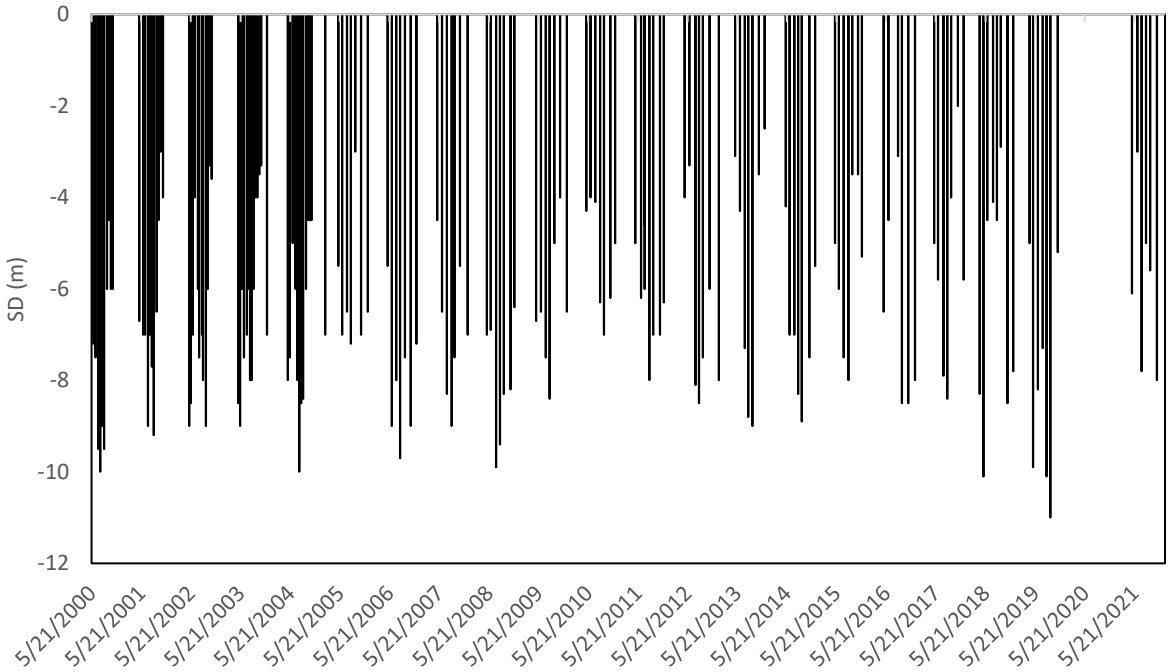

Lake Louise Annual Lake Levels
228
227
226
225
224
223
222
221
220
219
4/29/2000
1/24/2003
10/20/2005
7/16/2008
4/12/2011
1/6/2014
10/2/2016
6/29/2019
3/25/2022

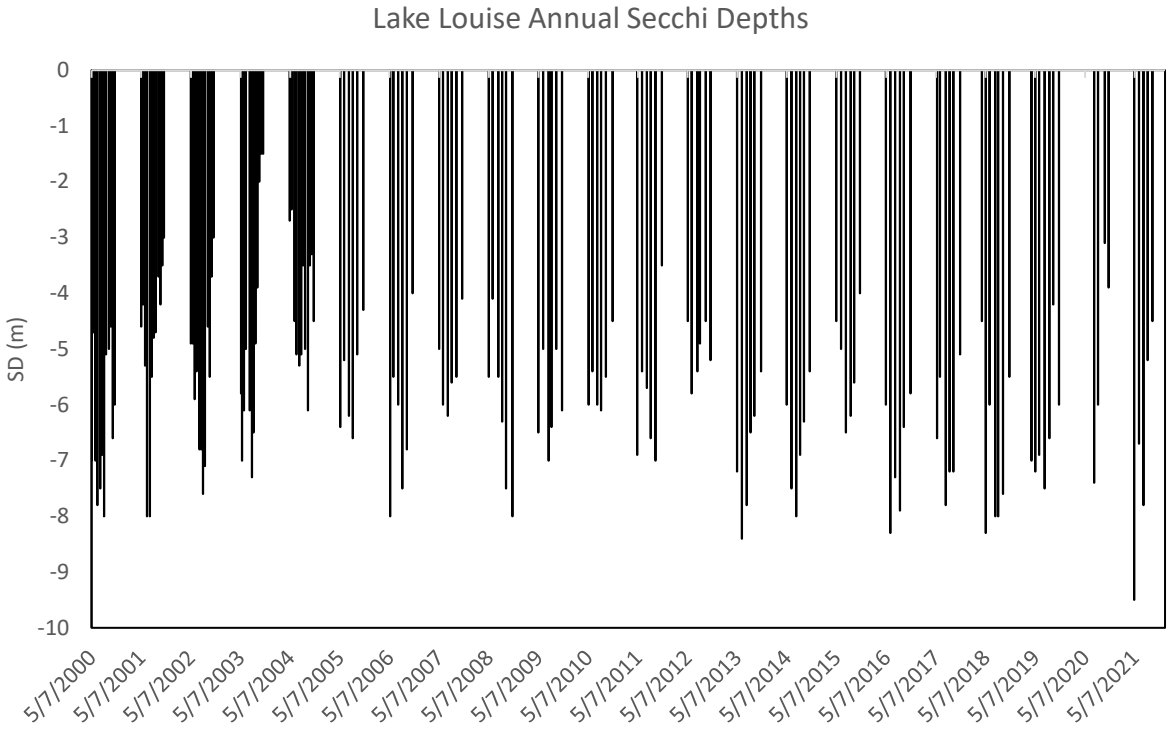

Waughop Lake Annual Lake Levels
Lake Level (ft)
10
9
8
7
6
5
4
3
2
1
0
11/23/2009
4/7/2011
8/19/2012
1/1/2014
5/16/2015
9/27/2016
2/9/2018
6/24/2019
11/5/2020
3/20/2022

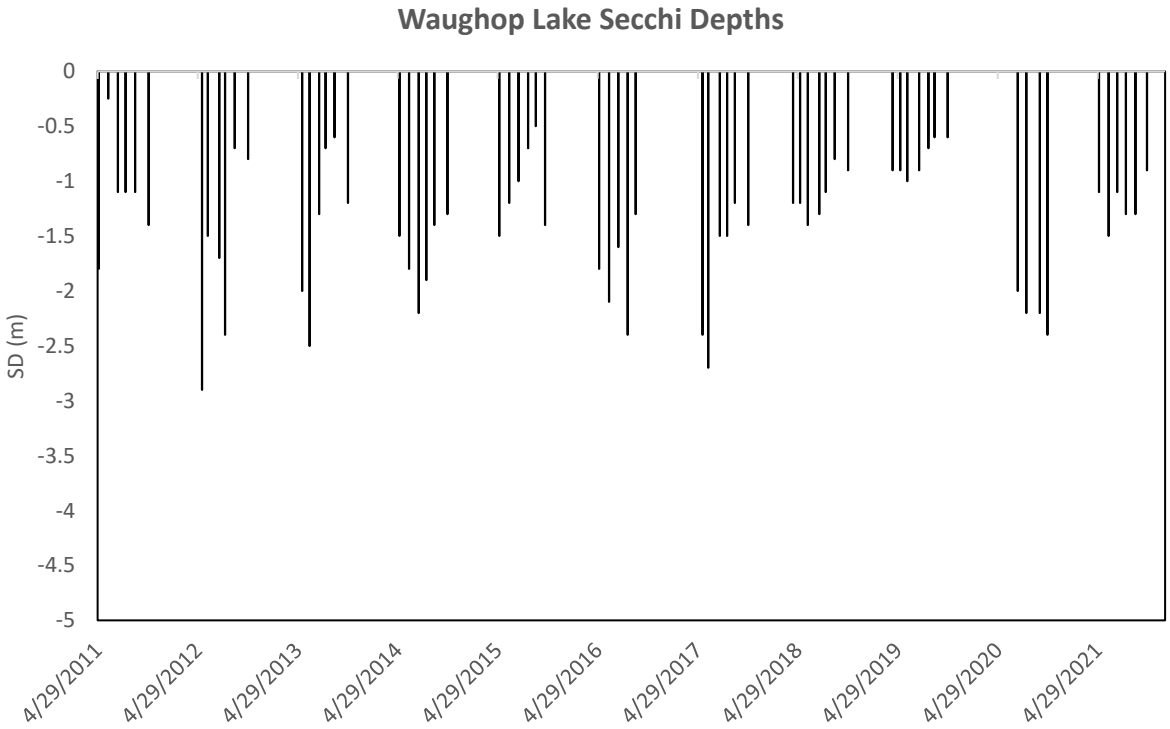
American Lake Annual Secchi Depths

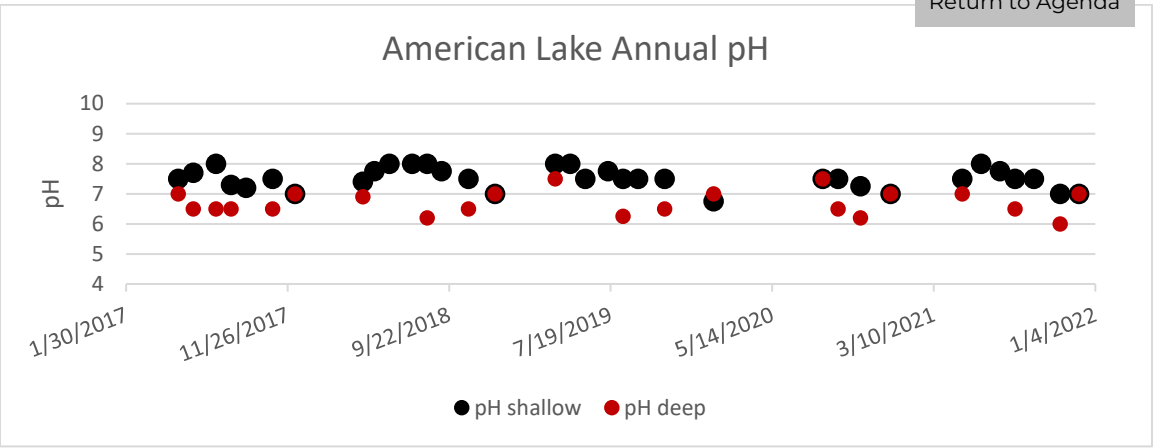


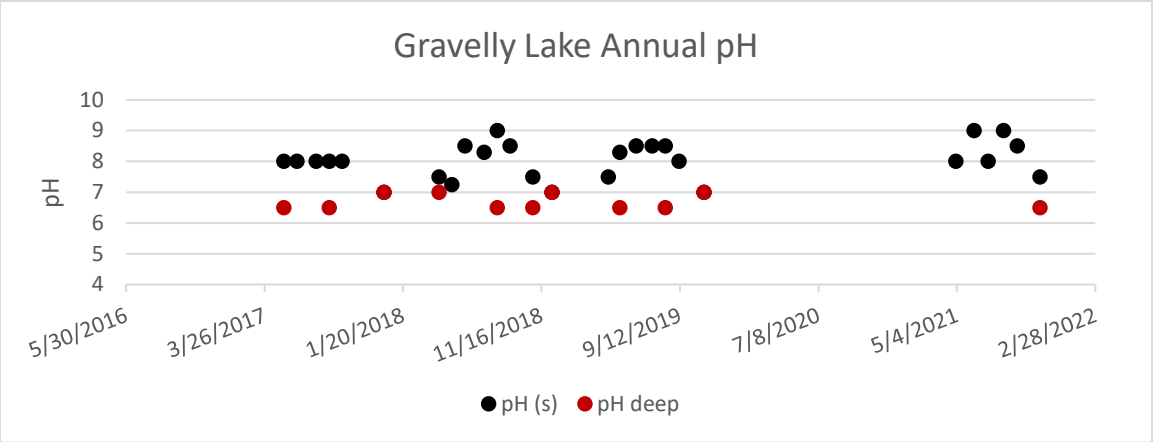
Gravelly Lake Annual Secchi Depths

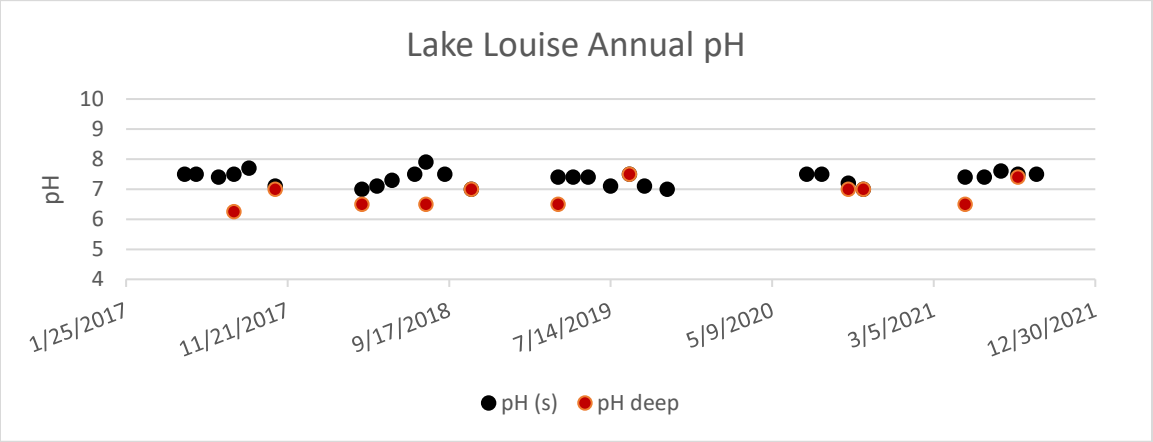


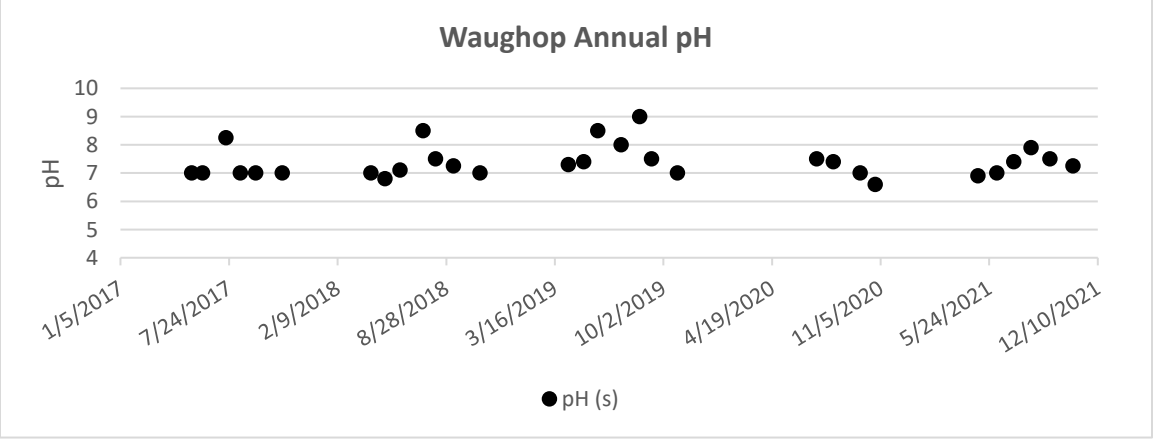

Lake Louise Annual Secchi Depths
SD (m)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
5/7/2000
5/7/2001
5/7/2002
5/7/2003
5/7/2004
5/7/2005
5/7/2006
5/7/2007
5/7/2008
5/7/2009
5/7/2010
5/7/2011
5/7/2012
5/7/2013
5/7/2014
5/7/2015
5/7/2016
5/7/2017
5/7/2018
5/7/2019
5/7/2020
5/7/2021


Waughop Lake Secchi Depths
SD (m)
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
-4.5
-5
4/29/2011
4/29/2012
4/29/2013
4/29/2014
4/29/2015
4/29/2016
4/29/2017
4/29/2018
4/29/2019
4/29/2020
4/29/2021


American Lake Annual pH
pH
10
9
8
7
6
5
4
1/30/2017
11/26/2017
9/22/2018
7/19/2019
5/14/2020
3/10/2021
1/4/2022
pH shallow
pH deep


Gravelly Lake Annual pH
pH
10
9
8
7
6
5
4
5/30/2016
3/26/2017
1/20/2018
11/16/2018
9/12/2019
7/8/2020
5/4/2021
2/28/2022
pH (s)
pH deep


Lake Louise Annual pH
pH
10
9
8
7
6
5
4
1/25/2017
11/21/2017
9/17/2018
7/14/2019
5/9/2020
3/5/2021
12/30/2021
pH (s)
pH deep


Waughop Annual pH
pH
10
9
8
7
6
5
4
1/5/2017
7/24/2017
2/9/2018
8/28/2018
3/16/2019
10/2/2019
4/19/2020
11/5/2020
5/24/2021
12/10/2021
pH (s)

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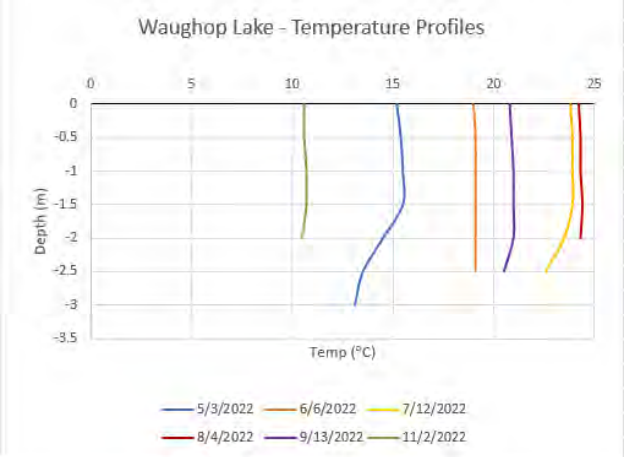
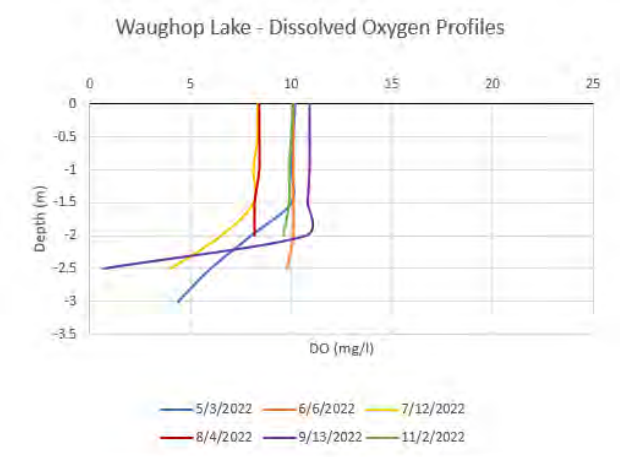
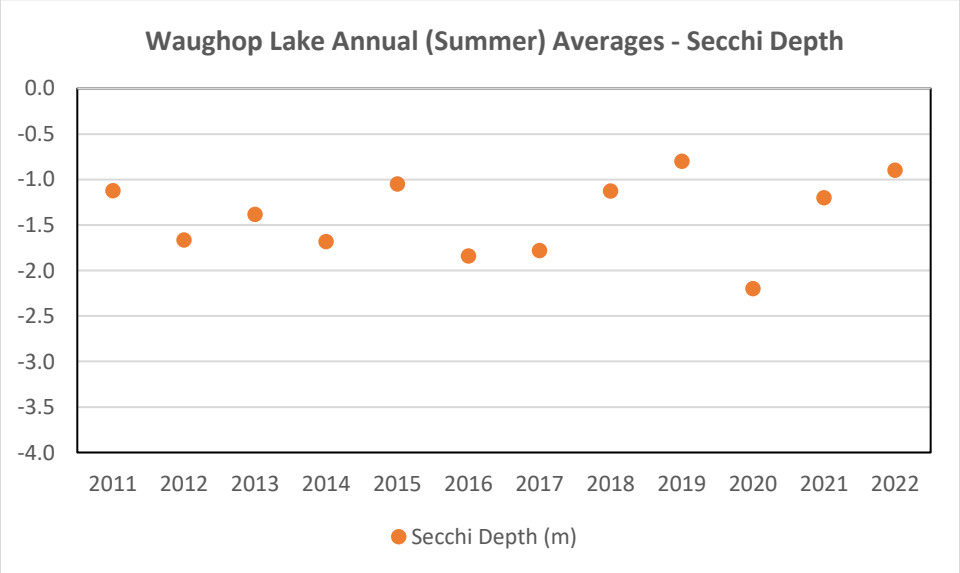
City of Lakewood

Waughop Lake Monitoring Program

During the 2022 Waughop monitoring season, 2 volunteers participated in lake monitoring with a total of 36 volunteer hours.







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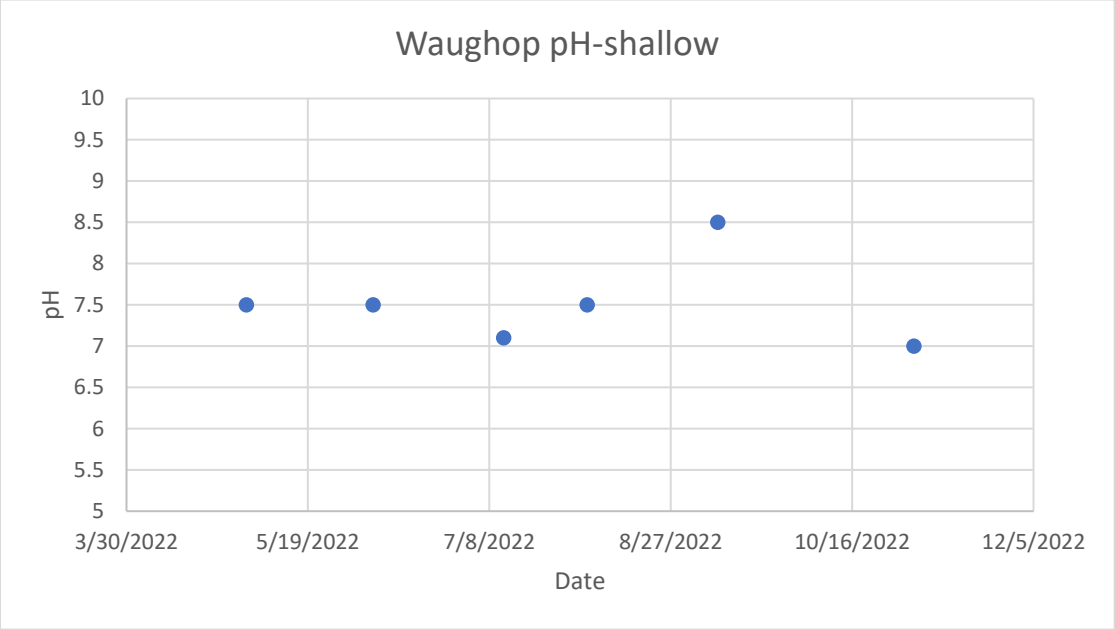

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Shoreline Observations

Location	Algae scum presence/% aquatic plant coverage					
Date		June	July	August	September	October
Site 1: Beach for boats	47.170887, -122.561897	None	None	None	Yes	No
Site 2: SE corner	47.169195, -122.562447	None	None	Yes	Yes	Yes
Site 3: South by trash can	47.168922, -122.563195	None/ 40%	None/ 50%	None/ 35%	Yes/33%	Yes/20% Spatterdock
Site 4: Dock	47.168762, -122.565413	None/ 60%	yes/ 85%	Yes/ 90%	Yes/90%	Yes/85% Spatterdock
Site 5: By college outfall	47.171458, -122.567353	None/ 30%	none/ 70%	Yes/ 40%	Yes/70%	Yes/65% Spatterdock
Site 6: N. fishing spot	47.172233, -122.563545	none	none	Yes	Yes	Yes

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Raw Data:

Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (°C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae
5/2/2022	9:26 AM	4	0.6	11.8	15.2	10.2	12.7	0.6	7.5	Substantial algae bloom
6/6/2022	9:10 AM	3.7	1.1	14.3	19	10.1	18	0.7	7.25	Substantial algae bloom
7/12/2022	9:20 AM	3.1	1.1	25.4	23.8	8.3	22.6	4	6.72	Very soupy, a few small dots but mostly well dissolved
8/4/2022	9:12 AM	3.3	0.9	22.3	24.2	8.4	24.3	7.8	6.12	Heavy
9/9/2022	9:26 AM	2.9	0.6	19.7	20.8	10.9	20.5	0.7	5.35	
11/2/2022	9:40	2.9	1.2	8.7	10.6	10.1	10.8	3.3	4.75	Substantial algae bloom

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Date	pH (1m)	pH (surface)	TP (mg/l)	SRP (mg/l)	TN (mg/l)	Chla (ug/l)	Phaeo a (ug/l)	Sulfate (mg/l)	Alkalinity (mg CaCO3/l)	Total Aluminum (mg/l)
5/2/2022	7.5		0.039	0.002	1.15	23	9.1	51.2	37.5	0.286
6/6/2022	7.5	7.5	0.03	<0.001	0.709	7.6	3.3			
7/12/2022	7.1		0.29	<0.001	1.06	5.9	2			
8/4/2022	7.5		0.042	<0.001	0.851	12	6.2	45.2	47.6	0.415
9/9/2022	8.5		0.056	0.002	0.853	22	7.1			
11/2/2022	7		0.04	<0.001	1.11	13	6.1	41.7	58.2	0.177

If you have additional questions, reach out to Belinda Paterno at belindap@piercecd.org.

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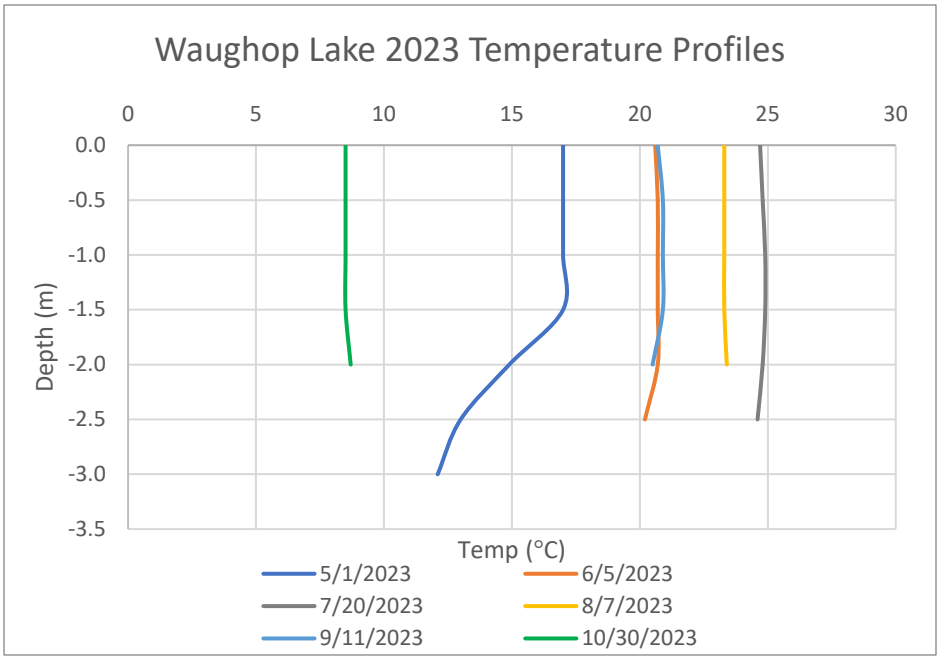
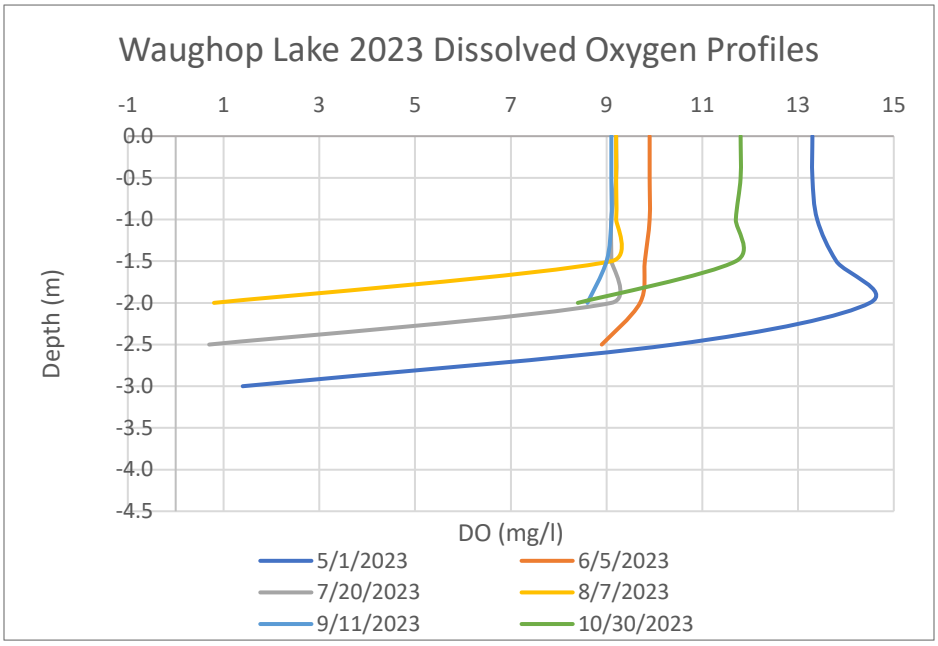
City of Lakewood

Waughop Lake Monitoring Program

During the 2023 Waughop monitoring season, 3 volunteers participated in lake monitoring with a total of 21 volunteer hours.





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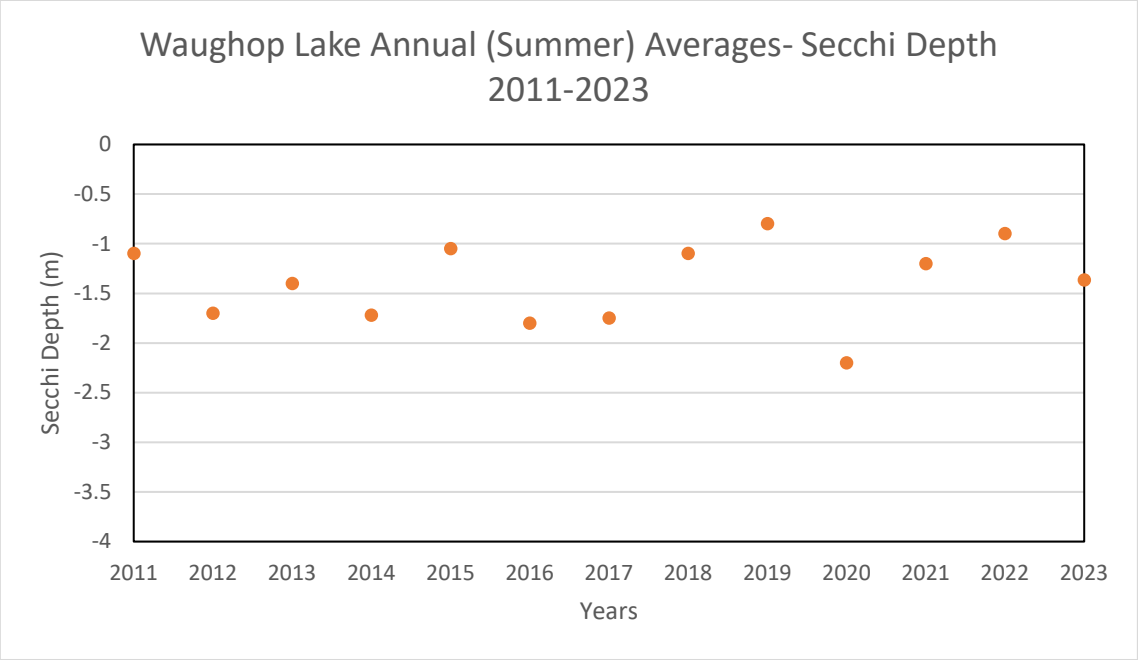
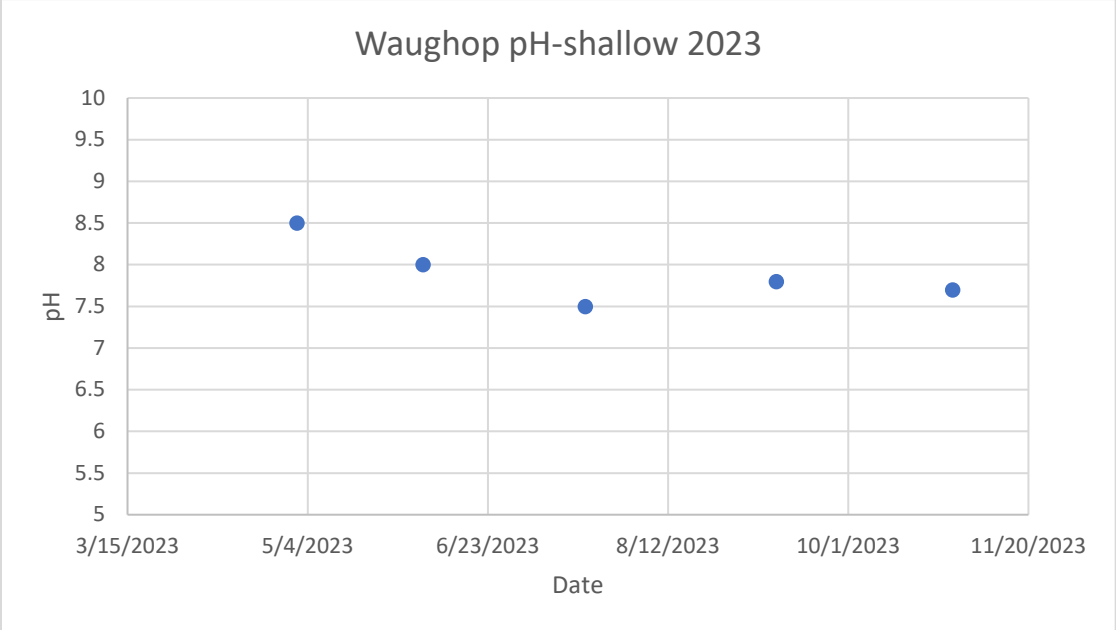
Over 70 Years of Conservation

308 West Stewart Avenue
P.O. Box 1057
Puyallup, WA 98371
www.piercecd.org
253.845.9770
Toll Free: 866.845.9485





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Shoreline Observations

Location	Algae scum presence/% aquatic plant coverage					
Date		June	July	August	September	October
Site 1: Beach for boats	47.170887, -122.561897	None	None	Yes	None	None
Site 2: SE corner	47.169195, -122.562447	None	None	None	None	None
Site 3: South by trash can	47.168922, -122.563195	None/ 20%	None/ 20%	None/ 20%	None/15%	Water too far receded /30%
Site 4: Dock	47.168762, -122.565413	Yes/ 45%	None/ 85%	None/ 85%	Water too far receded /80%	Water too far receded /80%
Site 5: By college outfall	47.171458, -122.567353	None/ 35%	None/ 90%	None/ 90%	No/40%	None/45%
Site 6: N. fishing spot	47.172233, -122.563545	None	None	Yes	No	None

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Raw Data

Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae
5/1/2023	9:30 AM	3.5	0.6	13.2	17	13.3	12.1	1.4	5.84	Substantial
6/5/2023	9:00 AM	3	0.9	17.3	20.6	9.9	20.2	8.9	5.26	Substantial
7/20/2023	9:00 AM	2.8	2	21.9	24.7	9.2	24.6	0.7	5.26	Moderate to heavy
8/7/2023	9:50 AM	2.6	1.9	20.5	23.3	9.2	23.4	0.8	3.9	Moderate
9/11/2023	9:47 AM	2.5	1.9	25.2	20.7	9.1	20.5	8.6	3.8	Substantial
10/30/2023	9:39 AM	2.5	0.9	8.6	8.5	11.8	8.7	8.4	3.46	Moderate

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Date	pH (1 m)	pH (surface)	TP (mg/l)	SRP (mg/l)	TN (mg/l)	Chla (ug/l)	Phaeo a(ug/l)	Sulfate (mg/l)	Alkalinity (mg CaCO3/l)	Total Aluminum (mg/l)
5/1/2023	8.5		0.041	<0.001	0.931	19	9.3	25.3	48.7	0.499
6/5/2023	8		0.033	0.002	0.941	8	4			
7/20/2023	7.5		0.017	<0.001	0.619	3.6	2.9			
8/7/2023		7.6	0.025	<0.001	0.987	5.3	3.8	110	38.4	0.919
9/11/2023	7.8	7.9	0.026	<0.001	0.81	7.7	3.1			
10/30/2023	7.7	7.6	0.039	0.001	0.965	14	4.1	102	34.6	0.949

If you have additional questions, reach out to Bryan Mohlman at Bryanm@piercecd.org.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1747583 **PAGE 1**

REPORT DATE: 06/07/24

DATE SAMPLED: 05/06/24 **DATE RECEIVED:** 05/07/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Waughop 1m	0.050	0.007	22.9	0.843	26.9	7.50

SAMPLE ID	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)	CONDUCTIVITY (umhos/cm)
Waughop 1m	0.4110	3.99	57.2	23	6.1	229

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Waughop 1m	6.04	0.953	2.88	19.0	25.6	<1.00

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1747583 **PAGE 2**

REPORT DATE: 06/07/24

DATE SAMPLED: 05/06/24 **DATE RECEIVED:** 05/07/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	05/13/24	05/08/24	05/20/24	05/13/24	05/14/24	05/06/24
DETECTION LIMIT	0.002	0.001	0.250	0.050	1.00	0.10
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.004	0.005	3.97	0.186	116	
DUPLICATE	0.004	0.005	4.05	0.179	116	
RPD	0.92%	2.45%	2.17%	3.84%	0.22%	NA
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.004	0.005	3.97	0.186		
SPIKED SAMPLE	0.052	0.026	8.48	1.14		
SPIKE ADDED	0.050	0.020	4.50	1.00		
% RECOVERY	96.69%	107.99%	100.29%	95.40%	NA	NA
QC CHECK						
FOUND	0.097	0.036	3.80	0.442	100	
TRUE	0.094	0.039	4.00	0.469	100	
% RECOVERY	103.19%	91.37%	95.00%	94.24%	100.00%	NA
BLANK	<0.002	<0.001	<0.250	<0.050	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1747583 **PAGE 3**

REPORT DATE: 06/07/24

DATE SAMPLED: 05/06/24 **DATE RECEIVED:** 05/07/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)	CONDUCTIVITY (umhos/cm)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H	EPA 120.1
DATE ANALYZED	05/08/24	05/20/24	05/31/24	05/30/24	05/30/24	06/04/24
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1	0.10
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	Waughop 1m
ORIGINAL	0.0583	2.84	9570	2.7	7.0	229
DUPLICATE	0.0567	2.84	9720	2.7	7.0	234
RPD	2.91%	0.00%	1.56%	0.00%	0.00%	2.16%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH			
ORIGINAL	0.0583	2.84				
SPIKED SAMPLE	0.5782	13.0				
SPIKE ADDED	0.5000	10.0				
% RECOVERY	103.97%	101.95%	OR	NA	NA	NA
QC CHECK						
FOUND	0.5433	30.7	9.86			1414
TRUE	0.5000	30.0	10.0			1413
% RECOVERY	108.65%	102.33%	98.60%	NA	NA	100.07%
BLANK	<0.0030	<0.50	<1.00	NA	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
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NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

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3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1747583 **PAGE 4**

REPORT DATE: 06/07/24

DATE SAMPLED: 05/06/24 **DATE RECEIVED:** 05/07/24

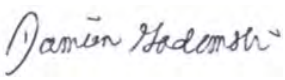
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	05/11/24	05/11/24	05/11/24	05/11/24	05/14/24	05/14/24
DETECTION LIMIT	0.100	0.100	0.500	0.700	1.00	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	29.4	6.48	2.27	100		
DUPLICATE	29.6	6.54	2.26	101		
RPD	0.87%	0.82%	0.14%	0.86%	NA	NA
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH			
ORIGINAL	29.4	6.48	2.27			
SPIKED SAMPLE	40.4	17.1	13.1			
SPIKE ADDED	10.0	10.0	10.0			
% RECOVERY	110.90%	106.32%	108.64%	NA	NA	NA
QC CHECK						
FOUND	10.5	10.5	10.7	69.3		
TRUE	10.0	10.0	10.0	66.2		
% RECOVERY	105.19%	104.55%	107.42%	104.79%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.700	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

3600 Fremont Ave N
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

City of Lakewood
Bryan Mohlman
6000 Main St.
Lakewood, WA 98499

RE: Waughop Lake Sampling,
Work Order Number: 2405116

May 14, 2024

Attention Bryan Mohlman:

Fremont Analytical, Inc, an Alliance Technical Group company, received 2 sample(s) on 5/7/2024 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes
Project Manager

CC:
Bryan Mohlman
Weston Ott

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.4 for Environmental Testing
ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing
Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910

Original

Date: *05/14/2024*

CLIENT: City of Lakewood
Project: Waughop Lake Sampling
Work Order: 2405116

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2405116-001	Total Sulfides @ 1 Meter	05/06/2024 10:15 AM	05/07/2024 9:36 AM
2405116-002	Total Sulfides @ 0.5 m from	05/06/2024 10:15 AM	05/07/2024 9:36 AM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2405116**

Date: **5/14/2024**

CLIENT: City of Lakewood
Project: Waughop Lake Sampling

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2405116**
Date Reported: **5/14/2024**

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **2405116**
Date Reported: **5/14/2024**

CLIENT: City of Lakewood
Project: Waughop Lake Sampling

Lab ID: 2405116-001 **Collection Date:** 5/6/2024 10:15:00 AM
Client Sample ID: **Total Sulfides @ 1 Meter** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R91640		Analyst: SS
Sulfide	ND	0.0500		mg/L	1	5/13/2024 3:46:48 PM

Lab ID: 2405116-002 **Collection Date:** 5/6/2024 10:15:00 AM
Client Sample ID: **Total Sulfides @ 0.5 m from** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R91640		Analyst: SS
Sulfide	ND	0.0500		mg/L	1	5/13/2024 3:46:48 PM

Work Order: 2405116
CLIENT: City of Lakewood
Project: Waughop Lake Sampling

QC SUMMARY REPORT

Total Sulfide by SM 4500-S2-D

Sample ID: **MB-R91640**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **5/13/2024**		RunNo: **91640**		
Client ID: **MBLKW**	Batch ID: **R91640**					Analysis Date: **5/13/2024**		SeqNo: **1911464**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500									

Sample ID: **LCS-R91640**	SampType: **LCS**			Units: **mg/L**		Prep Date: **5/13/2024**		RunNo: **91640**		
Client ID: **LCSW**	Batch ID: **R91640**					Analysis Date: **5/13/2024**		SeqNo: **1911465**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.190	0.0500	0.2000	0	94.9	80	120				

Sample ID: **2405116-001ADUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **5/13/2024**		RunNo: **91640**		
Client ID: **Total Sulfides @ 1 Mete**	Batch ID: **R91640**					Analysis Date: **5/13/2024**		SeqNo: **1911467**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500						0		20	

Sample ID: **2405116-001AMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **5/13/2024**		RunNo: **91640**		
Client ID: **Total Sulfides @ 1 Mete**	Batch ID: **R91640**					Analysis Date: **5/13/2024**		SeqNo: **1911468**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.240	0.0500	0.2000	0.04024	99.9	80	120				

Sample ID: **2405116-001AMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **5/13/2024**		RunNo: **91640**		
Client ID: **Total Sulfides @ 1 Mete**	Batch ID: **R91640**					Analysis Date: **5/13/2024**		SeqNo: **1911469**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.247	0.0500	0.2000	0.04024	103	80	120	0.2400	2.72	20	

Work Order: 2405116
CLIENT: City of Lakewood
Project: Waughop Lake Sampling

QC SUMMARY REPORT

Total Sulfide by SM 4500-S2-D

Sample ID: **2405211-002CDUP** SampType: **DUP** Units: **mg/L** Prep Date: **5/13/2024** RunNo: **91640**
Client ID: **BATCH** Batch ID: **R91640** Analysis Date: **5/13/2024** SeqNo: **1911496**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500						0		20	

Sample ID: **2405211-002CMS** SampType: **MS** Units: **mg/L** Prep Date: **5/13/2024** RunNo: **91640**
Client ID: **BATCH** Batch ID: **R91640** Analysis Date: **5/13/2024** SeqNo: **1911497**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.190	0.0500	0.2000	0.01643	86.7	80	120				

Return to Agenda

Sample Log-In Check List

Client Name:	COL	Work Order Number:	2405116
Logged by:	Morgan Wilson	Date Received:	5/7/2024 9:36:00 AM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	FedEx		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	5.9

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Chain of Custody Record & Laboratory Services Agreement

Date: 05/6/24 | Page: | of:

Laboratory Project No (internal): 2405116

Project Name: Waughop Lake Sampling

Special Remarks: Please send costs to "City of Lakewood"

Please report to Bryan Mohlman at

Email: BryanM@piercecd.org

Client: CIty of Lakewood

Project No:

Address: 6000 Main St.

Collected by: Pierce Conservation District (Graham)

City, State, Zip: Lakewood, WA 98499

Location: Waughop Lake

Telephone: 253-983-7725

Report To (PM): Bryan Mohlman email: bryanm@pierceCD.or

Disposal: Samples will be disposed in 30 days unless otherwise requested. ☐ Retain volume (specify above) ☐ Return to client

Email(s): Wott@cityoflakewood.us

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8) Total (T) ǀ Dissolved (D)	Anions (IC)***	EDB (8011)	TOTAL SULFIDES				Comments
1	Total Sulfides @ 1 meter	05/6/24	10:15 Al	W	1											X					
2	Total Sulfides @ 0.5 m from	05/6/24	10:15A	W	1											X					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☒ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x [signature]	Bryan Mohlman	5/6/24 1pm	x [signature]	Gittein-Gipson	5/7/24 9:36
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1748224**	**PAGE 1**	
REPORT DATE:	**06/28/24**		
DATE SAMPLED:	**06/03/24**	**DATE RECEIVED:**	**06/04/24**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Waughop 1m	0.037	<0.001	1.32	4.8	4.5

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1748224 **PAGE 2**

REPORT DATE: 06/28/24

DATE SAMPLED: 06/03/24 **DATE RECEIVED:** 06/04/24

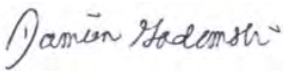
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	SM18 4500PF	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H
DATE ANALYZED	06/10/24	06/05/24	06/11/24	06/28/24	06/28/24
DETECTION LIMIT	0.002	0.001	0.050	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	Waughop 1m	Waughop 1m
ORIGINAL	0.007	<0.001	0.351	4.8	4.5
DUPLICATE	0.006	<0.001	0.359	4.3	3.8
RPD	4.98%	NC	2.25%	11.76%	16.87%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL	0.007	<0.001	0.351		
SPIKED SAMPLE	0.058	0.021	1.41		
SPIKE ADDED	0.050	0.020	1.00		
% RECOVERY	102.83%	105.89%	106.10%	NA	NA
QC CHECK					
FOUND	0.094	0.040	0.443		
TRUE	0.094	0.039	0.469		
% RECOVERY	100.30%	102.56%	94.46%	NA	NA
BLANK	<0.002	<0.001	<0.050	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1748959**	**PAGE 1**	
REPORT DATE:	**07/19/24**		
DATE SAMPLED:	**07/01/24**	**DATE RECEIVED:**	**07/02/24**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Waughop 1m	0.041	<0.001	1.07	15	6.7

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1748959 **PAGE 2**

REPORT DATE: 07/19/24

DATE SAMPLED: 07/01/24 **DATE RECEIVED:** 07/02/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	SM18 4500PF	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H
DATE ANALYZED	07/08/24	07/03/24	07/15/24	07/12/24	07/12/24
DETECTION LIMIT	0.002	0.001	0.050	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	Waughop 1m	Waughop 1m
ORIGINAL	0.004	<0.001	0.329	15	6.7
DUPLICATE	0.004	<0.001	0.334	16	8.0
RPD	4.36%	NC	1.51%	6.90%	17.27%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL	0.004	<0.001	0.329		
SPIKED SAMPLE	0.056	0.020	1.24		
SPIKE ADDED	0.050	0.020	1.00		
% RECOVERY	103.14%	100.00%	90.60%	NA	NA
QC CHECK					
FOUND	0.094	0.037	0.479		
TRUE	0.094	0.039	0.469		
% RECOVERY	100.30%	94.87%	102.13%	NA	NA
BLANK	<0.002	<0.001	<0.050	NA	NA

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OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski

Damien Gadomski, PhD
Laboratory Manager

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1749807 **PAGE 1**

REPORT DATE: 09/07/24

DATE SAMPLED: 08/05/24 **DATE RECEIVED:** 08/06/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Waughop 1m	0.056	0.002	11.4	1.21	48.6	7.42

SAMPLE ID	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)	CONDUCTIVITY (umhos/cm)
Waughop 1m	0.8476	5.47	50.2	18	6.1	275

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Waughop 1m	8.06	1.18	3.59	25.0	44.7	<1.00

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1749807 **PAGE 2**

REPORT DATE: 09/07/24

DATE SAMPLED: 08/05/24 **DATE RECEIVED:** 08/06/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	08/12/24	08/07/24	08/26/24	08/13/24	08/08/24	08/07/24
DETECTION LIMIT	0.002	0.001	0.250	0.050	1.00	0.10
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	Waughop 1m	
ORIGINAL	0.006	0.003	0.865	0.269	48.6	
DUPLICATE	0.006	0.002	0.763	0.245	50.1	
RPD	1.09%	3.44%	12.60%	9.34%	3.12%	NA
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.006	0.003	0.865	0.269		
SPIKED SAMPLE	0.060	0.024	5.46	1.28		
SPIKE ADDED	0.050	0.020	4.50	1.00		
% RECOVERY	107.58%	105.20%	102.02%	100.80%	NA	NA
QC CHECK						
FOUND	0.095	0.042	4.05	0.449	107	
TRUE	0.094	0.039	4.00	0.469	100	
% RECOVERY	101.06%	106.60%	101.25%	95.74%	107.00%	NA
BLANK	<0.002	<0.001	<0.250	<0.050	NA	NA

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3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1749807 **PAGE 3**

REPORT DATE: 09/07/24

DATE SAMPLED: 08/05/24 **DATE RECEIVED:** 08/06/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)	CONDUCTIVITY (umhos/cm)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H	EPA 120.1
DATE ANALYZED	08/09/24	08/07/24	08/15/24	08/09/24	08/09/24	08/15/24
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1	0.10
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.0566	4.83	1.80	6.9	12	613
DUPLICATE	0.0551	4.73	1.84	5.9	13	610
RPD	2.69%	2.20%	2.14%	16.67%	5.41%	0.49%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH			
ORIGINAL	0.0566	4.83	1.80			
SPIKED SAMPLE	0.5298	15.0	11.8			
SPIKE ADDED	0.5000	10.0	10.0			
% RECOVERY	94.64%	101.95%	100.33%	NA	NA	NA
QC CHECK						
FOUND	0.5156	33.0	18.0			1411
TRUE	0.5000	30.0	20.0			1413
% RECOVERY	103.12%	110.00%	90.00%	NA	NA	99.86%
BLANK	<0.0030	<0.50	<1.00	NA	NA	NA

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IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1749807 **PAGE 4**

REPORT DATE: 09/07/24

DATE SAMPLED: 08/05/24 **DATE RECEIVED:** 08/06/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	08/09/24	08/09/24	08/09/24	08/09/24	08/08/24	08/08/24
DETECTION LIMIT	0.100	0.100	0.500	0.700	1.00	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	31.0	6.71	2.29	105		
DUPLICATE	31.2	6.76	2.29	106		
RPD	0.65%	0.63%	0.17%	0.64%	NA	NA
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH			
ORIGINAL	31.0	6.71	2.29			
SPIKED SAMPLE	42.7	17.6	12.8			
SPIKE ADDED	10.0	10.0	10.0			
% RECOVERY	117.74%	109.13%	104.91%	NA	NA	NA
QC CHECK						
FOUND	10.9	10.7	10.4	71.2		
TRUE	10.0	10.0	10.0	66.2		
% RECOVERY	108.63%	107.12%	104.38%	107.69%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.700	NA	NA

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SUBMITTED BY:

Damien Gadomski

Damien Gadomski, PhD
Laboratory Manager

3600 Fremont Ave N
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

City of Lakewood
Bryan Mohlman
6000 Main St
Lakewood, WA 98499

RE: Waughop Lake Sampling,
Work Order Number: 2408069

August 12, 2024

Attention Bryan Mohlman:

Fremont Analytical, Inc, an Alliance Technical Group company, received 2 sample(s) on 8/6/2024 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes
Project Manager

Date: *08/12/2024*

CLIENT: City of Lakewood
Project: Waughop Lake Sampling
Work Order: 2408069

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2408069-001	1m Total Sulfides	08/05/2024 9:25 AM	08/06/2024 9:45 AM
2408069-002	0.5 from bot Total Sulfides	08/05/2024 9:30 AM	08/06/2024 9:45 AM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2408069**

Date: **8/12/2024**

CLIENT: City of Lakewood
Project: Waughop Lake Sampling

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2408069**
Date Reported: **8/12/2024**

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **2408069**
Date Reported: **8/12/2024**

CLIENT: City of Lakewood
Project: Waughop Lake Sampling

Lab ID: 2408069-001 **Collection Date:** 8/5/2024 9:25:00 AM
Client Sample ID: **1m Total Sulfides** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R93564		Analyst: SLL
Sulfide	ND	0.0500		mg/L	1	8/12/2024 10:46:05 AM

Lab ID: 2408069-002 **Collection Date:** 8/5/2024 9:30:00 AM
Client Sample ID: **0.5 from bot Total Sulfides** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R93564		Analyst: SLL
Sulfide	ND	0.0500		mg/L	1	8/12/2024 10:46:05 AM

Work Order: 2408069
CLIENT: City of Lakewood
Project: Waughop Lake Sampling

QC SUMMARY REPORT

Total Sulfide by SM 4500-S2-D

Sample ID: **MB-R93564** SampType: **MBLK** Units: **mg/L** Prep Date: **8/12/2024** RunNo: **93564**
Client ID: **MBLKW** Batch ID: **R93564** Analysis Date: **8/12/2024** SeqNo: **1953246**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500									

Sample ID: **LCS-R93564** SampType: **LCS** Units: **mg/L** Prep Date: **8/12/2024** RunNo: **93564**
Client ID: **LCSW** Batch ID: **R93564** Analysis Date: **8/12/2024** SeqNo: **1953247**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.207	0.0500	0.2000	0	104	80	120				

Sample ID: **2408076-001CDUP** SampType: **DUP** Units: **mg/L** Prep Date: **8/12/2024** RunNo: **93564**
Client ID: **BATCH** Batch ID: **R93564** Analysis Date: **8/12/2024** SeqNo: **1953251**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.278	0.0500						0.2619	5.98	20	

Sample ID: **2408076-001CMS** SampType: **MS** Units: **mg/L** Prep Date: **8/12/2024** RunNo: **93564**
Client ID: **BATCH** Batch ID: **R93564** Analysis Date: **8/12/2024** SeqNo: **1953252**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.433	0.0500	0.2000	0.2619	85.7	80	120				

Sample ID: **2408076-001CMSD** SampType: **MSD** Units: **mg/L** Prep Date: **8/12/2024** RunNo: **93564**
Client ID: **BATCH** Batch ID: **R93564** Analysis Date: **8/12/2024** SeqNo: **1953253**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.430	0.0500	0.2000	0.2619	83.8	80	120	0.4333	0.864	20	

Work Order: 2408069
CLIENT: City of Lakewood
Project: Waughop Lake Sampling

QC SUMMARY REPORT

Total Sulfide by SM 4500-S2-D

Sample ID: **2408139-002BDUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **8/12/2024**		RunNo: **93564**			
Client ID: **BATCH**	Batch ID: **R93564**					Analysis Date: **8/12/2024**		SeqNo: **1953264**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500						0		20	

Sample ID: **2408139-002BMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **8/12/2024**		RunNo: **93564**			
Client ID: **BATCH**	Batch ID: **R93564**					Analysis Date: **8/12/2024**		SeqNo: **1953265**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.174	0.0500	0.2000	0	86.9	80	120				

Return to Agenda

Sample Log-In Check List

Client Name:	COL	Work Order Number:	2408069
Logged by:	Morgan Wilson	Date Received:	8/6/2024 9:45:00 AM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	FedEx		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☑ No ☐ NA ☐

Person Notified:	Bryan Mohlman	Date:	8/6/2024
By Whom:	Morgan Wilson	Via:	☑ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:	Run Per Historical - Total Sulfide		
Client Instructions:	Proceed per Historical		

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	6.0

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Chain of Custody Record & Laboratory Services Agreement

Fremont Analytical
An Altogeo Technical Group Company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Date: 08/05/2024 Page: 1 of: 1

Laboratory Project No (internal): 2408069

Project Name: Waughop Lake Sampling

Special Remarks: Please invoice City of Lakewood and report findings to me at BryanM@PierceCD.org

Client: City of Lakewood

Project No:

Address: 6000 Main St.

Collected by: Pierce Conservation District

City, State, Zip: Lakewood, WA, 98371

Location: Waughop Lake, Lakewood WA

Telephone: 253-983-7725

Report To (PM): Bryan Mohlman; BryanM@PierceCD.org

Disposal: Samples will be disposed in 30 days unless otherwise requested. ☐ Retain volume (specify above) ☐ Return to client

Email(s): Wott@cityoflakewood.us; BryanM@piercecd.org

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8) Total (T) ⁞ Dissolved (D)	Anions (IC)***	EDB (8011)	Comments
1	1m Total Sulfides	08/05/24	9:25	W													
2	0.5 from bot Total Sulfides	08/05/24	9:30	W													
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☒ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x	Jacqueline Breuden	08/05/24	x	Briana Ballard	8/6 9:45AM
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

Chain of Custody Record & Laboratory Services Agreement

Fremont Analytical
An Altogeo Technical Group Company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Date: 08/05/2024 Page: 1 of: 1

Laboratory Project No (internal): 2408069

Project Name: Waughop Lake Sampling

Project No:

Collected by: Pierce Conservation District

Location: Waughop Lake, Lakewood WA

Report To (PM): Bryan Mohlman; BryanM@PierceCD.org

Special Remarks:
Please invoice City of Lakewood and report findings to me at BryanM@PierceCD.org

Update per historical & BM -mw 8/6/24

Disposal: Samples will be disposed in 30 days unless otherwise requested.
☐ Retain volume (specify above) ☐ Return to client

Client: City of Lakewood

Address: 6000 Main St.

City, State, Zip: Lakewood, WA, 98371

Telephone: 253-983-7725

Email(s): Wott@cityoflakewood.us; BryanM@piercecd.org

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8) Total (T) ; Dissolved (D)	Anions (IC)***	EDB (8011)	Total Sulfide	Comments
1	1m Total Sulfides	08/05/24	9:25	W													X	
2	0.5 from bot Total Sulfides	08/05/24	9:30	W													X	
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual*: Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☒ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x	Jacqueline Snedden	08/05/24	x	Briana Ballard	8/6 9:45AM
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1750639**	**PAGE 1**	
REPORT DATE:	**09/28/24**		
DATE SAMPLED:	**09/09/24**	**DATE RECEIVED:**	**09/10/24**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Waughop 1m	0.051	0.002	1.22	33	4.9

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1750639 **PAGE 2**

REPORT DATE: 09/28/24

DATE SAMPLED: 09/09/24 **DATE RECEIVED:** 09/10/24

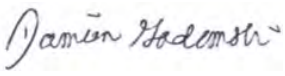
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	SM18 4500PF	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H
DATE ANALYZED	09/16/24	09/11/24	09/18/24	09/17/24	09/17/24
DETECTION LIMIT	0.002	0.001	0.050	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.006	0.007	0.298	0.7	0.5
DUPLICATE	0.006	0.008	0.304	0.6	0.5
RPD	0.81%	9.77%	1.99%	15.38%	14.29%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL	0.006	0.007	0.298		
SPIKED SAMPLE	0.056	0.026	1.27		
SPIKE ADDED	0.050	0.020	1.00		
% RECOVERY	101.16%	95.98%	97.10%	NA	NA
QC CHECK					
FOUND	0.094	0.039	0.448		
TRUE	0.094	0.039	0.469		
% RECOVERY	100.30%	100.00%	95.52%	NA	NA
BLANK	<0.002	<0.001	<0.050	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1751398**	**PAGE 1**	
REPORT DATE:	**11/11/24**		
DATE SAMPLED:	**10/07/24**	**DATE RECEIVED:**	**10/08/24**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Waughop 1m	0.048	0.005	1.26	26	3.0

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1751398 **PAGE 2**

REPORT DATE: 11/11/24

DATE SAMPLED: 10/07/24 **DATE RECEIVED:** 10/08/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	SM18 4500PF	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H
DATE ANALYZED	10/14/24	10/10/24	10/15/24	10/29/24	10/29/24
DETECTION LIMIT	0.002	0.001	0.050	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.058	0.002	0.196	44	8.7
DUPLICATE	0.058	0.002	0.197	40	8.5
RPD	0.16%	0.50%	0.51%	8.51%	2.06%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL	0.058	0.002	0.196		
SPIKED SAMPLE	0.108	0.022	1.21		
SPIKE ADDED	0.050	0.020	1.00		
% RECOVERY	99.73%	100.92%	101.70%	NA	NA
QC CHECK					
FOUND	0.095	0.040	0.434		
TRUE	0.094	0.039	0.469		
% RECOVERY	101.06%	102.56%	92.54%	NA	NA
BLANK	<0.002	<0.001	<0.050	NA	NA

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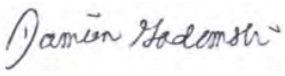
SUBMITTED BY:



Damien Gadomski, PhD
Laboratory Manager

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1752340**	**PAGE 1**	
REPORT DATE:	**12/05/24**		
DATE SAMPLED:	**11/08/24**	**DATE RECEIVED:**	**11/08/24**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
Waughop 1m	0.052	0.002	20.7	1.08	47.2	7.38

SAMPLE ID	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)	CONDUCTIVITY (umhos/cm)
Waughop 1m	0.5930	4.62	38.2	49	14	262

SAMPLE ID	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
Waughop 1m	6.67	1.11	3.82	21.2	43.1	<1.00

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1752340 **PAGE 2**

REPORT DATE: 12/05/24

DATE SAMPLED: 11/08/24 **DATE RECEIVED:** 11/08/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	DOC (mg/L)	TOTAL-N (mg/L)	ALKALINITY (mgCaCO3/L)	pH
METHOD	SM20 4500PF	SM20 4500PF	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	11/12/24	11/08/24	11/12/24	11/12/24	11/14/24	11/08/24
DETECTION LIMIT	0.002	0.001	0.250	0.050	1.00	0.10
DUPLICATE						
SAMPLE ID	BATCH	Waughop 1m	BATCH	BATCH	Waughop 1m	
ORIGINAL	0.002	0.002	<0.250	0.221	47.2	
DUPLICATE	0.002	0.002	<0.250	0.235	46.4	
RPD	0.74%	2.04%	NC	6.14%	1.71%	NA
SPIKE SAMPLE						
SAMPLE ID	BATCH	Waughop 1m	BATCH	BATCH		
ORIGINAL	0.002	0.002	<0.250	0.221		
SPIKED SAMPLE	0.056	0.021	4.46	1.11		
SPIKE ADDED	0.050	0.020	4.50	1.00		
% RECOVERY	107.56%	95.37%	99.16%	88.71%	NA	NA
QC CHECK						
FOUND	0.094	0.042	3.85	0.468	105	
TRUE	0.094	0.039	4.00	0.469	100	
% RECOVERY	100.00%	106.60%	96.25%	99.79%	105.00%	NA
BLANK	<0.002	<0.001	<0.250	<0.050	NA	NA

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IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1752340 **PAGE 3**

REPORT DATE: 12/05/24

DATE SAMPLED: 11/08/24 **DATE RECEIVED:** 11/08/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	CHLORIDE (mg/L)	SULFATE (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)	CONDUCTIVITY (umhos/cm)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H	EPA 120.1
DATE ANALYZED	11/13/24	11/18/24	11/13/24	11/13/24	11/13/24	11/18/24
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1	0.10
DUPLICATE						
SAMPLE ID	BATCH	BATCH	Waughop 1m	BATCH	BATCH	BATCH
ORIGINAL	<0.0030	225	38.2	5.3	2.9	1387
DUPLICATE	<0.0030	228	39.1	5.3	2.9	1381
RPD	NC	0.93%	2.17%	0.00%	0.00%	0.43%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	Waughop 1m			
ORIGINAL	<0.0030		38.2			
SPIKED SAMPLE	0.5125		77.1			
SPIKE ADDED	0.5000		40.0			
% RECOVERY	102.50%	OR	97.12%	NA	NA	NA
QC CHECK						
FOUND	0.4988	29.2	9.13			1411
TRUE	0.5000	30.0	10.0			1413
% RECOVERY	99.76%	97.33%	91.30%	NA	NA	99.86%
BLANK	<0.0030	<0.50	<1.00	NA	NA	NA

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IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1752340 **PAGE 4**

REPORT DATE: 12/05/24

DATE SAMPLED: 11/08/24 **DATE RECEIVED:** 11/08/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	CALCIUM (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	HARDNESS (mgCaCO3/l)	HCO3 (mgCaCO3/l)	CO3 (mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	11/13/24	11/13/24	11/13/24	11/13/24	11/13/24	11/13/24
DETECTION LIMIT	0.100	0.100	0.500	0.700	1.00	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	65.2	12.4	2.32	214		
DUPLICATE	65.0	12.3	2.30	213		
RPD	0.32%	0.40%	1.10%	0.34%	NA	NA
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH			
ORIGINAL	65.2	12.4	2.32			
SPIKED SAMPLE	76.2	23.0	12.9			
SPIKE ADDED	10.0	10.0	10.0			
% RECOVERY	110.11%	106.40%	105.63%	NA	NA	NA
QC CHECK						
FOUND	10.5	10.6	10.5	69.7		
TRUE	10.0	10.0	10.0	66.2		
% RECOVERY	104.52%	105.79%	105.00%	105.31%	NA	NA
BLANK	<0.100	<0.100	<0.500	<0.700	NA	NA

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OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski

Damien Gadomski, PhD
Laboratory Manager

3600 Fremont Ave N
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

City of Lakewood
Bryan Mohlman
6000 Main St
Lakewood, WA 98499

RE: Waughop Lake Sampling,
Work Order Number: 2411161

November 15, 2024

Attention Bryan Mohlman:

Fremont Analytical, Inc, an Alliance Technical Group company, received 2 sample(s) on 11/8/2024 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes
Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.4 for Environmental Testing
ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing
Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910

Original

Date: *11/15/2024*

CLIENT: City of Lakewood
Project: Waughop Lake Sampling
Work Order: 2411161

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2411161-001	1m Total Sulfides	11/08/2024 12:00 AM	11/08/2024 12:19 PM
2411161-002	0.5 from bottom TS	11/08/2024 12:00 AM	11/08/2024 12:19 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2411161**

Date: **11/15/2024**

CLIENT: City of Lakewood
Project: Waughop Lake Sampling

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms

WO#: **2411161**
Date Reported: **11/15/2024**

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **2411161**
Date Reported: **11/15/2024**

CLIENT: City of Lakewood
Project: Waughop Lake Sampling

Lab ID: 2411161-001 **Collection Date:** 11/8/2024
Client Sample ID: **1m Total Sulfides** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R95602		Analyst: BB
Sulfide	0.0520	0.0500		mg/L	1	11/11/2024 8:49:51 AM

Lab ID: 2411161-002 **Collection Date:** 11/8/2024
Client Sample ID: **0.5 from bottom TS** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch ID: R95602		Analyst: BB
Sulfide	0.0520	0.0500		mg/L	1	11/11/2024 8:49:51 AM

Work Order: 2411161
CLIENT: City of Lakewood
Project: Waughop Lake Sampling

QC SUMMARY REPORT

Total Sulfide by SM 4500-S2-D

Sample ID: **MB-R95602**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **11/11/2024**		RunNo: **95602**		
Client ID: **MBLKW**	Batch ID: **R95602**					Analysis Date: **11/11/2024**		SeqNo: **1995109**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	ND	0.0500									

Sample ID: **LCS-R95602**	SampType: **LCS**			Units: **mg/L**		Prep Date: **11/11/2024**		RunNo: **95602**		
Client ID: **LCSW**	Batch ID: **R95602**					Analysis Date: **11/11/2024**		SeqNo: **1995110**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.194	0.0500	0.2000	0	96.8	80	120				

Sample ID: **2411161-001ADUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **11/11/2024**		RunNo: **95602**		
Client ID: **1m Total Sulfides**	Batch ID: **R95602**					Analysis Date: **11/11/2024**		SeqNo: **1995112**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.0545	0.0500						0.05200	4.67	20	

Sample ID: **2411161-001AMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **11/11/2024**		RunNo: **95602**		
Client ID: **1m Total Sulfides**	Batch ID: **R95602**					Analysis Date: **11/11/2024**		SeqNo: **1995113**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.215	0.0500	0.2000	0.05200	81.4	80	120				

Sample ID: **2411161-001AMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **11/11/2024**		RunNo: **95602**		
Client ID: **1m Total Sulfides**	Batch ID: **R95602**					Analysis Date: **11/11/2024**		SeqNo: **1995114**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide	0.217	0.0500	0.2000	0.05200	82.6	80	120	0.2147	1.15	20	

Return to Agenda

Sample Log-In Check List

Client Name:	COL	Work Order Number:	2411161
Logged by:	Morgan Wilson	Date Received:	11/8/2024 12:19:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp °C
Sample	0.2

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Fremont Analytical
An Alliance Technical Group Company
3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790

Chain of Custody Record & Laboratory Services Agreement

Date: 11/8/24 Page: 1 of: 1

Laboratory Project No (internal): 2411161

Project Name: Waughop lake Sampling

Special Remarks: Please invoice City of Lakewood and report findings to me at BryanM@piercecd.org

Client: City of Lakewood

Project No:

Address: 6000 Main ST

Collected by: Pierce Conservation district

City, State, Zip: Lakewood, WA, 98371

Location: Waughop Lake, Lakewood WA

Telephone: 253-983-7725

Report To (PM): Bryan Mohlman; BryanM@piercecd.org

Disposal: Samples will be disposed in 30 days unless otherwise requested. ☐ Retain volume (specify above) ☐ Return to client

Email(s): Wott@cityoflakewood.us; BryanM@piercecd.org

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	# of Cont.	VOCs (EPA 8260 / 624)	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SVOCs (EPA 8270 / 625)	PAHs (EPA 8270 - SIM)	PCBs (EPA 8082 / 608)	Metals** (EPA 6020 / 200.8) Total (T) | Dissolved (D)	Anions (IC)***	EDB (8011)	Total Sulfides			Comments
1	1m total sulfides	11/8/24		W																
2	0.5 from bottom TS	11/8/24		W																
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water

**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Turn-around Time:
☐ Standard ☐ Next Day
☐ 3 Day ☐ Same Day
☐ 2 Day ☐ _____ (specify)

I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.

Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x	Jaqueline Snarden	11/8/24 12:18	x	Briana Ballard	11/8 12:19pm
Relinquished (Signature)	Print Name	Date/Time	Received (Signature)	Print Name	Date/Time
x			x		

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	**1752954**		**PAGE 1**
REPORT DATE:	**12/12/24**		
DATE SAMPLED:	**12/02/24**	**DATE RECEIVED:**	**12/03/24**

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

SAMPLE ID	TOTAL-P (mg/L)	SRP (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
Waughop 1m	0.051	<0.001	1.66	109	7.3

IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER: 1752954 **PAGE 2**

REPORT DATE: 12/12/24

DATE SAMPLED: 12/02/24 **DATE RECEIVED:** 12/03/24

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER SAMPLES FROM PIERCE CONSERVATION DISTRICT

QA/QC DATA

QC PARAMETER	TOTAL-P (mg/L)	SRP (mg/L)	TOTAL-N (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	SM18 4500PF	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H
DATE ANALYZED	12/09/24	12/04/24	12/10/24	12/11/24	12/11/24
DETECTION LIMIT	0.002	0.001	0.050	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.007	<0.001	0.207	111	11
DUPLICATE	0.007	<0.001	0.193	105	9.5
RPD	1.59%	NC	7.00%	4.94%	14.86%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL	0.007	<0.001	0.207		
SPIKED SAMPLE	0.057	0.021	1.29		
SPIKE ADDED	0.050	0.020	1.00		
% RECOVERY	100.74%	105.00%	108.30%	NA	NA
QC CHECK					
FOUND	0.095	0.039	0.437		
TRUE	0.094	0.039	0.469		
% RECOVERY	101.06%	100.00%	93.18%	NA	NA
BLANK	<0.002	<0.001	<0.050	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.
NA = NOT APPLICABLE OR NOT AVAILABLE.
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski

Damien Gadomski, PhD
Laboratory Manager