

February 23, 2018

School District 68 (Nanaimo-Ladysmith)
395 Wakesiah Road
Nanaimo, BC V9R 3K6

ISSUED FOR USE
FILE: 704-ENW.VENW03150-01
Via Email: BHackwood@sd68.bc.ca

Attention: Brian Hackwood, Maintenance Manager

Subject: Domestic Water Testing (Lead) Inventory – Dufferin Crescent Elementary School

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) was retained School District 68 Nanaimo-Ladysmith (SD 68) to conduct a domestic water testing inventory at Dufferin Crescent Elementary School located in SD 68. Tetra Tech understands that the BC Ministry of Education has issued a directive to protect drinking water. The directive requires that a systematic investigation of public drinking water supplies at select schools in the District be undertaken. The investigation is based on procedures set forth by Health Canada modified per the Vancouver Island Health Authority (VIHA) guidelines, to ascertain risk and mitigation.

Tetra Tech understands that the sampling schedule, collection, testing and reporting of results needs to be completed by March 1, 2018 in order to allow sufficient time for SD 68 to implement mitigation measures prior to its deadline of March 31, 2018.

Mr. Brian Hackwood, Maintenance Manager with SD 68, provided Tetra Tech with authorization to proceed with the inventory on January 18, 2018.

2.0 METHODOLOGY

Tetra Tech completed the domestic water testing inventory program at Dufferin Crescent Elementary School on January 29th and February 13th, 2018. The 2018 sampling program was conducted as per the protocols established during the 2016 program. The methodologies employed during the field program are detailed in the following subsections.

2.1 Sampling Locations

Tetra Tech reviewed plans for the facility prior to commencing the field work to identify potential sampling locations. The facility was then assessed in the field and sampling locations were selected based on the probability of human consumption at a location. The sampling locations included one point that was closest to the location where the water supply enters the building, one that is the furthest point from where the water supply enters the building and from points where human consumption of water occurred or was reasonably likely to occur. The sampling locations for Dufferin Crescent Elementary School are shown on the attached Figure 1.

Hallway drinking fountains and kitchen sinks were all considered to have a high probability of human consumption of water and were always sampled. Sinks with visible evidence of human consumption of water, such as water bottles, cups, or electric kettles were also considered to have a high probability of human consumption of water and were sampled. Although classroom sinks (including those with water fountains) were considered to have a moderate

to high probability of human consumption of water, only representative samples were collected as per the direction of SD 68 Maintenance Manager, Mr. Brian Hackwood. Classroom laboratory and art room sinks, where present, were considered to have a low probability of human consumption of water so only representative samples were collected. Finally, washrooms and utility sinks, unless there was other evidence of human consumption of water (such as an electric kettle) were considered to be a low probability of human consumption of water and only representative samples were collected.

2.2 Drinking Water Sampling

Sampling was conducted in the early hours of Monday, January 29th and February 13th, 2018 in order collect water samples representative of an approximate worst-case scenario of water that had remained in contact with the school's plumbing over the course of a weekend. Two samples were collected at each sample location; the first collected immediately prior to any water line flushing (0 second sample); the second collected after thirty seconds of water line flushing (30 second sample).

The process for the sequence of analysis for a sample location is as follows:

- Only the pre-flush (0 second) sample is initially submitted for laboratory analysis;
- If the analytical result exceeds the *Guidelines for Canadian Drinking Water Quality* (GCDQG) Maximum Allowable Concentration (MAC), the 30 second sample would be submitted for further analysis; and
- If the 30 second sample analytical result exceeds the GCDQG MAC, additional samples would be collected after flushing with cold water for 2 minutes and 5 minutes at a subsequent sampling event and both samples submitted for analysis.

Water samples were collected directly from the sample point into clean, labeled, new laboratory-supplied. After collecting the water each sample then had preservative added for total lead. Sampling personnel wore new nitrile gloves prior to collecting each sample. Samples were kept in a cooler with ice after collection until being brought back to Tetra Tech's Nanaimo office, where samples not immediately submitted to the laboratory were stored in refrigerated conditions.

2.3 Analytical Testing

Samples were analyzed by Maxxam Analytics in Burnaby, British Columbia. Maxxam is a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory that is qualified to analyze the samples using British Columbia Ministry of Environment (MOE)-approved procedures. All water samples submitted were analyzed for total lead.

2.4 Quality Assurance / Quality Control

During the sampling program, Tetra Tech implemented a Quality Assurance/Quality Control (QA/QC) program to ensure the integrity of the sampling methodology and analytical testing. The QA/QC program adhered to Tetra Tech's in-house Quality Management System (QMS), which was designed to generate representative samples, minimize the potential for cross-contamination between sampling locations and samples, and reduce the potential for systematic bias.

The QA/QC program included the following tasks:

- Recording the results of field activities in the field concurrently with the activities;

- Use of clean, new sampling gloves at each sampling location;
- Placing samples into new, labeled laboratory-supplied containers;
- Transporting samples to Maxxam in chilled coolers using chain-of-custody procedures;
- Using a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory that is qualified to analyze the samples using MOE-approved procedures;
- Independently verifying the sample concentrations flagged by Maxxam as being greater than Health Canada guidelines by uploading laboratory results using ESdat, an environmental data management software, to minimize transcription errors; and
- Conducting a review of this report by a qualified senior Tetra Tech professional to ensure that the report meets Tetra Tech technical and reporting requirements.

Laboratory Quality Assurance / Quality Control Program

Water samples were submitted to Maxxam, a CALA accredited laboratory. Laboratory testing was conducted using methods outlined in the British Columbia Environmental Laboratory Manual. Laboratory QA/QC reports are attached to the laboratory reports presented in Appendix B. Samples included in the QA/QC reports consist of laboratory batches and will include random samples from the lab report and potentially other projects to complete a batch.

The Laboratories will note any sample deficiencies, such as unacceptable headspace, broken jars or bottles, etc. As well, the laboratory will measure the temperature of samples received by the laboratory in Burnaby.

Laboratory Duplicate – Relative Percent Difference (RPD)

A second aliquot is obtained from a randomly chosen sample. The aliquot is processed and the results expressed as the RPD between the two results. The purpose of the laboratory duplicate is to evaluate analytical precision and sample homogeneity. Tetra Tech formed the duplicate samples by alternately placing approximately 10% of the sample volume into the original sample container and then placing the same amount into the duplicate sample container. Tetra Tech continued placing additional aliquots of approximately 10% of the sample volume into each container until both containers were filled. RPDs should only be calculated and assessed when both the sample and the duplicate concentration is greater than five times the reportable detection limit (RDL), referred to as the Practical Quantification Limit (PQL).

The RPD calculations are discussed in Section 5.0. At Dufferin Crescent Elementary School, duplicate samples 18DC18-0s and 18DC18-30s were collected at 18DC17-0s and 18DC17-30s respectively.

3.0 ASSESSMENT STANDARDS

As per the guidance from the Vancouver Island Health Authority (VIHA), Tetra Tech compared the sample analytical results to the *Guidelines for Canadian Drinking Water Quality* (GCDQG) published by Health Canada, February 2017. The guidelines list a Maximum Acceptable Concentration (MAC) for lead of 0.010 mg/L (10 µg/L). The MAC for lead is based on chronic effects and is intended to apply to average concentrations in water consumed for extended periods. No immediately toxic concentration for lead is listed, however exposure to lead should nevertheless be kept to a minimum.

4.0 ANALYTICAL RESULTS

Tetra Tech collected water samples from Dufferin Crescent Elementary School on January 29th and February 13th 2018. A total of 19 sample locations were identified; two samples were collected at each location (i.e., 0 second sample and 30 second sample). Nineteen (19) pre-flush (0 second) samples (plus one pre-flush duplicate) were submitted for laboratory analysis of total lead.

Seven of the 0 second samples contained concentrations of total lead that were greater than the GCDQG MAC.

Sample 18DC03 was collected from a sink drinking water fountain in classroom 127, sample 18DC04 was collected from a sink drinking water fountain in special needs classroom 132, sample 18DC08 was collected from a sink in the girls washroom 139, sample 18DC09 was collected from a sink in the boys washroom 120, sample 18DC13 was collected from a sink in the boys change room 105, sample 18DC17 (and duplicate sample 18DC18) was collected from a sink in workroom 201A, and sample 18DC20 was collected from a sink in the second floor seminar room.

The 30 second samples from the seven locations that exceeded lead concentrations in their 0 second samples were submitted for laboratory analysis. Tetra Tech noted that sample 18DC20-0s had an abnormally high lead concentration of 649 µg/L. To address the possibility of this sample result being artificially high due to low use, SD 68 requested that Tetra Tech re-collect the 0 and 30 second samples at this location. The second 0s results were still abnormally high and continued to exceed the MAC, but reduced at 469 µg/L.

The 30 second sample from 18DC20 contained concentrations of total lead that were greater than the GCDQG MAC. The remaining samples analyzed all contained concentrations of total lead that were less than the GCDQG MAC.

The 30 second sample collected January 29th from 18DC20 contained concentrations of total lead (13.3 µg/L) greater than the MAC; however the subsequent 30 second sample collected February 13th contained concentrations of total lead (4.60 µg/L) less than the MAC. Prior to receiving the February 13th 30 second results, Tetra Tech requested analysis for total lead of 2 minute and 5 minute flush samples from 18DC20 on (also collected February 13th) in order to minimize turnaround time in case of the 30 second sample results being above the MAC.

The 2 minute and 5 minute samples from 18DC20 contained concentrations of total lead less than the GCDQG MAC.

Sampling locations are shown on Figure 1. Laboratory testing results for Dufferin Crescent Elementary School are summarized in the table below. The complete laboratory certificate is provided as Appendix B with Dufferin Crescent Elementary School results found on included lab report R2510579 on pages 3-4; lab report R2513683 pages 4-5, and lab report R2518420 on page 3.

Table 1: Laboratory Testing Results

Sample ID	Sample Date	MAC	Total Lead (µg/L)
0 Second Samples			
18DC01-0s	1/29/2018	10 µg/L	2.39
18DC02-0s	1/29/2018		3.87
18DC03-0s	1/29/2018		15.2
18DC04-0s	1/29/2018		12.2
18DC05-0s	1/29/2018		5.00
18DC06-0s	1/29/2018		8.40
18DC07-0s	1/29/2018		5.57
18DC08-0s	1/29/2018		21.0
18DC09-0s	1/29/2018		68.6
18DC10-0s	1/29/2018		0.52
18DC11-0s	1/29/2018		4.00
18DC12-0s	1/29/2018		2.32
18DC13-0s	1/29/2018		66.0
18DC14-0s	1/29/2018		7.26
18DC15-0s	1/29/2018		8.00
18DC16-0s	1/29/2018		3.03
18DC17-0s	1/29/2018		66.4
18DC18-0s*	1/29/2018		46.2
18DC19-0s	1/29/2018		8.56
18DC20-0s	1/29/2018		649
	2/13/2018	469	
30 Second Samples			
18DC03-30s	1/29/2018	10 µg/L	1.29
18DC04-30s	1/29/2018		1.23
18DC08-30s	1/29/2018		6.09
18DC09-30s	1/29/2018		1.23
18DC13-30s	1/29/2018		3.31
18DC17-30s	1/29/2018		4.38
18DC18-30s*	1/29/2018		4.91
18DC20-30s	1/29/2018		13.3
	2/13/2018	4.60	
2 Minute Samples			
18DC20-2m	2/13/2018	10 µg/L	4.00
5 Minute Samples			
18DC20-5m	2/13/2018	10 µg/L	5.80
Notes:	Grey Fill	Exceeds GCDQG MAC	
*duplicate sample 18DC18-0s and 18DC18-30s were collected at 18DC17-0s and 18DC17-30s respectively			

5.0 DISCUSSION AND RECOMMENDATIONS

Tetra Tech's sampling program was based upon guidance from the Ministry of Health, found in the document *Guidance on Controlling Corrosion in Drinking Water Distribution Systems* (2009). The rationale is that for each sampling point, if the pre-flush (0 second) sample (Tier 1) contained elevated lead concentrations, it could indicate that the faucet or fittings are the likely source of lead. If a subsequent 30 second flush sample (Tier 2) contained elevated lead concentrations, the source of the lead would likely be the piping (plumbing) leading to the faucet; whereas low lead concentrations in the 30 second sample would further indicate that the source was likely the faucet and fittings. Finally, a 5 minute flush sample (if required) should be drawing water directly from the water supply piping within the building and would indicate if flushing is feasible for lowering the lead concentration in water within the building.

The Health Canada guidance recommend that Tier 2 sampling (30 second samples) take place when Tier 1 sampling identifies more than 10% of sites with lead concentrations above the MAC, and then only at the 10% of sampling sites with the highest lead concentration. Rather, Tetra Tech ran every 30 second sample for locations where the 0 second sample was above the MAC to show that flushing was adequate to lower the lead concentration in the drinking water at each point of concern.

The guidance from the Ministry of Health recommended that samples be collected after the sampling points had been stagnant for a minimum of 8 hours but not longer than 24 hours in order to simulate the worst case daily scenario for lead in drinking water consumption. Based on guidance from VIHA, SD 68 directed Tetra Tech to collect samples Monday mornings prior to any staff or students arriving at the facilities in order to simulate a worst-case scenario for stagnant water. As such, lead concentrations reported represent what could be expected following a weekend and would likely be lower on subsequent weekday mornings.

Seven of the 19 pre-flush (0 second) samples collected at Dufferin Crescent Elementary contained concentrations of lead exceeding the GCDQG MAC. Sample location 18DC20 exceeded the GCDQG MAC for the 30 second sample, however only on the January 29th sampling event and not the February 13th sampling event. The reduction could be a result of water being run through a normally stagnant line. Two and 5 minute samples from 18DC20 did not exceed the GCDQG MAC. Because after re-sampling all locations had concentrations of lead that were below the MAC at either the 0 second or 30 second timeframe, the main water distribution infrastructure at Dufferin Crescent Elementary is not likely the source of the lead. Rather, the faucets/fittings at 18DC03, 18DC04, 18DC08, 18DC09, 18DC13, 18DC17 and 18DC20 are the likely sources at these locations.

18DC20, collected from a sink in the second floor seminar room, contained concentrations of lead in the 0 second sample of 649 µg/L (January 29th, 2018) and 469 µg/L (February 13th, 2018); 65 and 57 times the MAC for total lead. This high concentration indicates that the faucet/fittings at 18DC20 is likely a substantial source of lead at this location..

During sample collection, Tetra Tech noted signage throughout the facility stating "Water Quality – First thing in the morning... Run the water for two minutes before drinking. Throughout the day... Let the water run until it is cold before drinking." Tetra Tech recommends that this signage be maintained at each point where drinking water could be consumed and that this procedure continues to be followed as it promotes drinking water safety awareness. In most sample locations the flushing process recommended in the signage is adequate to lower any initial lead concentrations.

At Dufferin Crescent Elementary School duplicate samples 18DC18-0s and 18DC18-30s were collected at 18DC17-0s and 18DC17-30s respectively. The RPD for the two sample pairs submitted were 35.9% (0 second sample) and 11.4% (30 second sample). The RPD for the 0 second sample pair is higher than the 30% screening threshold as recommended by BC Ministry of Environment Q&A, and BC Environmental Laboratory Manual. Tetra Tech suspects that the highest lead concentration is likely found within the first 10 ml of water; even following duplicate collection protocols in this situation, with two 120 ml bottles filled at 0s it is possible that the water in the duplicate sample missed the highest slug concentration. Given the possibility of sample variability, Maxxam's internal QA/QC process; and that the 30 second duplicate pair and remaining duplicate samples collected throughout the program have generally met the 30% screening threshold, Tetra Tech considers the analytical results to be valid and re-sampling not necessary.

6.0 SUMMARY AND CONCLUSIONS

Seven pre-flush (0 second) samples (18DC03, 18DC04, 18DC08, 18DC09, 18DC13, 18DC17 and 18DC20) collected at Park Avenue Elementary contained concentrations of total lead greater than the GCDWQ MAC of 10µg/L (0.010 mg/L). After re-sampling, most of the previously noted samples had concentrations of lead below the MAC in the corresponding 30 second samples.

Sample 18DC20, collected from a sink in the second floor seminar room contained concentrations of lead in the 0 second samples which were 65 times (January 29th, 2018) and 57 times (February 13th, 2018) the MAC for total lead. This high concentration indicates that the faucet/fittings at 18DC20 is likely a substantial source of lead at this location; and Tetra Tech recommends that the faucet be replaced.

Tetra Tech recommends that SD 68 continue with its ongoing procedure of conducting a 2 minute flush at each drinking water consumption point each morning; and running taps/faucets until cold prior to consuming water. Signage stating "Water Quality – First thing in the morning... Run the water for two minutes before drinking. Throughout the day... Let the water run until it is cold before drinking" should be maintained at all water consumption points.

Tetra Tech recommends that the facility be inspected on a routine basis to ensure that the above noted signage is present and in good condition at each point where drinking water could be consumed. Tetra Tech further recommends that a bulletin be provided to staff summarizing the drinking water quality results at the facility and reminding them of the above procedure. Staff should then instruct students and visitors in the drinking water procedure.

7.0 CLOSURE

This report has been prepared based on the scope of work and for the use of School District 68, which includes distribution as required for the purposes for which this assessment was commissioned. The assessment has been carried out in accordance with generally accepted professional practice. No other warranty is made, either express or implied. Professional judgment has been applied in developing the recommendations in this report.

This report was prepared by personnel with professional experience in investigations of this nature and who specifically conducted the investigations at this Site. Reference should be made to the 'Geoenvironmental Report – Limitations on the Use of this Report' attached in Appendix A that forms a part of this report.

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.



Darren Thomas, B.A.Sc., EIT.
Environmental Engineer
Environment Practice
Direct Line: 250.756.3966 x229
Darren.Thomas@tetrattech.com



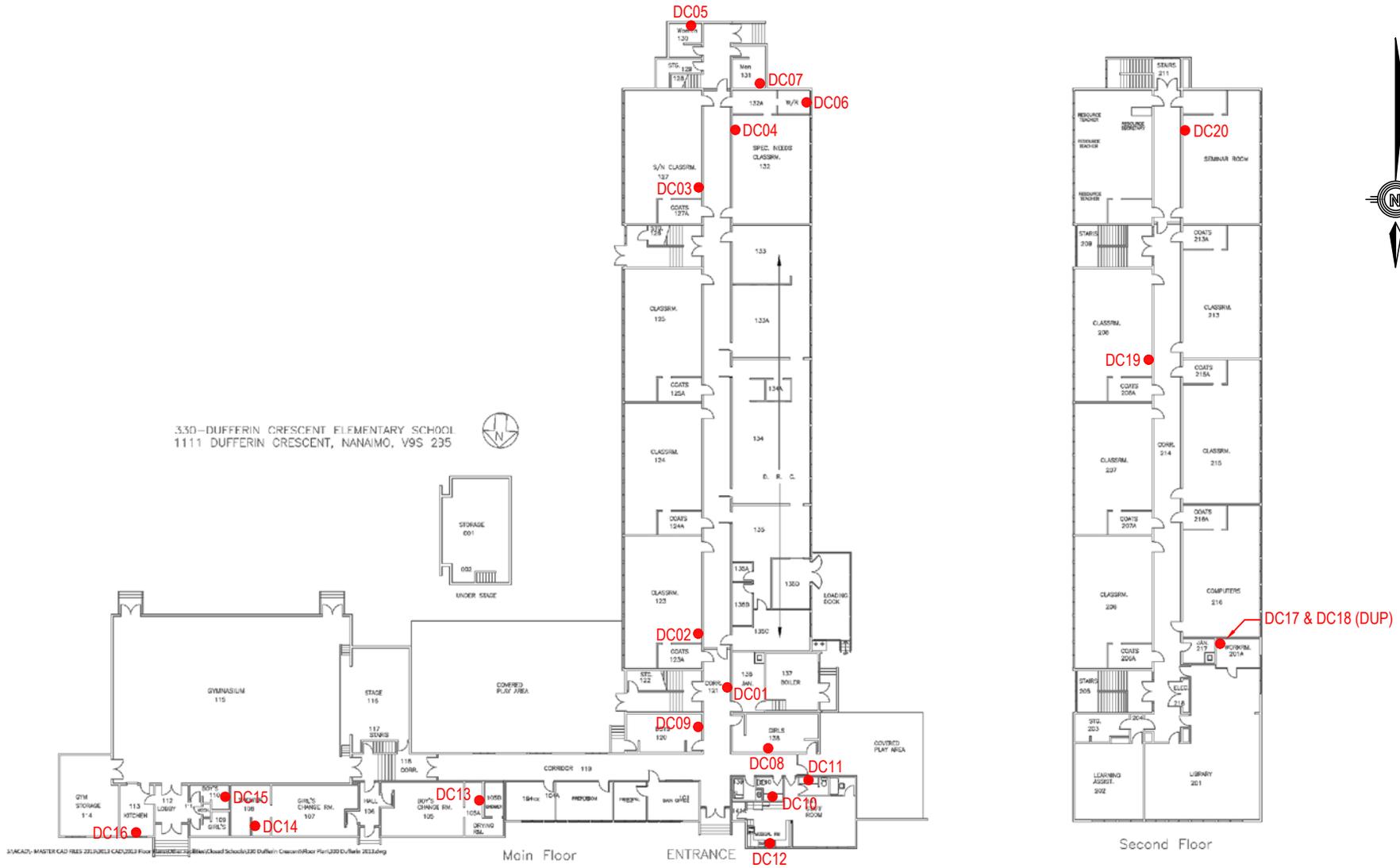
Nigel Cavanagh, M.Sc., R.P.Bio., P.Biol.
Senior Aquatic Biologist
Environment Practice
Direct Line: 250.756.3966 x240
Nigel.Cavanagh@tetrattech.com

/dr

Attachments: Figure 1 - Dufferin Crescent Elementary School Sample Locations
Appendix A - Limitations on the Use of this Document
Appendix B - Laboratory Report

FIGURES

Figure 1 Dufferin Crescent Elementary School Sample Locations



LEGEND:
● - SAMPLE LOCATION

NOTES
BASED ON DRAWING PROVIDED BY CLIENT
DRAWING IS NOT TO SCALE

CLIENT
SCHOOL DISTRICT NO 68

**DOMESTIC WATER TESTING
LEAD INVENTORY**

**330 - DUFFERIN CRESCENT ELEMENTARY SCHOOL
1111 DUFFERIN CRESCENT, NANAIMO BC**

STATUS
ISSUED FOR USE



PROJECT NO. ENW.VENW03150-01	DWN MRV	CKD DT	REV 0
OFFICE EDM	DATE February 1, 2018		

Figure 1

APPENDIX A

LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner

consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by persons other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary investigation and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.



APPENDIX B

LABORATORY REPORT

Your Project #: ENW.VENW03150-01
Site Location: 2018 DRINKING WATER

Attention: Darren Thomas

TETRA TECH CANADA INC.
#1 - 4376 BOBAN DRIVE
NANAIMO, BC
Canada V9T 6A7

Your C.O.C. #: 541404-04-01, 541404-05-01, 541404-06-01

Report Date: 2018/02/21
Report #: R2518420
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B811302

Received: 2018/02/14, 08:25

Sample Matrix: DRINKING WATER
Samples Received: 24

Analyses	Date		Laboratory Method	Analytical Method
	Quantity	Extracted		
Elements by CRC ICPMS (total)	19	N/A	2018/02/15 BBY7SOP-00003,	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	N/A	2018/02/16 BBY7SOP-00003,	EPA 6020b R2 m
Elements by CRC ICPMS (total)	4	N/A	2018/02/17 BBY7SOP-00003,	EPA 6020b R2 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your Project #: ENW.VENW03150-01
Site Location: 2018 DRINKING WATER

Attention: Darren Thomas

TETRA TECH CANADA INC.
#1 - 4376 BOBAN DRIVE
NANAIMO, BC
Canada V9T 6A7

Your C.O.C. #: 541404-04-01, 541404-05-01, 541404-06-01

Report Date: 2018/02/21
Report #: R2518420
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B811302
Received: 2018/02/14, 08:25

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Letitia Prefontaine, B.Sc., Senior Project Manager
Email: LPrefontaine@maxxam.ca
Phone# (604)639-2616

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B811302
Report Date: 2018/02/21

TETRA TECH CANADA INC.
Client Project #: ENW.VENW03150-01
Site Location: 2018 DRINKING WATER
Sampler Initials: DT

ELEMENTS BY ATOMIC SPECTROSCOPY (DRINKING WATER)

Maxxam ID			SY6838	SY6839	SY6840	SY6841	SY6842	SY6843		
Sampling Date			2018/02/13 07:30	2018/02/13 07:30	2018/02/13 07:30	2018/02/13 07:30	2018/02/05 00:00	2018/02/05 01:00		
COC Number			541404-04-01	541404-04-01	541404-04-01	541404-04-01	541404-04-01	541404-04-01		
	UNITS	MAC	DC20-0S	DC20-30S	DC20-2MIN	DC20-5MIN	SD05-30S	CI01-30S	RDL	QC Batch

Total Metals by ICPMS										
Total Lead (Pb)	ug/L	10	469	4.60	4.00	5.80	6.11	3.33	0.20	8911897
No Fill	No Exceedance									
Grey	Exceeds 1 criteria policy/level									
Black	Exceeds both criteria/levels									
RDL = Reportable Detection Limit										

Maxxam ID			SY6844	SY6845	SY6846	SY6847	SY6848	SY6849		
Sampling Date			2018/02/05 01:00	2018/02/05 01:00	2018/02/05 01:00	2018/02/05 01:00	2018/02/05 01:00	2018/02/05 01:00		
COC Number			541404-04-01	541404-04-01	541404-04-01	541404-04-01	541404-05-01	541404-05-01		
	UNITS	MAC	CI04-30S	CI07-30S	CI08-30S	CI09-30S	CI10-30S	CI13-30S	RDL	QC Batch

Total Metals by ICPMS										
Total Lead (Pb)	ug/L	10	1.05	3.70	6.89	1.75	2.36	6.57	0.20	8911897
No Fill	No Exceedance									
Grey	Exceeds 1 criteria policy/level									
Black	Exceeds both criteria/levels									
RDL = Reportable Detection Limit										

Maxxam ID			SY6850	SY6851	SY6852	SY6853	SY6854	SY6855		
Sampling Date			2018/02/05 01:00	2018/02/05 01:00	2018/02/05 01:00	2018/02/05 01:00	2018/02/05 03:00	2018/02/05 03:00		
COC Number			541404-05-01	541404-05-01	541404-05-01	541404-05-01	541404-05-01	541404-05-01		
	UNITS	MAC	CI12-30S	CI14-30S	CI15-30S	CIDUP-30S	UP01-30S	UP04-30S	RDL	QC Batch

Total Metals by ICPMS										
Total Lead (Pb)	ug/L	10	3.35	5.71	3.57	3.40	3.94	1.08	0.20	8911897
No Fill	No Exceedance									
Grey	Exceeds 1 criteria policy/level									
Black	Exceeds both criteria/levels									
RDL = Reportable Detection Limit										

Maxxam Job #: B811302
Report Date: 2018/02/21

TETRA TECH CANADA INC.
Client Project #: ENW.VENW03150-01
Site Location: 2018 DRINKING WATER
Sampler Initials: DT

ELEMENTS BY ATOMIC SPECTROSCOPY (DRINKING WATER)

Maxxam ID			SY6856		SY6857	SY6859	SY6860	SY6861		
Sampling Date			2018/02/05 03:00		2018/02/05 03:00	2018/02/05 03:00	2018/02/05 03:00	2018/02/05 03:00		
COC Number			541404-05-01		541404-05-01	541404-06-01	541404-06-01	541404-06-01		
	UNITS	MAC	UP05-30S	QC Batch	UP06-30S	UP09-30S	UP10-30S	UP11-30S	RDL	QC Batch

Total Metals by ICPMS										
Total Lead (Pb)	ug/L	10	6.26	8911897	1.50	4.36	2.35	3.53	0.20	8911922
No Fill	No Exceedance									
Grey	Exceeds 1 criteria policy/level									
Black	Exceeds both criteria/levels									
RDL = Reportable Detection Limit										

Maxxam Job #: B811302
Report Date: 2018/02/21

TETRA TECH CANADA INC.
Client Project #: ENW.VENW03150-01
Site Location: 2018 DRINKING WATER
Sampler Initials: DT

ELEMENTS BY ATOMIC SPECTROSCOPY (DRINKING WATER)

Maxxam ID			SY6862		
Sampling Date			2018/02/05 03:00		
COC Number			541404-06-01		
	UNITS	MAC	UP13-30S	RDL	QC Batch
Total Metals by ICPMS					
Total Lead (Pb)	ug/L	10	1.09	0.20	8911922
No Fill	No Exceedance				
Grey	Exceeds 1 criteria policy/level				
Black	Exceeds both criteria/levels				
RDL = Reportable Detection Limit					

Maxxam Job #: B811302
Report Date: 2018/02/21

TETRA TECH CANADA INC.
Client Project #: ENW.VENW03150-01
Site Location: 2018 DRINKING WATER
Sampler Initials: DT

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	2.7°C
-----------	-------

MAC: The guidelines that have been included in this report have been taken from the Canadian Drinking Water Quality Summary Table, February 2017.

Criteria A = Maximum Acceptable Concentration (MAC) / Criteria B = Aesthetic Objectives (AO) / Criteria C = Operational Guidance Values (OG)
It is recommended to consult these guidelines when interpreting your data since there are non-numerical guidelines that are not included on this report.

Turbidity Guidelines:

1. Chemically assisted filtration: less than or equal to 0.3 NTU in 95% of the measurements or 95% of the time each month. Shall not exceed 1.0 NTU at any time.
2. Slow sand / diatomaceous earth filtration: less than or equal to 1.0 NTU in 95% of the measurements or 95% of the time each month. Shall not exceed 3.0 NTU at any time.
3. Membrane filtration: less than or equal to 0.1 NTU in 99% of the measurements made or at least 99% of the time each calendar month. Shall not exceed 0.3 NTU at any time.

Results relate only to the items tested.

Maxxam Job #: B811302
Report Date: 2018/02/21

QUALITY ASSURANCE REPORT

TETRA TECH CANADA INC.
Client Project #: ENW.VENW03150-01
Site Location: 2018 DRINKING WATER
Sampler Initials: DT

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8911897	Total Lead (Pb)	2018/02/15	NC	80 - 120	103	80 - 120	<0.20	ug/L	3.0	20
8911922	Total Lead (Pb)	2018/02/16	99	80 - 120	102	80 - 120	<0.20	ug/L		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

Maxxam Job #: B811302
Report Date: 2018/02/21

TETRA TECH CANADA INC.
Client Project #: ENW.VENW03150-01
Site Location: 2018 DRINKING WATER
Sampler Initials: DT

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rob Reinert, B.Sc., Scientific Spécialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



B811302_COC

INVOICE TO:		Report Information		Project Information	
Company Name	#1433 TETRA TECH CANADA INC	Company Name	Shawneen Walker <i>Shawneen Walker</i>	Quotation #	B71611
Contact Name	<i>Shawneen Walker</i>	Contact Name	<i>Shawneen Walker</i>	P.O. #	
Address	#1 - 4376 BOBAN DRIVE NANAIMO BC V9T 6A7	Address		Project #	ENW.VENW03140-01
Phone	(250) 756-2256 x	Phone	<i>Shawneen Walker</i>	Project Name	<i>SRS de tetra</i>
Email	<i>smwalker@tba.ca</i> ; EBA.Labdata@tetratech.com	Email	<i>smwalker@tba.ca</i> ; EBA.Labdata@tetratech.com	Site #	
				Sampled By	<i>Shawneen Walker</i>

Only

Bottle Order #:

541404

Chain Of Custody Record

Project Manager

Letitia Prefontaine

Regulatory Criteria:	Special Instructions	ANALYSIS REQUESTED (PLEASE BE SPECIFIC)	Turnaround Time (TAT) Required:
<input type="checkbox"/> CSR <input type="checkbox"/> CCME <input type="checkbox"/> BC Water Quality <input checked="" type="checkbox"/> Other <i>Health Canada</i>			Please provide advance notice for rush projects Regular (Standard) TAT: (will be applied if Rush TAT is not specified): Standard TAT = 5-7 Working days for most tests. Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered? (Y/N)	Lead - Drinking Water	# of Bottles	Comments
1	UP09-30s	18/02/14	08:00	Water	X		(
2	UP10-30s	↓	↓	Water	X		(
3	UP11-30s	↓	↓	Water	X		(
4	UP13-30s	↓	↓	Water	X		(
5								
6								
7								
8								
9								
10								

RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only
<i>Shawneen Walker</i>	18/02/14	08:00	<i>JULIO PEDRO THOR</i>	20/02/14	08:35		Time Sensitive <input type="checkbox"/> Temperature (°C) on Receipt 2,3,3 Custody Seal Intact on Cooler? <input type="checkbox"/> Yes <input type="checkbox"/> No <i>N/A</i>

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.
 * IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.