



**LAKELAND INDUSTRY & COMMUNITY ASSOCIATION**

**Ambient Air Monitoring Program**

**Quality Assurance Plan**

Prepared for:  
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## 1.0 PURPOSE AND SCOPE

The Alberta Air Monitoring Directive (AMD) sets out the requirements for monitoring and reporting air quality in the province of Alberta and requires the development of a Quality Assurance Plans (QAP) to ensure a set of consistent requirements for the documentation, implementation and maintenance of an air monitoring network.

This document is the QAP for the Lakeland Industrial and Community Association (LICA) air and deposition monitoring network. Its purpose is to

- document the requirements for the control and management of documents and data;
- provide links to detailed methods and procedures for air quality measurements;
- provide links to detailed procedures to confirm performance requirements through calibration/maintenance activities and data validation/ verification process;
- identify the audits' requirements and procedures used to establish, maintain and report quality data; and
- provide corrective action protocols to continue evaluate effectiveness and improve quality system.

## 2.0 OVERVIEW

### 2.1 Background to LICA

The LICA airshed monitoring network consists of four continuous monitoring stations, twenty-six passive monitoring stations, two volatile organic compound (VOC) and polycyclic aromatic hydrocarbon (PAH) samplers, one partisol sampling station, six passive polycyclic aromatic compounds (PACs) sampling stations, and four meteorological tower monitoring stations. The network is mostly contained in the Cold Lake Oil Sands Region in eastern Alberta.

### 2.2 LICA Air Monitoring Stations

- Continuous ambient air quality monitoring network stations and integrated sampling stations are:

Station Name	Cold Lake South	Maskwa	St. Lina	Bonnyville East
Station ID	1174	1248	1250	1608
Coordinates	54.41402,	54.604935,	54.215961,	54.252747,
	-110.23316	-110.452637	-111.503304	-110.690611
Continuous Monitoring Parameter	SO2	√	√	√
	TRS	√		
	H2S		√	√
	THC	√	√	√
	CH4	√	√	√
	NMHC	√	√	√
	NOX	√	√	√
	NO	√	√	√
	NO2	√	√	√
	O3	√		√
	PM2.5	√		√
	TPX	√	√	√
	RH	√	√	√
	BP		√	√
	PRECIPTATION		√	√
	WS	√	√	√
	WD	√	√	√
STDWD	√	√	√	
Integrated Sampling	VOCs	√		√
	PAHs	√		√
	Partisol	√		
	Passive	√		
	NMHC Canister			√
	PAC			√

- Passive monitoring stations are:

Station ID	Name	Latitude	Longitude	Monitored Parameters
3	Therien	54.31085	-111.22607	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
4	Flat Lake	54.07262	-111.2051	SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
5	Lake Eliza	53.82417	-111.16605	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
6	Telegraph Creek	53.74068	-110.57655	SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
8	Muriel-Kehewin	54.0934	-110.74437	SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
9	Dupre	54.33462	-110.77965	SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
10	La Corey	54.49967	-110.81792	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
11	Wolf lake	54.69542	-110.84253	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
12	Foster Creek	55.03343	-110.50453	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
13	Primrose	54.75848	-110.45217	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
14	Maskwa	54.60518	-110.45263	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
15	Ardmore	54.4067	-110.46202	SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
16	Frog Lake	53.89065	-110.38418	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
17	Clear Range	53.55648	-110.15423	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
18	Fishing Lake	53.90295	-110.07623	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
19	Beaverdam	54.16925	-110.23285	SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
22	Cold Lake South (1)	54.4137	-110.23285	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
23	Medley-Martineau	54.7243	-110.06618	SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
24	Fort George	53.8783	-110.74807	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
25	Burnt Lake	54.79104	-110.33424	H <sub>2</sub> S, SO <sub>2</sub>
26	Mahihkan	54.63738	-110.57538	H <sub>2</sub> S, SO <sub>2</sub>
27	Mahkeses	54.59014	-110.38028	H <sub>2</sub> S, SO <sub>2</sub>
28	Town of Bonnyville	54.2753	-110.74065	SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
29	Cold Lake South (2)	54.41385	-110.23283	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
32	St. Lina	54.21639	-111.50295	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>
40	Portable (Bonnyville-East)	54.252747	-110.690611	H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub>

- PAC stations:

No.	Station Name	Latitude	Longitude
9	Dupre	54.334617	-110.77965
10	La Corey	54.499667	-110.817917
15	Ardmore	54.4067	-110.462017
18	Fishing Lake	53.90295	-110.076233
24	Fort George	53.878302	-110.748065
32	St. Lina	54.216389	-111.50295

- Meteorological tower monitoring stations:

There are four meteorological tower monitoring stations. All four stations are deployed and operating. These stations provide continuous meteorological (met) monitoring measurements for the parameters of Relative Humidity (RH), Ambient Temperature (AT), Wind Speed (WS) and Wind Direction (WD). The coordinates of the stations are listed below.

	Latitude	Longitude
<b>BRV #1</b>	54.378898	-110.700652
<b>BRV #2</b>	54.388940	-111.014615
<b>BRV #3</b>	54.383978	-110.798708
<b>BRV #4</b>	54.415313	-110.974020



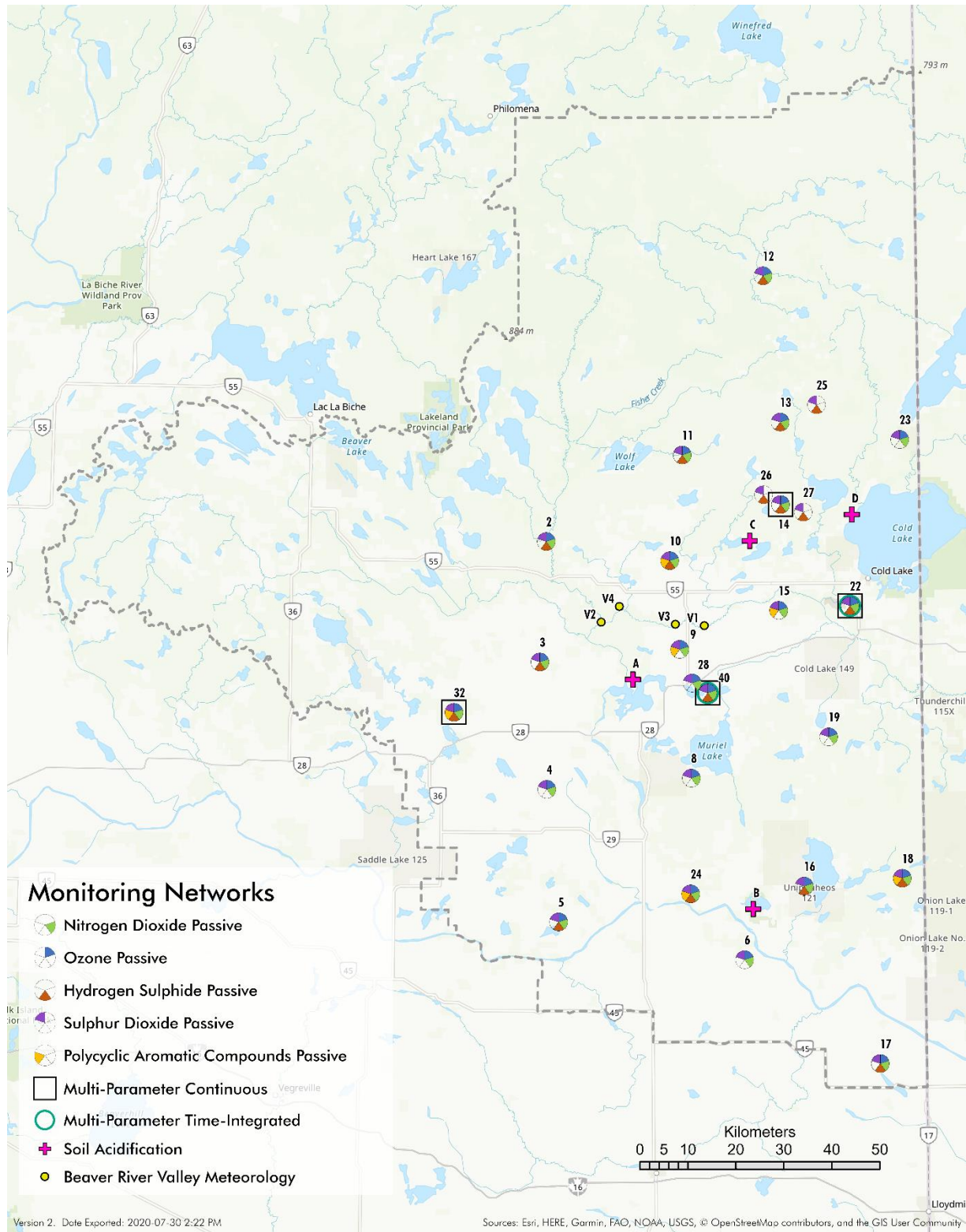


Figure 1: LICA Air and Deposition Monitoring Program

## 2.3 Quality Metrics

Industrial development in the LICA airshed zone results in emissions of a range of air contaminants. Air quality has a direct impact on overall quality of life. For this reason, LICA operates a comprehensive network of air quality monitoring stations. Several different methods are used to monitor ambient air quality. These range from instruments that continuously sample and analyze the air onsite, to systems which require laboratory analysis of an air sample or filter. Air quality measurements are compared to *Alberta Ambient Air Quality Objectives and Guidelines* (AAAQO & AAAQG) and the *Canadian Ambient Air Quality Standards* (CAAQS). LICA aims to exceed the 90% data completeness requirement of the AMD. Completeness is documented in each monthly report submitted to the data portal.

## 2.4 Quality Practices

The procedures and practices relevant to the collection of air and deposition monitoring data are included in this document. These procedures and practices document the roles and responsibilities of individuals, organizations and corporations involved in the measurement program (Section 3), the processes used to design and maintain quality data (Section 4), the procedures used to collect and report data in the network as well as network document processes (Section 6) and the procedures specifically designed to assess and maintain quality data (Section 7).

### 3.0 RESOURCES

#### 3.1 LICA Board of Directors

Lakeland Industry & Community Association (LICA) is an incorporated not-for-profit society. It has a volunteer Board of Directors, some elected and some appointed. The Board:

- provides direction and leadership;
- responds to direction from its membership;
- encourages communication and issue resolution; and
- prioritizes issues and provides resources for standing committees.

LICA operates an air and deposition monitoring program and serves as an Alberta Airshed Zone. The Environmental Monitoring Programs Manager facilitates and coordinates regional air monitoring which is executed by third party contractors and LICA staff.

#### 3.2 Organizational Chart

The organizational chart for the LICA air monitoring program is below. Strategic direction and fiscal oversight of the air monitoring program is provided by the LICA Board of Directors. The LICA monitoring program is aligned with the goals and strategies of the Oil Sands Monitoring (OSM) program. OSM is also the primary funder for air and deposition monitoring activities. The Environmental Monitoring Programs Manager and Data and Reporting Specialist oversee the day to day operations, reporting, and continuous improvement of the LICA air and deposition monitoring program; most of the program is delivered by third-party operators, laboratories, and contractors.

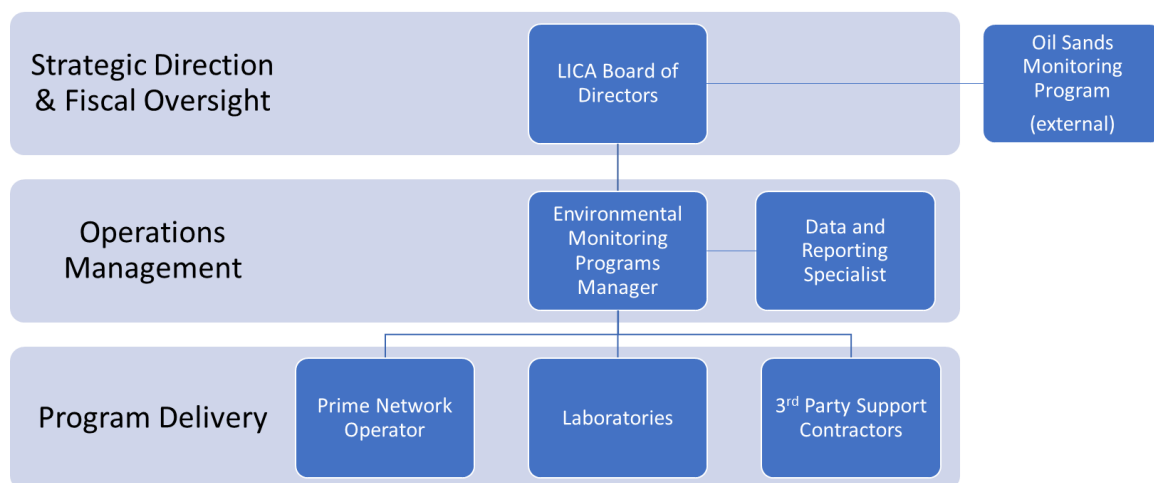


Figure 2: Organizational Chart for LICA’s Air Monitoring System

### 3.3 Roles and Responsibilities

#### 3.3.1 Person Responsible - Environmental Monitoring Programs Manager

The person responsible for quality assurance of air and deposition data in the LICA network is the Environmental Monitoring Programs Manager (EMPM). The LICA EMPM is responsible for ensuring all the ambient air monitoring activities performed on the LICA ambient air monitoring stations meet requirements presented in the Alberta's Air Monitoring Directive (AMD) 2016.

The LICA EMPM performs the following general activities:

- provide overall management of the air and deposition monitoring program, including monitoring, QA/QC, and reporting functions, contracting with external suppliers, project technical and program management reporting;
- understand the requirements of the AMD and in particular the operating, and the quality procedures described in the Air Monitoring Directive (Chapter 5);
- compliance with all regulatory requirements related to the monitoring program;
- implements and evaluates the monitoring program, including network design and expansion;
- document the audit findings and results of the evaluations, including the summaries of results and problems to correct;
- take corrective action as needed, documenting the actions taken and the results;
- provide input to the LICA Airshed board of directors; and
- serve on LICA Airshed committees and represent the airshed externally as required.

#### 3.3.2 Data and Reporting Specialist

The Data and Reporting Specialist works closely with the LICA EMPM. The main roles of this position are as follows. Details are provided in the job description which may be adjusted from time to time.

- prepare air data analysis/report, including monthly and annual data reports for LICA's monitoring programs
- evaluate data management and operations excellence including monitoring program effectiveness, efficiency, and contractor performance.
- steward continuous improvement of data quality and reporting
- champion the development and maintenance of Standard Operating Procedures (SOP) and the Quality Assurance Plan (QAP)

- Ensure reports and other data products are available in a timely and accessible manner on the LICA website.

### 3.3.3 Network Servicing Contractors – Prime Network Operator

The prime network operator is responsible for the following:

- performing routine maintenance and monthly calibration services in the field;
- repairing equipment, which may be further subcontracted as needed;
- confirming all other instrument calibrations;
- preparing and provide monthly field operational summaries; and
- participating in external audits conducted by the Government and/or third party, which is contracted by LICA.

### 3.3.4 Laboratory Contractors

LICA contracts laboratories to analyze samples from passive monitoring stations, VOC and PAH samplers as well as VOC canister samplers. LICA may request analysis of other samples from time to time. Laboratories completing these and other requested services must be accredited for that work under the Canadian Association for Environmental Analytical Laboratories (CAEAL).

LICA may request verification of CAEAL certification and documentation of analytical procedures and QA/QC protocols.

The laboratory contractors are responsible for the following:

- providing passive samplers and intermittent samplers;
- preparing and provide medium for the passive sampling and intermittent sampling; and
- performing sample analysis and provide the sample results.

*\*\* The QAP Checklist for Contractors is used to ensure the laboratories meet the requirements of the AMD 2016, Chapter 4: Monitoring Requirements and Equipment Technical Specifications. \*\**

## 3.4 Training

The network operator and laboratory contractors must identify the training needs of all air quality monitoring personnel and to ensure that appropriate training is provided to all.

Training must be provided to all staff working on the program as appropriate:

- All contractor staff working for the LICA program are fully informed of the specific monitoring and data management requirements for the LICA program.
- All personnel who are undergoing training must be supervised.
- Training records of each personnel must be maintained. Completion of training must be documented, and training certifications must be kept current and accessible in the personnel file.
- The effectiveness of training is to be evaluated for the purpose of maintaining high quality LICA data.

The prime network operator must identify and undertake training needed to perform tasks in the LICA network related to technical operations. The following list is the minimum training required for performing work on the LICA network:

- equipment maintenance and use;
- equipment calibration;
- sample collection, packaging and shipping;
- data reduction and handling;
- data acquisition system operation; and
- datalogger operation.

The laboratory contractors must identify and pass training required for performing tasks in the LICA network which relate to sample preparation and analysis. The laboratory contractors must complete all required training prior to performing analytical work for the LICA network.

Training relevant to workplace safety are required for both the network operator and the laboratory contractors prior to performing field work on LICA network:

- Hazard Identification;
- Workplace Hazardous Materials Information Systems (WHMIS); Transportation of Dangerous Goods (TDG);
- First Aid;
- H2S Alive; and
- Safe Driving.

The LICA EMPM must ensure both the Data and Reporting Specialist and the network operator meet the training Personnel requirements of the AMD 2016, Chapter 5.

The network operator and laboratory contractors must ensure the Personnel requirements of AMD 2016, Chapter 5, are being met.

*\*\* The QAP Checklist for Contractors is used to ensure the network operator meet the Personnel requirements of AMD 2016 Chapter 5. \*\**

### 3.5 Service suppliers

The LICA EMPM must establish the standards for service suppliers required by LICA and for ensuring that purchased services meet the requirements. The LICA EMPM is responsible for ensuring that the standards and requirements are clearly communicated to potential suppliers; these requirements must be documented in terms and conditions of contracts.

It is the responsibility of the suppliers to be aware of the requirements and to comply with them.

The prime network operator must provide evidence that it is COR or SECOR certified and in good standing with the Workers Compensation Board.

### 3.6 Purchasing and Inventory

LICA maintains a modest inventory of network replacement parts. All equipment and non-consumable parts scheduled for replacement based on equipment manufacture specifications. Typically a major component (an entire air monitoring analyzer) is replaced when close to its 10<sup>th</sup> service year.

The network operator must maintain an inventory of consumables necessary for the routine operation of the network. These consumables may include inlet filters, charcoal canisters, desiccant, and daily span gases.

The network operator must ensure that supplies and consumables meet the requirements provided by the equipment manufacturer, AMD, and/or as otherwise required by the LICA. The network operator must also retain documentation that the consumables are approved for use and/or meet the quality standards established by LICA. The network operator must maintain an inventory of consumables that are meant to be used on the LICA network.

*\*\* The QAP Checklist for Contractors is used to ensure the network operator meet the Purchasing of Services and Supplies requirements in AMD 2016 Chapter 5: Quality System. \*\**

### 3.7 Equipment and Software

The LICA EMPM must ensure that continuous ambient air analyzers, meteorological sensors, other equipment used with the ambient air analyzers and sensor, and software are met the requirements of Continuous Ambient Air Analyzers and Meteorological Sensors requirements in AMD 2016 Chapter 4: Monitoring Requirements and Equipment Technical Specifications.

### 3.8 Calibration Standards

The network operator must ensure that all calibration standards and measurement devices used in the LICA ambient air monitoring stations are a) certified as traceable to with U.S. National Institute of Standards and Technology (NIST) or b) the Dutch Metrology Institute (VSL) primary standard, and they are derived from local or working standards, also named secondary standard (e.g., compressed gas cylinders and permeation devices). The network operator must provide a copy of certification for the calibration standards and calibrators that are used in the network to LICA EMPM. A copy of the certification is saved in the LICA server.



## 4.0 NETWORK PROCESSES

### 4.1 Network Design and Expansion

The original design of the LICA network is documented in a report by Jacques-Whitford (2006). [023\\_Implementation\\_Plan\\_Report-Airshed\\_Zone-march\\_2006.pdf](#)

Current network design, and all changes to the network including the number and location of stations must be approved by the Oil Sands Monitoring (OSM) Program as documented in annual OSM workplans.

### 4.2 Monitoring Site Criteria

The need for monitoring and the siting of the appropriate monitors are typically based on factors including sources of emissions, dispersion modelling, and human and environmental health studies. These are often conducted when new facilities are planned. They may also take place when network consolidation is considered.

LICA uses the following criteria when establishing siting for samplers:

- proximity to industrial and transportation emission sources;
- all-weather access; and
- local siting to flow obstructions and terrain meeting the Site Selection and Siting Criteria requirements in AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements.

#### 4.2.1 Continuous Ambient Air Monitoring Sampling

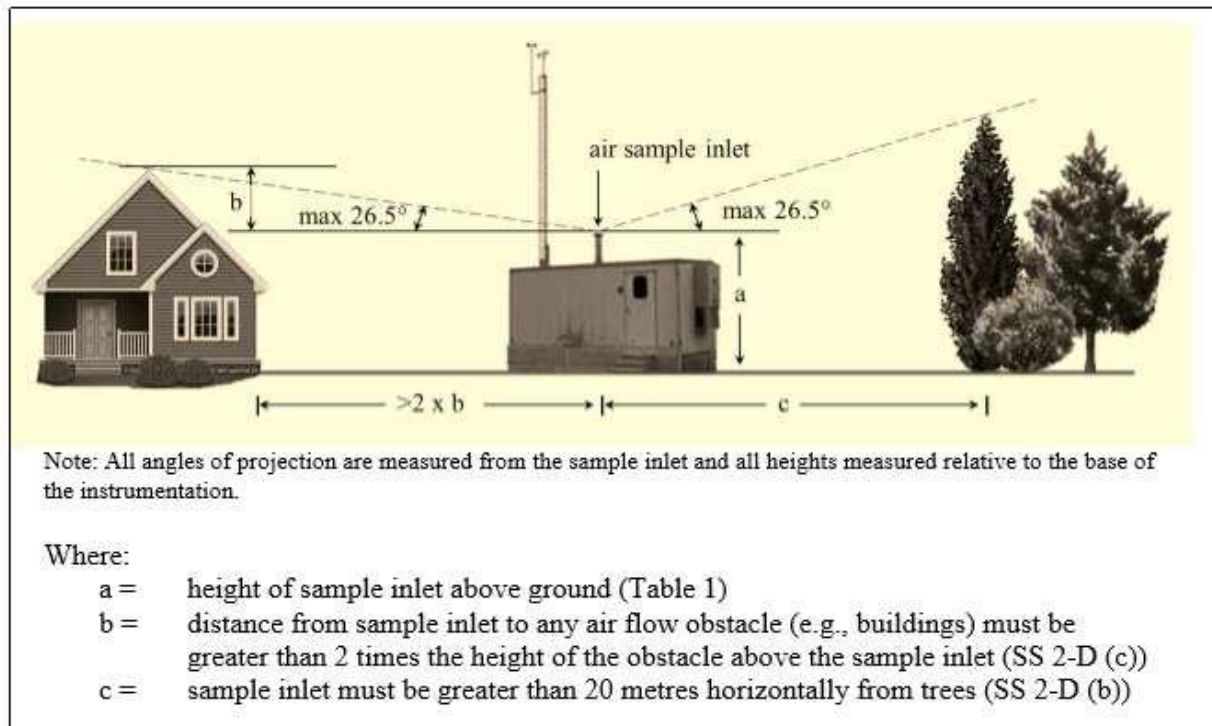
When siting for a continuous ambient air monitoring station, LICA follows the Site Selection and Siting Criteria requirements in AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements.

Below are the siting criteria quoted from AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements.

Pollutant	Height above ground (m)	Distance from Supporting Structures		Other Criteria / Requirements
		Vertical (m)	Horizontal <sup>1</sup> (m)	
PM <sub>2.5</sub> and PM <sub>10</sub>	2 to 15	>2	>2	No nearby <sup>2</sup> furnace or incinerator stacks
SO <sub>2</sub>	3 to 15	>1	>1	No nearby <sup>2</sup> furnace or incinerator stacks
				Inlet height must be > 0.8 of the mean height of surrounding buildings
H <sub>2</sub> S, TRS, HC, BTEX, NH <sub>3</sub>	3 to 15	>1	>1	Inlet height must be > 0.8 of the mean height of surrounding buildings
CO	3 to 10	>1	>1	> 10 metres from street intersections or at mid-block location
O <sub>3</sub> , NO <sub>2</sub>	3 to 15	>1	>1	

<sup>1</sup> When an inlet is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on the roof.

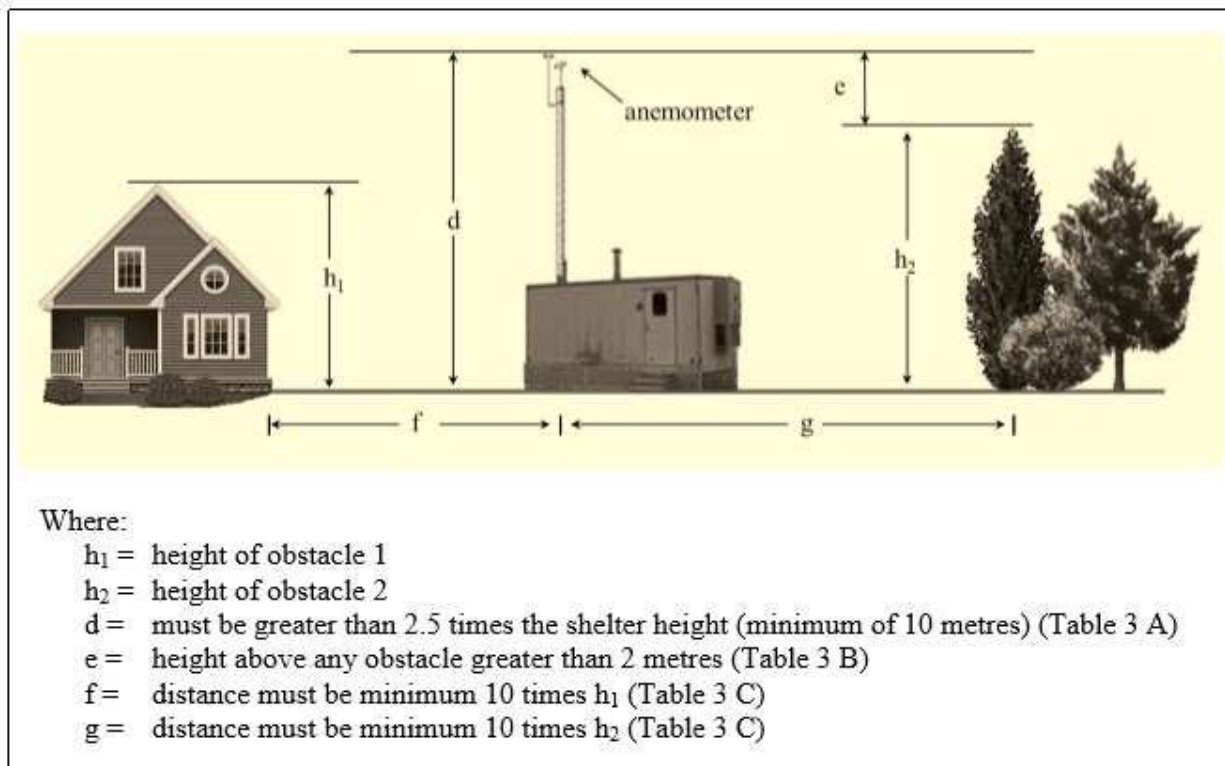
<sup>2</sup> Distance depends on the height of furnace or incinerator stacks, type of waste or fuel burned, and quality of fuel (sulphur and ash content). This is to avoid undue influences from nearby sources.



<b>Average Traffic (vehicles per day)</b>	$\leq 10,000$	15,000	20,000	40,000	70,000	$\geq 110,000$
<b>Minimum distance to roadway (metres)</b>	$\geq 10$	20	30	50	100	$\geq 250$

Note: If vehicle count falls between the values provided, the vehicle count should be rounded up to the nearest 10,000 to choose minimum siting distance from roadways.

Site Characteristics	Wind Instruments
Height above ground	A. Greater than 2.5 times shelter height (minimum of 10 metres)
Other requirements	B. Height above any obstacle greater than 2 metres, and surroundings for 100 metre radius must be uniform
	or: C. Distance from obstacles greater than 10 times the obstacle height



Authorization for and description of the approved continuous network is provided in the 5-year work plan ([E - A1-1-1-1718 DRAFT - LTM - Active Ambient Air Quality Monitoring \(Nov 3 2016\).pdf](#)) which also includes a map of the current stations.

#### 4.2.2 Integrated Sampling

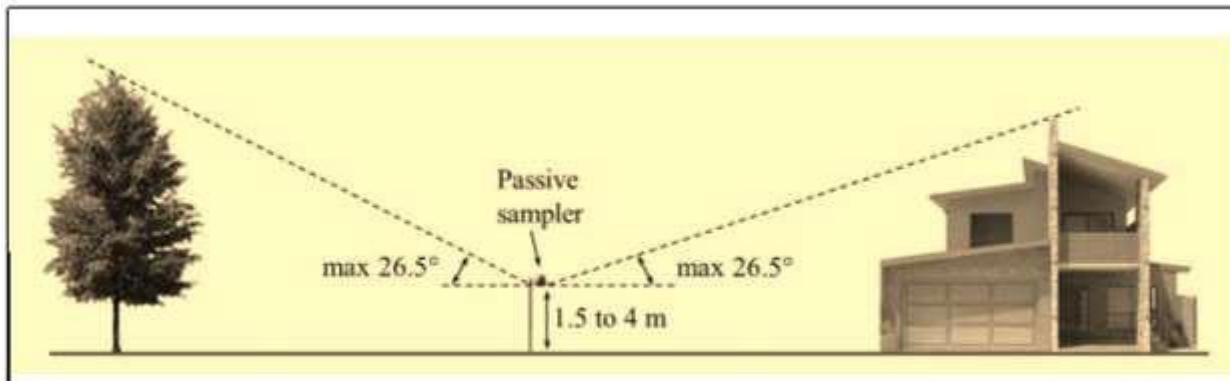
When siting for passive sampler, LICA follows the Passive and Intermittent Sampler Siting Criteria requirements of AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements.

#### 4.2.3 Passive Sampling

All passive samplers are mounted to a supporting structure, mostly fence post, to avoid airflow being blocked. Passive sampler siting criteria quoted from AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements.

Site Characteristics	Passive Samplers
Diffusion barrier surface height above ground	1.5 to 4 metres
Other requirements	Elevation angle is 26.5° or less from the diffusion barrier surface to the top of any obstacle

Note: All angles of projection are measured from the instrument inlet and all heights measured relative to the base of the instrumentation.



Authorization for and description of the approved passive network is provided in the 5-year work plan ([F - A1-2-1-1718 DRAFT - LTM - Passive Ambient Air Quality Monitoring \(Oct 31 2016\) \(LICA and PRAMP\).pdf](#)) which also includes a map of the current stations.

#### 4.2.4 Intermittent Sampling

Below are the intermittent sampler siting criteria quoted from AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements.

Site Characteristics	Intermittent Samplers
Sampler inlet - height above ground	minimum 2 metres, maximum 15 metres
Other requirements	A. Distance from an obstacle greater than 2.5 times the height of the obstacle above the sampler, and
	B. at least 2 metres from any other samplers or inlets with flow rates greater than 200 litres per minute, or at least 1 metre apart from any other samplers or inlets with flow rates less than or equal to 200 litres per minute, and
	C. unrestricted air flow in 3 to 4 wind quadrants.

### 4.3 Sampling System Design

Design of the sampling system, including the specifications of shelters, station inlets, equipment racks and passive mounts is conducted and documented by the network operator. The network operator must ensure that all designs meet the minimum specifications of the 3.3.0 Sampling System requirements of AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements as well as 4.4.0 Mobile Air Monitoring requirements of AMD 2016 Chapter 4: Monitoring Requirements and Equipment Technical Specifications.

*\*\* The QAP Checklist for Contractors is used to ensure the network operator meet AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements. \*\**

### 4.4 Monitoring Requirement and Equipment Technical Specification

LICA follows the requirements listed in the AMD 2016 Chapter 4: Monitoring Requirements and Equipment Technical Specifications. The network operator must follow and meet the AMD 2016 Chapter 4: Monitoring Requirements and Equipment Technical Specifications.

#### 4.4.1 Continuous Ambient Air Monitoring Sampling

Specifications and standard operating procedures for all calibration systems for continuous instruments are maintained and documented by the Network operator. The network operator must ensure the Continuous Ambient Monitoring requirements listed in AMD 2016 Chapter 4: Monitoring Requirements and Equipment Technical Specifications are met.

##### 4.4.1.1 Requirements for sampling system cleaning

- The manifold and sample tubing of all LICA ambient air monitoring samplers must be inspected and cleaned at least once a month during the time a monthly calibration is conducted.

- The sample tubes, flow splitters and other associated intake assemblies from particulate intakes to the particulate analyzer must be inspected and cleaned at least once a year.
- The PM<sub>2.5</sub> inlet cyclones must be cleaned at least once every 30 days or at every sample filter change, whichever occurs first.
- The PM<sub>2.5</sub> inlet cyclones of the filter based intermittent particulate sampler must be cleaned at least every fifteen 24-hour samples.

The network operator is responsible for following and meeting the 3.3.3 Sampling System Cleaning requirements of AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements.

*\*\* The QAP Checklist for Contractors is used to ensure the network operator meet the 3.3.3 Sampling System Cleaning requirements of AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements as well as LICA Performance Specification for Continuous Ambient Air Monitoring Analyzers requirements. \*\**

#### 4.4.1.2 Calibration

Calibration is conducted to maintain a quality of data collected by an analyzer. Since the response of most analyzers shows drift with time, calibration is required to correct the drift so values shown in the ambient air reports represent true substance concentration. Calibration must be performed periodically on all ambient air monitoring analyzers and equipment, mass flow controllers, calibration gases, calibrators and meteorological sensors. While conducting a calibration, the network operator must have the analyzer operating in its normal sampling mode, within operating temperature, at the analyzer's normal operating range, and have the test sample going through all filters, scrubbers, conditioners, and other components that are used during normal ambient sampling and through as much of the ambient air inlet system as is practicable.

##### 4.4.1.2.1 Multi Point Calibration

Multipoint calibrations are performed a minimum of once a month for each continuous air monitor. An additional calibration must be performed under the following conditions: 1) within three days after the initial start-up and stabilization of a newly installed instrument, 2) prior to shutdown or moving of an instrument which has been working to specification, and 3) when major repair has been done on the instrument.

A valid multipoint calibration conducted on an analyzer with linear design includes a zero concentration and a minimum of three test concentrations within the analyzer's operating range.

A minimum of 5 up-scale calibration points is required when calibrating an analyzer that is non-linear by design.

During the multipoint calibration, zero and high point calibration adjustment may need to be performed. When it needs to be performed, unadjusted zero point, named As Found Zero, must be obtained prior to making zero value adjustment. Unadjusted high point, named As Found Span, must be obtained prior to making span value adjustment.

Multipoint Calibration/Verification acceptance limits

Requirement	Calibration Acceptance Criteria
Multipoint Calibration/ Verification	<ul style="list-style-type: none"> <li>* Deviation of the as found zero point and as found span point <math>\leq 10\%</math> from the expected calibration response</li> <li>* Within <math>\pm 5\%</math> of the least squares regression slop (0.95 to 1.05)</li> <li>* Correlation coefficient <math>\geq 0.995</math></li> <li>* Deviation from the adjusted slop <math>\leq 5\%</math> for any one point</li> <li>* Intercept within <math>\pm 3\%</math> of the analyzer's full scale</li> </ul>

If one of the calibration acceptance criteria is not met, the analyzer failure can be concluded. Immediate corrective action is required to correct the issue. Further corrective action Data collected between the last valid calibration and until the analyzer pass the post-repair calibration is considered invalid unless other evident can support data validity.

The network operator is required to develop, maintain, and implement the Multipoint calibration SOP. LICA maintains the right to review the SOP.

The network operator is responsible to ensure the LICA ambient air quality gas analyzer calibration SOPs are followed for equipment calibration.

When performing an ambient air quality gas analyzer calibration, the network operator also must follow the requirements of the Multi Point Calibration Procedure, Dynamic Calibration Using a Permeation Device, Gas Phase Titration and Ozone Calibration listed in AMD 2016 Chapter 7: Calibration.

Time during the first multi-point calibration is not considered downtime. If more than one calibration is performed during the month, the time during the additional calibration is considered as downtime.

The network operator must maintain calibration records, a copy of which is kept in each continuous ambient air monitoring station. The network operator must meet the Calibration records, calibration reports and maintenance/service records requirements highlighted in the AMD 2016 Chapter 7: Calibration.

4.4.1.2.2 Daily Zero-Span Calibration

Daily zero-span calibrations are conducted on commercial ambient air quality gas analyzers.

Daily zero-span calibrations are performed on a daily basis, 23 to 25 hours apart, and each calibration check must not exceed 1 hour per calendar day. LICA has decided to run a daily zero-span calibration in a 23-hour interval.

Each daily zero-span calibration contains one zero point check and one span point check. The test span gas concentration must be between 40% and 80% of the analyzer’s operational range. Both the zero point check and the span point check must achieve a minimum of 10 minutes stability.

Zero baseline correction is performed during the reporting process. No span point drift adjustment is performed.

Zero-span calibration acceptable limits

Requirement	Calibration Acceptance Criteria
Zero check	$\leq \pm 3\%$ of full scale
Span check	$\leq \pm 10\%$ drift

Time during the first zero-span calibration is not considered downtime. If more than one calibration is performed during a daily, the time during the additional calibration is considered as downtime.

The network operator is required to maintain calibration records and maintenance/service record. LICA maintains the right to access documentation of the system on request.

4.4.1.2.3 Flow Calibration

The network operator must ensure the LICA flow calibration SOP is followed.

When performing a flow calibration, the network operator also must follow the requirements of the Flow Calibration listed in AMD 2016 Chapter 7: Calibration.

The network operator must maintain calibration records and maintenance/service records. LICA maintains the right to access documentation of the system on request.

The network operator must develop, maintain, and implement the Flow calibration SOP. LICA maintains the right to review the SOP.

4.4.1.2.4 Wind Instrument Calibration

The wind system must be removed from the wind tower at least once per year for mechanical inspection, mechanical alignment, electronic alignment and calibration. For the Ultrasonic wind system, the network operator must perform an electrical inspection once a year and a factory calibration at a minimum of every 2 years. When inspecting an ultrasonic wind system, ensure a) the heaters are functioning properly, b) the aviary spikes are in their proper place and not touching the heaters, and c) the wind speed is being registered. For the RM Young wind system, the network operator is required to perform a system calibration at a minimum of every year.

The network operator must develop, maintain, and implement the Wind Instrument Calibration/Maintenance SOP. LICA maintains the right to review the SOP.



When performing a wind instruments calibration, the network operator also must follow the requirements of the Calibration of Wind Instruments listed in AMD 2016 Chapter 7: Calibration.

#### 4.4.1.2.5 Particulate Matter Instrument Calibration

The type of the Particulate Matter instruments LICA are currently using is SHARP 5030, SHARP 5030i, and Teledyne T640. These instruments are used to monitor the concentration of the PM<sub>2.5</sub>. When performing a particulate matter instrument calibration, the operator must perform at a minimum of flow check, leak check, ambient temperature and barometric pressure check. For Sharp 5030i, ambient relative humidity must also be checked each month, All the check results must meet the manufacturer's specific limits.

The network operator must develop, maintain, and implement the Particulate Matter Calibration/Maintenance SOP. LICA maintains the right to review the SOP.

When performing a particulate matter instrument calibration, the network operator also must follow the requirements of the AMD 2016 Chapter 7: Calibration.

*\*\* The QAP Checklist for Contractors is used to ensure the network operator meet the calibration requirements of AMD 2016 Chapter 7: Calibration and Continuous Ambient Monitoring requirements of AMD 2016 Chapter 4: Monitoring Requirements and Equipment Technical Specifications. \*\**

#### 4.4.2 Integrated Sampling

The types of integrated sampling program include passive sampling and intermittent sampling. The integrated samplers are exposed in a monitoring environment for various sampling periods. The integrated sample then is sent to a laboratory for analysis to determine the ambient concentration or mass loading per sample.

The network operator must operate the integrated samplers following the Integrated Sampling general requirements listed in AMD 2016 Chapter 4: Monitoring Requirements and Equipment Technical Specifications.

##### 4.4.2.1 Passive Sampling

A passive sampler is normally installed in a rain shelter that provides the diffusion barrier surface of the sampler in a vertically downward-facing position. The network operator must operate each passive sampler in accordance with the manufacturer's requirements.

When deploying passive samplers, the network operator must prevent the diffusion barrier surface from becoming wet and protect the diffusion barrier surface from the ingress of particulate and from high wind speed.

The design of the sampler rain shelter, such as the colour, shape and surface material, may affect the temperature of the passive sampling environment. The network operator must ensure

that the sampler rain shelter does not interfere with the diffusive uptake rate and can minimize temperature rise due to direction and radiation.

The performance of a passive sampler can be affected by numerous factors, such as weather conditions, type of passive sample medium used, and the sampling method used. As a result, a passive sampler validation is required. The passive sampler validation includes validations in the laboratory as well as in the field. Quality control samples, such as sample blanks, duplicate samples, are used to provide an estimate of precision and accuracy of the monitoring method. It is the laboratories' responsibility to follow and meet the Passive Sampling requirements listed in AMD 2016 Chapter 4: Monitoring Requirements and Equipment Technical Specifications.

The network operator must deploy the passive samples every 30 days  $\pm$  3 days.

The network operator must deploy the PACs samples every 60 days  $\pm$  3 days

The network operator must develop, maintain, and implement the passive sampling SOP. LICA maintains the right to review the SOP.

The network operator must follow the Environment and Climate Change Canada procedure when exchanging the PAC samples.

#### 4.4.2.2 Intermittent Sampling

In LICA network, the intermittent sampling technologies are used to monitor Volatile Organic Compounds (VOCs) and Polycyclic Aromatic Hydrocarbons (PAHs). The intermittent sampling program is set to collect sample every 6 days and 24 hours a term per the NAPS (North American Pollution Surveillance) Schedule.

Active Sorbent Sampling technology is used to collect and monitor the PAHs samples. The sample air is pulled in a sorbent tube across the sorbent material to sample PAHs by a sampling pump. The network operator must use the poly urethane foam (PUF) sorbent sampling medium provided by Alberta Innovates for PAH sampling.

Canister Sampling technology is used to collect and monitor the VOCs in ambient air. The sampling air is drawn into a sampling container on the scheduled date and time. A proper orifice device is used to control the pressure of the air flow. The orifice device used in the LICA network allows the sample to be drawn into the canister for 24- hour period. After 24 hours, the canister is filled and the pump is stopped.

The network operator must develop, maintain, and implement the intermittent sampling SOP. LICA maintains the right to review the SOP.

The network operator must operate intermittent sampling programs in accordance to the Intermittent Sampling requirements listed in AMD 2016 Chapter 4: Monitoring Requirements and Equipment Technical Specifications.

*\*\* The QAP Checklist for Contractors is used to ensure the network operator/laboratories meet the Integrated Sampling requirements of AMD 2016 Chapter 4: Monitoring Requirements and Equipment Technical Specifications. \*\**

Calibration of instruments associated with VOC and PAH sampling are the responsibility of the laboratory conducting the analysis and are documented by same, as identified in Section 5.3. LICA maintains the right to access documentation of the system on request.

#### 4.5 Site Documentation

When a new ambient air monitoring site is established or/and changes are made to the location of a monitoring site, LICA must prepares/updates site documentation.

LICA must prepare site documentation for each LICA ambient air monitoring stations in accordance with the Site Documentation requirements of AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements.

The electronic copy of the site documentation can be found on the LICA server.

The Data and Reporting Specialist must ensure site documentation records are maintained according to the Site Documentation requirements of AMD 2016 Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements, with copies maintained on site. Site documentation is reviewed and updated in March each year after the continuous monitoring annual report is completed.

The LICA EMPM must submit the completed site documentation to AEP.

## 5.0 SAMPLE AND DATA COLLECTION SYSTEM OPERATING PROCEDURES

### 5.1 Continuous Sampling

Standard operation procedures (SOPs) for continuous monitors in the LICA network are found on the Alberta Environmental Monitoring and Science division website (<http://environmentalmonitoring.alberta.ca/resources/standards-and-protocols/>). SOPs for the specific instrumentation in the approved LICA network follow.

The network operator is required to develop, maintain, and implement the continuous sampling SOP. LICA maintains the right to review the SOP.

#### 5.1.1 Hydrogen Sulphide

SOP-001 Hydrogen Sulphide (<http://environmentalmonitoring.alberta.ca/wp-content/uploads/2015/09/SOP001-Hydrogen-Sulphide.pdf>)

The network operator is required to develop, maintain, and implement the Hydrogen Sulphide sampling SOP. LICA maintains the right to review the SOP.

#### 5.1.2 Total Hydrocarbons

SOP-002 Total Hydrocarbon (THC) (<http://environmentalmonitoring.alberta.ca/wp-content/uploads/2015/09/SOP002-Total-Hydrocarbons.pdf>)

The network operator is required to develop, maintain, and implement the Total Hydrocarbon sampling SOP. LICA maintains the right to review the SOP.

#### 5.1.3 Sulphur Dioxide

SOP-003 Sulphur Dioxide (<http://environmentalmonitoring.alberta.ca/wp-content/uploads/2015/09/SOP003-Sulphur-Dioxide.pdf>)

The network operator is required to develop, maintain, and implement the Sulphur Dioxide sampling SOP. LICA maintains the right to review the SOP.

#### 5.1.4 Methane and Non-Methane Hydrocarbons

SOP-004 Methane and Non-Methane Hydrocarbons  
(<http://environmentalmonitoring.alberta.ca/wp-content/uploads/2015/09/SOP004-Methane-NonMethane.pdf>)

The network operator is required to develop, maintain, and implement the Methane and Non-Methane Hydrocarbons sampling SOP. LICA maintains the right to review the SOP.

#### 5.1.5 Ozone

SOP-005 Ozone (<http://environmentalmonitoring.alberta.ca/wp-content/uploads/2015/09/SOP005-Ozone.pdf>)

The network operator is required to develop, maintain, and implement the Ozone sampling SOP. LICA maintains the right to review the SOP.

#### 5.1.6 Particulate Matter

Standard operating procedures for continuous particulate matter monitoring are currently being developed in cooperation with OSM and AEP.

The network operator is required to develop, maintain, and implement the Teom-FDMS Particulate Matter sampling SOP. LICA maintains the right to review the SOP.

#### 5.1.7 Oxides of Nitrogen

SOP-007 Oxides of Nitrogen (<http://environmentalmonitoring.alberta.ca/wp-content/uploads/2015/09/SOP007-NOx.pdf>)

The network operator is required to develop, maintain, and implement the Oxides of Nitrogen sampling SOP. LICA maintains the right to review the SOP.

#### 5.1.8 Total Reduced Sulphur

SOP-008 Total Reduced Sulphur (TRS) (<http://environmentalmonitoring.alberta.ca/wp-content/uploads/2015/09/SOP008-Total-Reduced-Sulphur.pdf>)

The network operator is required to develop, maintain, and implement the Total Reduced Sulphur sampling SOP. LICA maintains the right to review the SOP.

### 5.1.9 Meteorology

SOPs for meteorological data are documented by the Network operator for the following continuous parameters used in network operations: wind speed, wind direction, air temperature, relative humidity, precipitation amounts, and atmospheric pressure. LICA retains the right to access these SOPs on request.

### 5.1.10 Data Collection/ Data Verification/ Data Validation

SOP for Data Management & Reporting is prepared and maintained by LICA Data and Reporting Specialist. The Data Management & Reporting SOP is saved in the LICA server.

## 5.2 Integrated Sampling

### 5.2.1 Passive Sampling

SOPs for passive sampling are provided by the manufacturer and are documented by the Network operator [tb\\_PassiveAir\\_SampleHandling\\_20131122.pdf](#).

The network operator is required to develop, maintain, and implement the passive sampling SOP. LICA maintains the right to review the SOP.

The network operator is required to follow the procedure Environment and Climate Change Canada provides when exchanging the PAC samples. The PAC sample handling procedure can be found in the LICA sever.

### 5.2.2 Intermittent VOC and PAH Sampling

The intermittent samplers are programmed to run for 24 hours every 6th day per the NAPS (North American Pollution Surveillance) Schedule.

SOPs for the VOC and PAH samplers are managed and documented by the Network operator. LICA maintains the right to review the SOP. These systems must meet the requirements of AMD Chapter 4 and the manufacturer.

### 5.2.3 VOC Canister Sampling

The network operator is required to develop, maintain, and implement the VOC Canister Sampling SOP. LICA maintains the right to review the SOP.

## 6.0 AMBIENT AIR QUALITY CONTROL SYSTEM

### 6.1 Data Collection

#### 6.1.1 Continuous Sampling

LICA uses a digital data acquisition system, also called a datalogger, for data collection. Data includes raw ambient data, calibration data and instrument diagnostics information, all of which are stored in the system:

- The scan rate of each datalogger used in each LICA ambient air monitoring station is 1- second for all meteorological parameters and the same as actual instrument response times for continuous gas analyzers and particulate parameters.
- Final data are reported as hourly averages, but data can be averaged to shorter intervals based on reporting needs at the time. For example, one-minute base average interval data is used for daily zero/span calibration check, abnormal spike checks etc. Five-minute base average interval data is used for the VOC canister program.
- A valid base average must include at least 75 percent of scanned data. All continuous one- minute base average data are reviewed. Data corresponding to any malfunctions are discarded and the hourly averages are re-calculated. In cases where more than 25% of minute data are impacted, that hourly average is invalidated.
- The hourly average for standard deviation of wind direction are directly retrieved from the datalogger systems. The dataloggers have a built-in program which calculate the standard deviation of wind direction average using US EPA approval algorithms.

Data logger output is verified by comparing to the analyzer's digital output:

- Monthly;
- Upon commencement of monitoring program; and
- After changes to the data collection system

A time adjustment is performed when difference in time stamps between datalogger output and analyzer digital output.

The monitoring operational uptime for each LICA ambient air monitoring station is maintained at a minimum 90 percent each month by the network operator. Activities below are not considered as downtime when calculating data completeness.

- Daily zero/span calibration. Only one zero/span check is run per day. Time during the zero/span check is not considered as downtime. If an extra zero/span check is performed, the time during the additional check is considered as downtime.

- Multipoint calibration. Only one multipoint calibration is performed per month. Time during the calibration is not considered as downtime. If an extra multipoint calibration is performed, the time during the additional calibration is considered as downtime.
- Audit check performed by the Government.
- Equipment start-up/stabilization.

The network operator must ensure the datalogger system that is used in the LICA ambient air monitoring stations meets 6.3 Data Collection and Management requirements of AMD 2016 Chapter 6: Ambient Data Quality.

The network operator must maintain the 90 percent operational uptime each month.

*\*\* The QAP Checklist for Contractors is used to ensure the network operator meet the Data Collection and Management requirements of AMD 2016 of Chapter 6: Ambient Data Quality. \*\**

### 6.1.2 Integrated Sampling

Refer to section 5.2 Integrated Sampling section of this QAP.

## 6.2 Data Verification and Validation

Refer to LICA Data Management & Reporting SOP.

### 6.2.1 Continuous Sampling

Refer to LICA Data Management & Reporting SOP.

### 6.2.2 Integrated Sampling

#### 6.2.2.1 Passive Sampling

The laboratory must perform the verification and validation on passive samples. The network operator is required to develop, maintain, and implement Passive sampling SOP. LICA maintains the right to review the SOP.

#### 6.2.2.2 Intermittent VOC and PAH Sampling

The laboratory's must perform the verification and validation on VOC and PAH samples. The network operator must develop, maintain, and implement the Intermittent VOC and PAH sampling SOP. LICA maintains the right to review the SOP.



### 6.2.2.3 VOC Canister Sampling

The laboratory must perform the verification and validation on VOC canister samples. The network operator is required to develop, maintain, and implement the Intermittent VOC canister sampling SOP. LICA maintains the right to review the SOP.

*\*\* The QAP Checklist for Contractors is used to ensure the network operator/laboratories meet the 3.0 Integrated Sampling requirements of AMD 2016 Chapter 4: Monitoring Requirements and Equipment Technical Specifications. \*\**

## 7.1 REPORTING

LICA must include a sign-off cover letter when submitting a LICA report to AEP; the letter indicates that the data or reports being submitted have been reviewed by the LICA EMPM prior to submission.

Prior to hourly data submission to Alberta's Air Data ETS system and inclusion in reports being submitted to AEP, the collected ambient air monitoring data are rounded to appropriate number of significant figures, based on analyzer's actual measurement capability or the method used to obtain the data.

When reporting a comparison of final data to Albert Ambient Air Monitoring Quality Objectives and Guidelines(AAAQOs), the data is rounded to one significant figure greater than the AAAQOs.

Prior to hourly data submission to Alberta's Air Data ETS system and inclusion in reports being submitted to AEP, the units for all collected ambient air monitoring data are converted to the appropriate units required by Alberta's Ambient Air Quality Data Warehouse.

In each LICA ambient air monitoring report, the following must be included:

- A cover letter containing information required for the type of report;
- Identification of the LICA airshed;
- The (i) name), (ii) phone number, (iii) mailing address and (iv) email address of the LICA EMPM;
- Clear identification of (i) who prepared the report and (ii) who reviewed the report;
- (i) a unique JOB number on the report, and (ii) reporting timeframe to which the report applies, to enable the Director to differentiate the report from other reports submitted by the Alberta airshed;
- A list of approval numbers, company names and industrial operation names for which the Alberta airshed is monitoring on behalf of;
- Page number on each page showing that page is part of the report and clear identification of the end of the report; and
- The date the report was generated.

## 7.2 Electronic Ambient Air Monitoring Data Submission

Validated continuous ambient air monitoring data collected at both permanent and portable ambient air monitoring stations is reported monthly to the AEP and submitted to Alberta's Air Data ETS system by the end of the month following the month of data collection in accordance with the AMD 2016 and this QAP.

Validated data collected by passive and intermittent samplers is reported monthly to the AEP and submitted to Alberta's Air Data ETS system within one year of data collection in accordance with the AMD 2016 and this QAP.

When submitting concentrations for passive sampling or intermittent sampling, where there are replicate samples, both sample concentrations and replicate sample concentrations are reportable data values and are submitted individually.

The LICA Data and Reporting Specialist must ensure that the final data submitted to Alberta's Air Data ETS system meet the requirements of validation codes for submission.

The LICA Data and Reporting Specialist must format and submit the data following the Alberta Airshed Reporting and Data Submission requirements of AMD 2016 Chapter 9: Reporting.

The electronic ambient air monitoring data submission must be completed no later than the end of the month following the month of data collection being reported in accordance with the AMD 2016 and this QAP.

### 7.3 Non-Conformance Reporting

Non-conformance reports include exceedance reports and performance report. A exceedance report must be submitted to AEP immediately when any air monitoring results show that ambient air concentrations exceeds the AAAQO/Gs. Performance report is submitted to AEP when monitoring equipment uptime does not meet the 90 percent requirement.

The network operator must immediately report ambient air concentrations exceeding the AAAQO/Gs and any significant interruption of monitoring equipment that affect operation uptime; this reporting is done on behalf of LICA to AEP and an AEP-issued reference number is obtained.

The network operator must also report the non-conformance to the LICA EMPM with a) correlative meteorological data, b) correlative metadata, c) the reference number provided by AEP, and d) corrective action that will be implemented to avoid future reoccurrence.

The LICA EMPM must submit a 7-day follow-up report to AEP unless otherwise directed.

### 7.4 Monthly Reports

A summary of validated data is reported monthly to the AEP no later than the end of the month following the month of data collection being reported in accordance with the AMD 2016 and this QAP.

A monthly report must contain:

- cover letter;
- title page;
- table of contains;
- information on monitoring, incidents and deviations;

- identification of any deletion or resubmission of data, missed calibration or issues with ambient data;
- percent valid hourly data;
- hourly average time series plot and discussion of known events;
- monthly average concentration, minimum concentration and maximum concentration;
- monthly wind roses;
- comparisons to hourly and monthly AAAQOs, and;
- representation of monthly data distribution.

Monthly reports for LICA ambient air monitoring stations are prepared by the LICA Data and Reporting Specialist. The PDF monthly report must be submitted to Alberta's Air Data ETS system.

The LICA Data and Reporting Specialist must include all the information necessary to meet the Alberta Airshed Monthly Reports requirements of AMD 2016 Chapter 9: Reporting.

## 7.5 Annual Reports

A summary of monthly information is reported annually to the AEP in accordance with the AMD 2016 and this QAP. The deadline for the annual reports is in the month of March following the year of data collection.

A monthly report must contain:

- cover letter;
- title page;
- table of contents;
- identification of any changes made to monthly reports;
- information on monitoring, incidents and deviations;
- percent valid hourly data for the whole year;
- annual average concentration, minimum concentration and maximum concentration;
- annual average plot over past years, if applied, and discussion of context;
- annual average spatial plot of passive results, if applied;
- annual wind roses;
- comparisons to all AAAQOs over the year;
- number of AAAQO exceedances;
- representation of annual data distribution; and

- any deletion or resubmission of data, missed calibration or issues with ambient data not covered in the monthly reports.

Annual reports for LICA ambient air monitoring stations are prepared by the LICA Data and Reporting Specialist. The PDF annual report must be submitted to Alberta's Air Data ETS system.

The LICA Data and Reporting Specialist must include all the information necessary to meet the Alberta Airshed Annual Reports requirements of AMD 2016 Chapter 9: Reporting.

## 7.6 Other Reports

### 7.5.1 Alberta Airshed Notifications

The LICA EMPM is required to submit electronic notifications using the AMD Notification Template to AEP prior to adding a new monitoring station, adding a new ambient analyzer or meteorological sensor for a new added monitoring parameter, and modifying or replacing an existing ambient analyzer or meteorological sensor with a different monitoring method, with a minimum of fourteen days advance notice.

The LICA EMPM must submit electronic notifications using the AMD Notification Template to AEP prior to the scheduled shut-down of any ambient analyzer or meteorological sensor either for an extended period or permanently or prior to the scheduled ambient station relocation, with a minimum of thirty days advance notice.

The LICA EMPM must submit electronic notifications using the AMD Notification Template to AEP as soon as the scheduled dates change after notification has been given to AEP with information of reasons for the changes and new scheduled dates.

Any change that affect real-time data submission of ambient air monitoring data are being notified by the LICA EMPM to AEP. The report must be submitted to AEP electronically via Alberta's Air Data ETS system.

### 7.5.2 Ambient Air Monitoring Report and Data Resubmission

When errors, omissions or other issues in air monitoring data and reports that were identified during reviews or audits, including internal audits or government audits, after initial report and data submission, the report and data must be resubmitted.

The LICA EMPM must submit electronic notifications using the AMD Notification Template to AEP as soon as the errors, omissions or other issues are discovered.

The notification includes the following information:

- identification and description of the errors, omissions or other issues identified;
- an explanation of the cause of the errors, omissions or other issues that were identified; and

- identification of all changes and corrections that are expected to be required in response to the errors, omissions or other issues that were identified.

The LICA Data and Reporting Specialist must work with the LICA EMPM gather information required above in a time manner. The LICA Data and Reporting Specialist must prepare and submit an amended report addressing the errors, omissions or other issues that were identified to the LICA EMPM within twenty days of the initial discovery of the errors, omissions or other issues. A unique identifier indicating it is an amended report (and a reference to the original report that it corrects) must be included in the amended report. A word of “Revised” or “Revision” must be shown on the cover page of the amended report, and a summary of the revision must be included in the summary section of the amended report. The amended report must meet the reporting requirements of AMD 2016 Chapter 9: Reporting. The report must be submitted to Alberta’s Air Data ETS system.

The LICA EMPM must submit the amended report to AEP within thirty days of the initial discovery of the errors, omissions or other issues. The report must be submitted to Alberta’s Air Data ETS system.

The LICA Data and Reporting Specialist must re-submit corrected data to Alberta’s Air Data ETS system within twenty days of the initial discovery of the errors, omissions or other issues.

## 8.0 DOCUMENT AND RECORD CONTROL

### 8.1 Controlled Documents

A record is a document and can be used as an input from one process to another, but in the context of the Alberta AMD, a record is generated to state results achieved or to provide evidence of activities performed. Records and documents provide evidence of activities performed and can be used to assess compliance to AMD requirements. A controlled document is identified as data, reports or records that relate to the air monitoring, analysis, reporting maintenance activities, SOPs and work instructions.

All control documents:

- are reviewed at a minimum of every three-years;
- contain LICA logo, a unique file number, and revision number;
- contain a revision page to track changes of the file. The old versions of the document will be kept on the LICA server so that versions can be compared when needed;
- are stored on the LICA server with password protection;
- are backed-up automatically in a portable storage unit located in the LICA office in Bonnyville every month;
- are retained for three years if they are raw data; and
- are retained for ten years if they are final reports and data summaries.

The LICA EMPM must review data and documents and to authorize revisions and is ultimately responsible for accuracy and timeliness of availability. The LICA EMPM may delegate some aspects of these responsibilities to the Data and Reporting Specialist.

The network operator must maintain field records for each air monitoring station. Each field records must contain a) instrument maintenance activities, b) quality control checks, c) troubleshooting activities, d) site visits, and e) any other relevant information pertinent to instrument performance. LICA maintains the right to access documentation of the system on request.

### 8.2 Data and Report Storage

LICA will retain all information relevant to the LICA air monitoring network in a password protected for a period of 10 years. The retained information includes the following:

- field logs and daily data check summaries;
- equipment audit and calibration results, maintenance records;
- relevant personnel and training records; and
- all housekeeping information generated by the data collection system.

LICA will retain all information relevant to the LICA air monitoring network in a password protected for the lifetime of the air monitoring network. The retained information includes following

- all laboratory results including measurements and sample quality information;
- copies of all data or other reports submitted to the AEP or similar organization;
- all information it requests from the network operator and Data Quality and Reporting Contractor;
- relevant personnel and training records;
- this QAP and all further revisions;
- records of corrective actions and resolutions;
- all data and equipment audit reports, including internal audits, external audits and government audits; and
- any other reports with relevance to the air monitoring network.

The contractors, including the network operator, laboratory personnel who performs sample analysis, must retain personnel and training records for staff under its control.

### 8.3 Websites

The LICA website (<http://www.lica.ca>) contains information about the airshed and the air monitoring system. It provides access to archived data. It also provides access to real-time data and contains a calculated health index.

Near real-time ambient air data is programmed to be sent to the website developer and then posted on the LICA website. The Alberta Air Quality Health Index (AQHI) is calculated using the near real-time ambient air data and provided by the DAS LICA is using. The AQHI values are sent to the website developer in order to post it on the LICA website for public to review. Both the near real-time ambient air data and the AQHI values shown on the LICA website are intended for public awareness. Data are considered “Raw” as they have not undergone quality control and quality assurance procedures.

The LICA website is maintained by LICA organization staff. Reports, data, and documentation are posted on the LICA website prior to review by either the LICA EMPM or LICA organization members.



## 8.4 Document Revision Procedures

### 8.4.1 QAP

LICA QAP is issued only as an electronic document. When the QAP is updated, the following procedures are used:

- The LICA EMPM must update the QAP. The LICA EMPM may choose to have the QAP report completed by a LICA employee or a contractor. However, the LICA EMPM is still responsible for the content of the report and has the duty to review and approve all changes.
- The revision number and date are clearly noted on the report. LICA QAP report must contain a revision tracking sheet that indicates the reason for the update and who prepared it. The revision tracking sheet is normally placed in the last page of the report.

The only controlled version of the QAP is the online version located on the LICA website (<http://www.lica.ca>). All other digital copies when downloaded, and all hardcopy documents, are uncontrolled.

### 8.4.2 Procedures and protocols

The air monitoring program changes from time to time. Changes may be requested by regulatory bodies, the public, LICA, and LICA's employees and contractors. LICA requires that the need for changes are fully understood and that the organization has the capability to deliver the changes and the documentation to support the changes.

Before acceptance of a change to procedures or protocols, the request is reviewed by the LICA EMPM to ensure that:

- changes are adequately defined and documented; differences between the current and changed procedures are resolved;
- an assessment of the risk of change to LICA has been conducted and the risk is considered acceptable; and
- LICA has the capability and capacity to meet these requirements.

The LICA EMPM must identify appropriate employees or contractors to undertake the changes, ensuring approved changes are implemented, and ensuring that acceptable documentation of changes is in place.

All LICA SOPs include revision numbers and tracking sheets.

## 9.0 QUALITY ASSURANCE PROCEDURES

### 9.1 Internal Audits

#### 9.1.1 QAP Audits

LICA reviews the QAP at least every three years. Updates are made as necessary to account for new instrumentation, new monitoring sites, etc. The review is conducted by personnel under the direction of the LICA EMPM.

#### 9.1.2 Network Assessment (AMD Audit)

LICA conducts a general review of its airshed monitoring program at least every three years. The review commences by the end of the third year following the previous review. The review is conducted by personnel or a third party, as determined by the EMPM or OSM.

At LICA's discretion, a review of monitoring program operations is also conducted which examines resource efficiency and effectiveness, and evaluation of performance measures and the business plan.

#### 9.1.3 External Audits

AEP conducts annual audits of the LICA network.

LICA Ambient Audit Protocol LICA-CD-AAP-0001 is required to be followed by both the LICA EMPM and the network operator or contractors.

#### 9.1.4 Continuous Improvement

The LICA EMPM who is responsible for continuous improvement of the LICA network actively canvasses LICA staff and the network operator for opportunities. In addition, the LICA EMPM uses the outputs of the corrective action process as well as all other quality assurance processes to improve network performance and the effectiveness of the quality system.

## 10.0 CORRECTIVE ACTION PROTOCOL

### 10.1 LICA Approach

LICA searches for and identifies problems with its air monitoring system through audits, measurement, or other activities. In addition, the monitoring system changes with time. To deal with system deficiencies and changes, LICA has developed a generalized corrective action process to ensure that:

- problems (including nonconformities) are identified and investigated;
- root causes are identified;
- corrective and preventive actions are identified and implemented; and
- actions are tracked and their effectiveness is verified.

LICA uses a “root cause analysis” to identify causes for not meeting targets and address non-conformances. The following checklist is used as a guide so that we have:

- identified the problem(s)? identified the cause(s)?
- identify a solution for each?
- implemented the solution(s)?
- documented the solution(s)?
- communicated the solution(s)?
- documented the action(s)?

### 10.2 Corrective Action Procedure

Refer LICA Corrective Action Procedure LICA-CA-CAP-0001, which can be found in LICA server.

## 11 REFERENCES

Alberta Environment and Parks. Air monitoring directive.

<http://aep.alberta.ca/air/legislation/air-monitoring-directive/default.aspx>.

Jacques Whitford. 2006. Implementation Plan for the LICA Airshed.

[http://www.lica.ca/attachments/023\\_Implementation\\_Plan\\_Report-Airshed\\_Zone-march\\_2006.pdf](http://www.lica.ca/attachments/023_Implementation_Plan_Report-Airshed_Zone-march_2006.pdf)

## 12 ACRONYMS AND ABBREVIATIONS

AEP	Alberta Environment and Parks
AMD	Air Monitoring Directive
CAEAL	Canadian Association for Environmental Analytical Laboratories
CAP	Corrective Action Plan
DAS	Data Acquisition System
LICA	Lakeland Industrial and Community Association
NAPS	North American Pollution Surveillance
PAC	Polycyclic Aromatic Compound(s)
PAH	Polycyclic Aromatic Hydrocarbon(s)
QAP	Quality Assurance Plan
SOP	Standard Operating Procedure
TDG	Transportation of Dangerous Goods
TEOM-FDMS	Particulate monitoring method based on tapered element oscillating microbalances and a filter dynamics measurement system which account for volatile and non-volatile PM fractions.
THC	Total Hydrocarbons
TRS	Total Reduced Sulphur
VOC	Volatile Organic Compound(s)
WHMIS	Workplace Hazardous Materials Information Systems

## 13 Revisions

### Document Revisions History

Revision Number	Date	Reason for Revision	Prepared By	Approved By
0	April 2017	New issue	Millenium EMS Solutions Ltd.	
1	Nov 2018	Reviewed and modified QAP to meet AMD 2019 Requirements, annual review	L. Lin, Data & Reporting Specialist	
2	April 2019	Reviewed and fixed some wording errors. Post the Draft on LICA website, annual review	L. Lin, Data & Reporting Specialist	
3	March 2020	Reviewed and modified reporting section, added Data Management & Reporting SOP to QAP, annual review	L. Lin, Data & Reporting Specialist	
4	December 2021	Removed "Draft" from the online PDF file, organization description change, annual review including multiple small changes throughout, added approval section to revision table.	L. Lin, Data & Reporting Specialist, Michael Bisaga, Environmental Monitoring Programs Manager	Michael Bisaga, Environmental Monitoring Programs Manager