CHEMTECH CONSULTANCY LTD | AWT WATER & ENVIRONMENTAL SERVICES

LEGIONELLA RISK ASSESSMENT

DOMESTIC WATER SYSTEMS

CUSTOMER: NORTH LANARKSHIRE COUNCIL

SITE: ST AMBROSE & BUCHANAN HIGH SCHOOL

SURVEYED BY: ALAN WATSON B.SC.(Hons) F.W.M SOC & ALAN PURDON B.ENG. M.W.M SOC

SURVEY DATE: 16TH – 18TH SEPTEMBER 2019

(Non-technical abbreviated version)

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Please note this is an abridged version of the full risk assessment and should not be considered in isolation. Copy of the full versions may be requested from North Lanarkshire Council

1. EXECUTIVE SUMMARY AND RISK IDENTIFICATION

AIM OF THE RISK ASSESSMENT

The aim of this risk assessment is to enable the responsible person to make an informed decision regarding the adequacy of the precautions currently in place to minimise the risk to health from legionellosis to both building occupants and the general public.

INITIAL OVERVIEW AND ASSESSMENT

ChemTech Consultancy Ltd was commissioned by Chris Sullivan of North Lanarkshire Council to carry out a Legionella Risk Assessment at St Ambrose and Buchanan High Schools. During this assessment we were assisted by site staff who showed us around the property, explained the water systems on site and kindly donated their time to answer our questions regarding the management systems in place and the location of all records necessary to complete the Management section of this assessment.

St Ambrose and Buchanan High Schools are located on Townhead Road near Drumpellier Country Park and was opened in November 2012. The school sits alongside Buchanan High School and Townhead Community Centre. Up to 1250 pupils attend St Ambrose High with a further 101 pupils in attendance at Buchanan High. There is thought to be around 150 staff employed at the site. Buchanan High school caters for children with additional needs, some of whom may fall into the higher risk category. Due to the age range of staff present along with the possibility of many of these staff being smokers they may also fall into this category.

System Description
Mains water enters the property in the Tank Room located in the St Ambrose High Physical Education wing (ground floor). The Mains provides the make ups for the site's two 15000L (nominal capacity) GRP cold water storage tanks before supplying all staff sinks and various other outlets throughout the building. Cold water from the tanks is boosted via the Boiler Room pump set, supplying the cold feeds to the two hot water cylinders, and the majority of cold water on site. All hot water on site is supplied from the two 3000 litre calorifiers. The cylinders are provided with a secondary return system and anti-stratification equipment. An additional cold water storage tank is located on the 2nd floor in the Science Wing plant room for the purpose of providing Category 5 protection for the laboratory area sinks.

Cold Water System
Inspection of the site cold water storage tanks revealed satisfactory conditions, with only light sediment noted at the base of all tanks. Temperature monitoring indicated that satisfactory water turnover is occurring within CWST 2 and Lab CWST 3. Tank 2 appears to be the lead tank, and is inadvertently carrying out the majority of the duty. As a result, Tank 1 is demonstrating a higher storage temperature due to poor turnover and is susceptible to stagnation and heat gain. It was noted that hollow support pipes are present within Tanks 1 and 2, and these should be replaced due to the potential for stagnant water to pool inside these, increasing the possibility of biofilm formation. Inspection of the Laboratory tank revealed that, due to the positioning of the tank inlet, this does not currently satisfy the criteria for a Category 5 tank. The inlet should be repositioned and located at the raised chamber above the position of the weir overflow.

Cold water temperatures varied across the systems, with significant heat gain noted at extremity points and in low use areas. This is most likely the result of low turnover, thermal gain from a high ambient temperature and some very long pipe runs within the building. Ideally, high use outlets should be positioned at the extremity points on the systems to encourage water turnover. Long pipework runs to few or single outlets should be avoided where possible, for example, the 1st floor Home Economics and Art areas contains few outlets supplied from the boosted cold water system, with the majority of cold water being supplied from the Mains water service. This is resulting in

significant heat gain occurring due to low turnover, and consideration should be given to converting all outlets in this area to Mains should the pressure be sufficient. The cold water outlets to the Art Room sinks are supplied from the Hydrotherapy area below, and due to the particularly high ambient temperature, the degree of heat gain is more significant than in other areas. As a first course of action, all cold pipework should be provided with adequate insulation in an attempt to reduce heat gain. Secondly, should elevated cold temperatures persist, the cold and Mains water pipework should be strategically reconfigured to encourage water turnover.
Finally, consideration may have to be given to the installation of a chlorine dioxide dosing system to assist with microbiological control at cold water far points should temperature profiles not be reduced to be below 20ºC.

Hot Water System
The site calorifiers were inspected and found to be storing hot water at a temperature of approximately 63°C, with a secondary return temperature of 54°C also being maintained. Despite the acceptable temperatures noted on the principle loop, it was noted that various subordinate loops were failing to circulate effectively. As a result, low hot water supply temperatures were recorded in specific areas across the site (i.e. Community Centre, 1st Floor Art Department, 1st floor Home Economics Hospitality, 1st floor staff toilets above reception, 2nd Floor RE Wing, 2nd Floor Greenhouse and 2nd Floor Modern Languages Base). This must be investigated further as this could be the result of an incorrectly balanced secondary return system. Temperatures should continue to be recorded at the sentinel points identified within this risk assessment to ensure that the circulatory system is providing an effective thermal control regime. This problem of balancing the secondary circuit is a common one and not unusual for a building of this size.

System Condition
Inspection of the pipework on site revealed that the cold-water pipework is currently uninsulated throughout although a programme of insulation is now underway. All copper pipework on cold water circuits has been replaced with UPVC. Due to the positioning of the pipework above warm rooms and adjacent to hot pipes, significant heat gain is occurring. It is recommended that all domestic pipework is insulated and provided with identification banding in accordance with BS1710. Dead leg pipework was observed in the 1-039 Health & Beauty Room where various outlets have been removed. Further investigation revealed that the hot flow, return and cold pipework have been capped in the corridor outside of the room reducing the length of redundant pipework to around 0.75 metres. These sections however must be cut back to the live system due the increased potential for bacterial growth and back contamination of the live systems. There is also new plastic cold pipework located in this area, and it could not be confirmed that this is not a live dead leg. It is recommended that an intrusive survey of all pipework ducts is undertaken to establish and confirm that no dead legs have been left following the changeover or from the original installation. It was noted that several dead legs have been created in disabled toilets where the hot supply pipework has been isolated (see Hot and Cold Outlets Section) It is believed that these have been isolated due to loosely fitting taps being unable to cope with the water pressure and flooding the areas, and this should be remedied as soon as possible.

Management
There are paper records on site relating to the management of the water systems indicating that temperature monitoring and shower head disinfection have been in place since November 2013 and October 2018. Electronic records are also in existence demonstrating sentinel temperature checks and shower head disinfections between August 2018 and September 2019. Although some control measures are in place this is not a complete program of measures. We would refer you to Section 10 where the full control scheme is described. It is recommended that a new monitoring schedule is developed and implemented, using the findings of this risk assessment and the sentinel points identified as the current Control Scheme only has one hot water and one cold water sentinel point which do not reflect the size or complexity of the building. There were no records found for the regular flushing of the low use outlets identified as part of this assessment. This should be instigated, and records maintained of the location, date and name of the person carrying out the

work. The completion of a non-conformance log is present in the electronic logbook and should be maintained to ensure all corrective actions are recorded and signed off once the necessary measures have been taken.

Although many control measures are in place there was no suitable Legionella Policy available at the time of inspection, this should be developed to describe the course of action that you will undertake to ensure compliance with ACoP L8:2013 and HSG 274. Additionally, to ensure clarity of understanding of each person's role within the defined company legionella policy, a full written definition, detailing the specific roles and responsibilities of each position, should be created.

The person occupying this position should then sign to show that they understand these roles and responsibilities. Regular audits are an excellent way of ensuring that the current risk assessment is still valid, all control measures are in place, remedial actions are being carried out in a timeous manner and all staff training is up to date. It is recommended that this should be carried out each year when a risk assessment is not being carried out.

Due to the operational periods of the site, please ensure that the operating instructions for all plant and equipment, including start-up and shut-down procedures, are included in your written scheme. If it is decided to enter into an agreement with a sub-contractor it is essential that an 'Allocation of responsibilities' document, or similar, is created and signed by each party to ensure that all tasks and control measures are assigned along with the frequencies that each task should be completed. A communication matrix should be created and provided with the current details of all parties/persons involved in the management of the water systems.

There is Hydrotherapy pool on site which is fitted with a filtration system including sand filters and an automatic chlorine dosing system. Currently the site complete daily pH and free chlorine checks, records were only available from April 2019. In addition a weekly backwash is completed via the sand filters, all actions are recorded. PWTAG recommends that microbiological sampling should be carried out of the pool on at least a weekly basis, given that the people who are using them may be more prone to infection that other persons. This should be put in place as soon as possible.

NB – The overall risk has been assessed as MEDIUM/HIGH due to the temperatures recorded on the hot and cold water systems and the lack of flushing records. A building of this type i.e. High School would typically return a MEDIUM risk. Following the completion of the remedial works, and the implementation of an appropriate Control Scheme, this risk could be reduced to MEDIUM.

IDENTIFICATION AND THE ASSESSMENT OF RISK

Each system section is accompanied by an explanation of the risk found with the actual risk detailed and reported based on the grading system below. This will enable the responsible person to prioritise future actions in conjunction with the remedial actions detailed in this document.

We have designated all of the areas of non-compliance into 3 categories.

LOW RISK	MEDIUM RISK	HIGH RISK
Action to be taken within a year. If not possible to do so, then put on a rolling programme	Action to be taken as soon as is practically possible.	Immediate action is required

ACTUAL RISK	MEDIUM/HIGH

NB – The overall risk has be assessed as MEDIUM/HIGH due to the temperatures recorded on the hot and cold water systems and the lack of flushing records. A building of this type i.e. High School would typically return a MEDIUM risk. Following the completion of the remedial works, and the implementation of an appropriate Control Scheme, this risk could be reduced to MEDIUM.

The Risk Assessor has used the risk factors detailed below to assess the overall risk of the system covered by this assessment. The "actual" relates to the current risk of this system to cause legionellosis.

Contamination – This is an assessment of the risk of the water source, including the quality, temperature and integrity of the water supply.

Amplification – this is an assessment of the likelihood that Legionella will proliferate, including an assessment of conditions such as the temperature, water change rate, areas of stagnant or slow water movement and how conducive the conditions are to microbial growth.

Transmission – this is an assessment of whether droplets or aerosols are likely to form and spread.

Exposure – this is an assessment of the risk that droplets or aerosols will be inhaled (or contaminated water aspirated)

Susceptibility of Individuals Exposed – this is an assessment of the nature of the exposed population, taking account of their vulnerability to legionella infection.

2. SYSTEM REGISTER

SYSTEMS REGISTER

	No of Systems / units present	Risk of Legionellosis
Legionella Management Systems	1	Medium
Town Mains Cold Water Supply	1	Low
Cold Water Storage Tank(s)	3	Medium
Domestic Cold Water Distribution Systems	2	Medium
Calorifier(s)	2	Medium
Combi Boiler	-	-
Stored Hot Water Heaters (15 litres or more)	-	-
Stored Hot Water Heaters (less than 15 litres)	-	-
Domestic Hot Water Distribution Systems	1	Medium
Showers (Individual number)	80	Medium/High
Closed Central Heating Systems	1	Not Assessed – Closed System
Wet Fire Fighting Systems	1 – Fire Tank and Sprinkler System	Low
Emergency Showers / Eye Washes	-	-
Spa Baths / Whirlpools	-	-
Air Humidification Systems	-	-
Vehicle Washes	-	-
Closed Chilled Water Systems	-	-
Machine Coolants	-	-
Ornamental Water Features	-	-
Water Softening Equipment	-	-
Other 'At-Risk' Systems	-	-
Hydrotherapy Pool	1	Medium /Low

SYSTEM IDENTIFICATION

Below is a list of all of the water systems identified on site, what supplies each system and what they in turn feed.

System ID Number	1	System Type	Town Mains	Asset Location	PE Wing Tank Room
System supplies	This system is fed from Town Mains and provides the make ups to the cold water storage tanks in addition to supplying various cold water outlets on site, mainly staff rooms and drinking water outlets.				

System ID Number	2	System Type	Boosted Stored Cold Water	Asset Location	PE Wing Tank Room
System supplies	This system is fed from the two cold water storage tanks on site and supplies the cold feed for the calorifiers in addition to the boosted water supply to the majority of cold outlets on site.				

System ID Number	3	System Type	Stored Hot Water	Asset Location	PE Wing Boiler Room
System supplies	This system is fed from the two hot water calorfiers on site and supplies all hot water on site.				

System ID Number	4	System Type	Boosted Stored Cold Water	Asset Location	2nd Floor Science Plant Room
System supplies	This system is fed from the Science plant room cold water storage tank and supplies the science wing laboratory sinks only.				

REVIEW POLICY

The record of the assessment is a living document that must be reviewed to ensure it remains up-to-date. Arrange to review the assessment regularly and specifically whenever there is reason to suspect it is no longer valid. For example, the risk assessment for a new construction ought to be performed before commissioning, but then reviewed when the system has been operating normally for several weeks or months. An indication of when to review the assessment and what to consider should be recorded. This may result from, eg:

(a) changes to the water system or its use;
(b) changes to the use of the building in which the water system is installed;
(c) the availability of new information about risks or control measures;
(d) the results of checks indicating that control measures are no longer effective;
(e) changes in key personnel;
(f) a case of legionnaires' disease/legionellosis associated with the system.

Question		Answer
1.	Is there any stored cold water on site?	Yes
2.	Is there any stored hot water on site?	Yes
3.	Are there any showers / spray outlets on site?	Yes
4.	Could the showers / spray outlets be used by any people who may be more susceptible / at risk?	Yes
5.	Is micro-biological sampling *required* at site?	No
6.	Have there been any positive results from the sampling?	No
7.	Is the water source other than the towns' mains?	No
8.	Are there any recommendations from High Risks regarding the water source?	No
9.	Are there any recommendations from High Risks regarding the Cold Water Storage Tank(s)?	No
10.	Are there any recommendations from High Risks regarding the water heater(s)?	No
11.	Are there any recommendations from High Risks regarding the outlets / pipework?	Yes
12.	Are there any other at risk water systems present?	Yes
13.	Has the overall risk been assessed as High?	No
14.	Have any parts of the Written Scheme still to be implemented? (If no Written Scheme answer yes)	Yes
15.	Is the Legionella Policy missing?	Yes

The answers from the above list help us to determine the length of time between this assessment and the next review. 12+ yes answers would say that this assessment should be reviewed in 12 months to ensure the high risk actions have been resolved. Up to only 2 yes answer would indicate that the system is very low risk and does not need to be reviewed as is. All other response numbers should be reviewed in 2 years' time as best practice.

Assessment Recommended Review Date -	18th September 2021
Annual Audit as per HSE Audit Checklist to be carried out no later than -	18th September 2020

3. CONTROL SCHEME

CONTROL SCHEME

MANAGEMENT

ACTION	(✓) / (x) / N/A
Formulate a legionella policy.	x
Formulate a Written Scheme (including a Planned Preventative Maintenance program) specific for the building and implement logbook system in accordance with L8.	X – Parts of the Written Scheme still require to be implemented
Schematic drawings provided as part of Risk Assessment	Not required – site pipework drawings have been updated during September 2019.
Implement a review of training required for relevant site & management personnel.	x
Formalise reporting / organisational responsibility charts.	x
Appoint deputies and establish communication lines.	x
Label plant, valves and services including sentinel points.	x
Ensure that all materials used in domestic water system are WRC approved.	✓
Annual review of L8 Legionella Management & Control programme.	x
Biennial or regular review of L8 Risk Assessment.	✓
Implement PPM – Planned Preventative Maintenance	✓

(✓) Indicates that client currently undertakes this control measure
(x) Indicates that client has still to implement this control measure
N/A Not applicable

COLD WATER STORAGE TANKS

ACTION	(✓) / (x) / N/A
Alternate CWST booster pumps weekly	X – Ensure that the pumps are set to change over automatically.
Measure temperatures at Cold Water Storage Tank(s) 6 monthly	✓
Inspect Cold Water Storage Tank(s) annually and clean and disinfect as required	✓
Turnover test to be carried out routinely	x

WATER HEATERS

ACTION	(✓) / (x) / N/A
Alternate hot water service secondary circulation pumps weekly	N/A – Single Pump
Check De-stratification pump is working correctly monthly	x
Measure the calorifier incoming cold pipe, base - middle and top on the shell of the calorifier, hot water flow pipe and hot water return pipe temperatures monthly	x
Purge water from calorifier base until clear at least on an annual basis	x
Flush expansion vessels monthly and purge to drain where practical	x
Measure the combination water heater incoming cold pipe, top stored cold section, and hot water flow pipe monthly	N/A
Test accuracy of temperature gauges annually	x
Open & inspect calorifier internally annually where accessible.	x
Where internal inspection is not possible annual pasteurisation be carried out	N/A

(✓) Indicates that client currently undertakes this control measure
(x) Indicates that client has still to implement this control measure
N/A Not applicable

OUTLETS

ACTION	(✓) / (x) / N/A
Flush all outlets in unoccupied areas weekly	x
Measure all cold sentinel points, including input to TMV, if fitted, monthly	x
Measure all hot sentinel points, including input to TMV, if fitted, monthly	x
Measure distribution temperatures at the non-sentinel cold outlets annually	x
Measure distribution temperatures at the non-sentinel hot outlets annually	x
Ensure all shower heads & hoses are de-scaled and disinfected quarterly	✓
Inspect pipework and insulation to ensure all are okay annually	x
Service Thermostatic Mixing Valves (TMVs), Thermostatic Mixing Taps (TMTs) or mixer valves to ensure correct operation and calibration annually	x
Inspect all tap heads for signs of scaling annually	x
Ensure whirlpool bath, pipework and jets are disinfected on a quarterly basis	N/A

Hydrotherapy Pool

ACTION	(✓) / (x) / N/A
Create Normal Operating Procedures document	x
Create Emergency action plan to deal with accidents and gross contamination	x
Create schematic layout of unit with exploded view	x

(✓) Indicates that client currently undertakes this control measure
(x) Indicates that client has still to implement this control measure
N/A Not applicable

MANDATORY SAMPLING REGIME

Bacterial Sampling	No. Of Samples	Recommended frequency
TVC, E. Coli and Coliform Sampling	-	-
Cold Water Storage Tanks	-	-
Natural Water Source	-	-
Swimming Pool	-	-
Hydrotherapy Pool	1	Weekly

Legionella Sampling	No. Of Samples	Recommended Minimum Frequency
Hydrotherapy Pool	1	Quarterly

RECOMMENDED SAMPLING REGIME

Legionella Sampling	No. Of Samples	Recommended Minimum Frequency
From CWSTs	3	Bi-annually
From Calorifier Drains	2	Annually
From outlets farthest from CWSTs 1&2	12	Bi-annually
From outlets farthest from CWSTs 3	1	Bi-annually
From outlets farthest from Calorifier	12	Bi-annually
From outlets closest to Calorifier	1	Bi-annually
From Showers (Hot and Cold)	11	Bi-annually
From Low Use Outlets	-	-

TVC, Coliform, E.coli Sampling	No. Of Samples	Recommended Minimum Frequency
From CWSTs	3	Bi-annually
From outlets farthest from CWST 1&2	12	Bi-annually
From outlets farthest from CWST 3	12	Bi-annually
From outlets farthest from Calorifier	12	/Bi-annually
From outlets closest to Calorifier	1	Bi-annually
From low use outlets	-	-

Please note:

1. Analysis of water samples for legionella and potable (TVC) quality should be carried out by a UKAS accredited laboratory. No composite samples should be taken.
2. All Legionella samples should be taken as per BS 7592:2008.

SECTION 4

RECOMMENDATIONS

HIGH RISK			
Section	**Recommendation**	**Person assigned to**	**Completed Date**
6	Ensure water is stored at 60˚C and returns at a minimum of 50˚C. Currently at significant risk of bacterial growth in areas where return system is not balanced correctly. ***(HSG 274 Part 2: Para 2.82 and Table 2.1)***		

MEDIUM RISK			
Section	**Recommendation**	**Person assigned to**	**Completed Date**
3	A site specific written scheme should be prepared to ensure that a full description of the preventative control measures and all documentation associated with the management of legionella are easily identifiable and that they detail the location where all documents are located. The written scheme should include; a copy of the company legionella policy, the current legionella risk assessment location and the status of all remedial works identified, the list of control measures required along with their frequencies and the operational parameters, the location of the schematic drawings for all water systems, a response document to show what actions should be taken in the event that the water system is not operating as designed and a detailed account of what will be audited, how often and by whom.		
3	Inadequate management, lack of training and poor communication are all contributory factors in outbreaks of Legionnaires' disease. It is therefore important that the people involved in assessing risk and applying precautions are competent, trained and aware of their responsibilities. A training plan for all appropriate staff should be prepared and reviewed regularly.		
3	Ensure that all control measures outlined in Section 10 Control Scheme are implemented at the recommended frequency.		
4	Please ensure that all mains water supplies to the wet fire system are separated by a double non return valve from all other mains feeds to the building. This could not be determined from pipework drawings. ***(Scottish Water Byelaws 2014)***		
5	Regular(annual) turn-over tests are required to determine the stored volume required. ***(HSG 274 Part 2: Para 2.36 and Scottish Water Byelaws 2014)***		
5	Adjust CWST valve arrangement to ensure that equal flow is occurring between tanks. Currently Tank 2 is operating as the lead vessel. ***(HSG 274 Part 2: Para 2.36 and Scottish Water Byelaws***		

	2014)		
5	Replace CWST hollow support pipes. These have been identified as a possible source of contamination due to the potential for water to stagnate internally within the pipes. ***(UK Department of Health Alert (EFA/2013/004))***		
5	Install drain valve on line to CWST Booster pump pressure vessel. ***(HSG 274 Part 2: Para 2.39)***		
4,5,6	Lag all accessible pipework to reduce any possible thermal gain or loss. ***(HSG 274 Part 2: Para 2.36)***		
6	Annually inspect calorifiers internally. ***(HSG 274 Part 2: Table 2.1)***		
7	Flush all rarely used outlets at least once per week for a minimum of 2 minutes and record this action once complete. ***(HSG 274 Part 2: Para 2.78)***		
7	Remove outlet and associated pipework of dead leg. Please refer to Hot & Cold Outlets section for location and details of dead legs. ***(HSG 274 Part 2: Para 2.77)***		
7	Ensure hot water outlet temperatures are in the 50-60°C range. Please refer to Hot & Cold Outlets section for temperatures. ***(HSG 274 Part 2: Table 2.1)***		
7	Ensure cold water outlet temperatures are below 20°C after 2 minutes through improved insulation and system design. Please refer to Hot & Cold Outlets section for temperatures. ***(HSG 274 Part 2: Para 2.6)***		
7	Please provide access to all TMVs. Please refer to Additional Comments within Hot & Cold Outlets section. ***(HSG 274 Part 2: Para 2.34)***		
7	Ensure TMVs are serviced as per manufacturer's instructions. ***(HSG 274 Part 2: Table 2.1)***		

LOW RISK			
Section	**Recommendation**	**Person assigned to**	**Completed Date**
4,5,6	Label all valves and all pipework wherever possible. ***(Scottish Water Byelaws 2014)***		
5	Reconfigure Laboratory Tank pipework and position inlet in raised chamber, above weir overflow. ***(Scottish Water Byelaws 2014)***		
6	Create access points and check the temperature at the top, middle and base of the calorifiers to determine any signs of stratification. ***(HSG 274 Part 2: Para 2.25)***		
6	Replace the pig-tail piece of pipe to the calorifier gauge with a piece of short, straight, copper pipe. ***(HSG 274 Part 2: Para 23)***		