Guide for Sampling for Reaction Products of 2-Propanone with Diphenylamine (PREPOD – CAS RN 68412-48-6) in Industrial Effluents

1.0 Introduction

PREPOD is part of the chemical grouping Amines and the chemical sub grouping Aromatic Amines. It is classified as Unknown or Variable Composition, Complex Reaction Products, or Biological Materials (UVCBs), and is used in Canada and elsewhere as an antioxidant in the manufacture of rubber products including tires. This substance is not naturally found in the environment.

PREPOD was declared toxic to the environment under CEPA on September 10, 2011. A Pollution Prevention (P2) Planning Notice was proposed as the instrument of choice to risk manages the substance.

As part of the P2 Planning Notice, facilities must consider effluent monitoring activities including sampling as described below:

a. Effluent samples are collected in such a way that they are representative of the effluent containing PREPOD released at the final discharge point under normal operating conditions;
b. The analysis of diisopropyldimethylacridan (DIPDMA), as an indicator of PREPOD presence, will be performed by Environment and Climate Change Canada's National Laboratory for Environmental Testing (NLET). The laboratory analysis will be performed according to the analytical method that was developed by NLET.
c. Effluent samples are collected and analyzed at least six months apart within predefined one-year periods for the duration of the Notice;

Sampling should be performed in accordance with generally accepted standards of good scientific practice at the time of the sampling event.

1.1 Purpose

This guidance document is to provide practical advice to facility operators on the sampling of industrial effluents for PREPOD.

This guide should be relied upon for general information purposes only, and should not be interpreted as legal advice and may not necessarily reflect all legal requirements of the pollution prevention planning provisions of Part 4 of CEPA 1999. Should a discrepancy arise between this document and Part 4 of the Act, the latter shall prevail.

1.2 Scope

This guidance document applies to water and effluent sampling, including:

- Effluent at the final discharge point
- Industrial process waters

This guidance document does not apply to groundwater sampling. It also does not provide detailed guidance on the interpretation of data.

1.3 Intended users

This guidance document is intended for any individual who samples industrial effluents for the purposes of detecting and measuring PREPOD components, whether conducted by the facility personnel or a third party on behalf of the facility operator.

Facilities subject to the P2 Planning Notice must have a thorough understanding of where and when PREPOD is introduced to their effluent, in order to select the appropriate sampling method, as described in Section 4 of this guidance document. For instance, PREPOD may be introduced by one specific process, several processes, at various times during the day, all day, only during maintenance activities, or only during cleaning activities and shower water at the end of shift. These activities should be captured as part of the sampling plan.

2.0 Planning a Sampling Event

Planning and preparing for a sampling event is an important, time-saving step that typically reduces the number of obstacles encountered during sampling[1].

2.1 Logistics

During the planning stages, it is recommended that the individual collecting the samples undertake the following:

- Prepare a monitoring plan as per Section 3, including identifying the monitoring sites, sampling methods, number of samples required, and occupational health and safety issues;
- Identify all activities associated with the production, process, and release of PREPOD from the facility's effluent (e.g., during production, cleaning or maintenance activities);
- Schedule the monitoring event, including planning how and when the samples will be transported to the laboratory. It is important to ensure that the samples are delivered to NLET within the conditions and holding time described in Section 6.5. The sampling schedules should also take into consideration the facility's activities, to ensure effluent content is representative of normal operating conditions associated with PREPOD;
- Organize and review site maps and locations to determine logistics of sampling. Sampling may occur at several other locations outside of the scope of this guidance document. Facilities must be able to identify specific processes that contribute to the presence of PREPOD in their final discharge point;
- Obtain and prepare all of the required equipment, including sampling equipment and personal protective equipment [PPE] for the sampling event. In addition, it is

[1] This guidance has been adapted from the Environment and Climate Change Canada Guide for Sampling and Analysis of Bisphenol A in Industrial Effluent, and has been modified based on recent PREPOD sampling experience.

important to test all equipment prior to the sampling event to ensure that it is operational and calibrated; and

- Prepare as much paperwork as practical before the sampling event, such as the preparation of sample labels, to save time and ensure completeness.

2.2 Occupational Health and Safety

A health and safety plan for the sampling event should be developed and included with the monitoring plan in order to mitigate the many hazards that can be associated with conducting fieldwork. The health and safety plan may include such elements as the following:

- Hazard identification and risk assessment:
  - exposure to hazardous substances (e.g., toxic gases);
  - temperature hazards (e.g., heat and cold stress);
  - working in high-traffic areas;
  - working adjacent to bodies of water; and
  - working in confined spaces.
- Actions undertaken to remove, mitigate or control risk; and
- Location of the nearest medical facility, and emergency procedures.

Due to the specific nature of the health and safety plans, a typical outline may include the following sections and/or important information:

- Purpose of the plan;
- Administrative information (project details, client information, project-specific health and safety personnel, etc.);
- Project description (site operations and physical description, type of fieldwork, scope, etc.);
- Primary responsibilities of project-specific health and safety personnel;
- Training requirements to carry out the fieldwork;
- Sign-in and sign-out procedure specific to the site;
- Preliminary assessment of potential hazards that may be encountered while working on-site (noise, moving equipment, traffic, etc.);
- PPE required while on-site;
- Emergency response procedure to follow while on-site;
- Map and directions to nearest hospital; and
- Health and safety plan approval information.

The above list does not represent a complete compilation of the information required for a specific site, but rather is meant to provide a general overview of typical requirements for guidance purposes.

3.0 Monitoring Plan

In order to ensure that monitoring is specific, targeted and cost effective, a monitoring plan must be developed. The monitoring plan will detail the actions, responsibilities and time frames necessary for the monitoring objective to be met.

3.1 Objective

The P2 Planning Notice identifies the following Risk Management Objective (RMO):

> To reduce the presence of PREPOD in industrial effluents by reducing the concentration of the DIPDMA component below its LoQ of 0.12 ng/L.

The objective of the monitoring plan is to understand the concentration of DIPDMA in the facility's effluent to ensure that it meets the RMO

3.2 Preliminary Assessment

In developing a sampling plan of the facility's effluents, it is important for the sample collector to understand the production process and effluents treatment process of the site. Once the sample collector has gained an understanding of the site's operating processes, a detailed sampling plan can be developed to meet the site's unique requirements. For example, a facility that only operates eight hours each day will have a different effluents flow pattern than a facility that operates 24 hours each day.

Sampling should be representative of the effluent containing PREPOD released at the final discharge point[2] under normal operating conditions. It is important to ensure that samples are collected from the last point where the facility has control over the quality of the effluent.

If sampling at this point is not possible, samples can be taken earlier in the process (e.g., production, packaging or cleaning), provided that effluent at the sampling location is as close as possible to the expected concentration of PREPOD resulting from normal operating conditions. Additionally, sampling can occur at another point within the process if it is possible to calculate, by using an estimation method, the concentration of PREPOD components at the final discharge point. Facilities should document the reasons for site selection and how estimates were determined.

3.3 Monitoring Plan Outline

A complete monitoring plan should include discussion of each of the following topics:

- Occupational health and safety equipment;
- Sampling equipment;
- Sampling type, method and location; and
- Quality assurance and quality control;

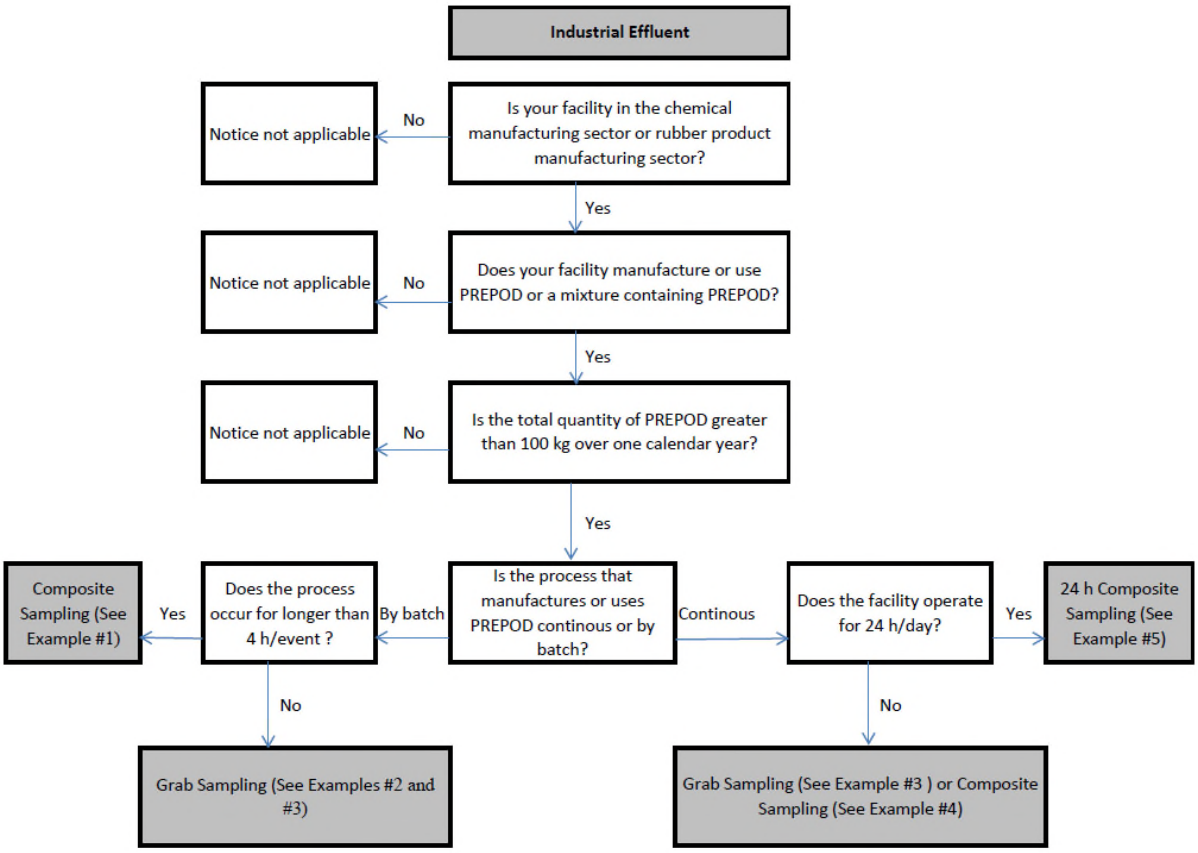
4.0 Sampling Type

The individual collecting the samples should have a thorough understanding of production processes at the industrial facility to ensure that representative samples are collected.

[2] If there is more than one final discharge point, representative sampling should occur at each final discharge point.

There are two basic collection techniques (grab sampling or composite sampling) that can be used when sampling industrial effluent containing PREPOD. It is imperative for facilities to determine their activities associated with the manufacture, use and release of PREPOD in order to identify whether a grab sample or composite samples will be required. Please refer to Figure 1 for a flow chart illustrating the appropriate sampling options.

Figure 1: Sampling Decision Flowchart



If the PREPOD-contributing process is not continuous, the sample collector can treat it as an intermittent process and choose the appropriate sampling technique based on the duration of the PREPOD-contributing process.

The guidance below is recommended for PREPOD sampling under normal operating conditions. However, in some specific instances it may be acceptable to collect a grab sample of a facility's effluent when a composite sample would normally be required. This can occur if the facility collects all of the effluent prior to final discharge, such as in a retention or collection tank. Facilities may also use composite sampling when the effluent content is highly variable, and use a grab sample when effluent content remains consistent during discharge. Also, if known, facilities can use grab samples at the precise

moment when PREPOD releases are likely to be at their highest level at the final discharge point.

The individual collecting the samples should work with site contacts to understand and choose the best method to ensure that the samples are as representative as possible of PREPOD releases.

4.1 Intermittent Process

Example #1 Composite Samples are appropriate for facilities that have an intermittent process, which operates for more than four hours and may contribute to the presence of PREPOD in the effluent. Composite sampling at the final discharge point is recommended for the length of time that PREPOD is likely to be present in the effluent. The facility may need to evaluate an appropriate lag time to ensure the PREPOD wastewater reaches the final discharge point prior to sampling.

Example #2 Grab Samples are appropriate for facilities that have an intermittent process, which operates for less than four hours consecutively and may contribute to the presence of PREPOD in the effluent. This situation may be experienced at a facility that uses a dry process, but which requires a cleaning or sanitation work shift. A grab sample of effluent at the facility's final discharge point is recommended during the four-hour cleaning or sanitation work shift.

Example #3 Grab Samples are appropriate for facilities that have an intermittent process, which may contribute to the presence of PREPOD in the effluent, but the wastewater is captured in a retaining tank prior to discharge. This situation may be experienced at a facility that captures wastewater for a few days prior to a discharge. It is recommended to collect a grab sample from the retaining tank prior to discharge and take a grab sample at the final discharge point after the retaining tank has been emptied to validate results. During tank sampling it is important to ensure that this tank is well mixed to ensure sample homogeneity and that no other effluent is released downstream from the final discharge point.

4.2 Continuous Process

Example #4 Composite Samples are appropriate for facilities that have a continuous process which operates for up to 24 hours per day and may contribute to the presence of PREPOD in the effluent. This situation may be experienced at a facility that operates during the day and has a sanitation work shift that washes equipment in contact with PREPOD. A composite sample is recommended for the duration of the facility's operation and the sanitation work shift.

Example #5 Composite Samples are appropriate for facilities that have a continuous process which operates for 24 hours per day and may contribute to the presence of PREPOD in the effluent. This situation may be experienced at a facility that operates three production work shifts per day where PREPOD is processed or used for a full 24 hours. A 24-hour composite is recommended in this example.

5.0 Equipment

In order for a sampling event to be successful, the sample collector needs to ensure that the appropriate equipment is available. Appropriate equipment may fall into any of the general categories, below.

5.1 Sampling Equipment

When sampling for trace analyses, as is typically expected with PREPOD sampling, it is very important that the sampling equipment be inert. Inert sampling equipment will not contaminate or interfere with the analytical results by imparting small concentrations of PREPOD into the sample or by adsorbing PREPOD onto the equipment surfaces. Typically, it is recommended that stainless steel, glass, or Teflon® equipment (i.e., buckets and sampling rods) be used to collect the sample. The sample collector must ensure that sampling equipment complies with the materials compatibility outlined above.

Table 2 provides a list of recommended equipment for various types of sampling events. Not all of these may be required for a particular sampling event, but they are included here for reference.

Table 2: Recommended equipment for sampling of trace contaminants in industrial effluents

Equipment	Grab Sample	Manual Composite Sample	Automatic Composite Sample
Autosampler			X
Autosampler mounting hardware (for manhole installations)			X
Teflon®tubing to fit autosampler fitting (usually 3/8" ID)			X
Teflon® or stainless steel strainer			X
Pickaxe (to remove the manhole cover)	X	X	X
Sledgehammer (in the event the manhole cover is difficult to open)	X	X	X
Gear clamps (to clamp tubing in place around strainer and fitting for the pump)			X
Nutdriver (to tighten the gear clamps)			X
Graduated cylinder (to calibrate the autosampler)			X
Rope			X
Sandbag (if required)			
10L glass composite sample jar or stainless steel container for use in the autosampler or manual composite sample		X	X
Knife or sharp scissors			X
Disposable gloves (i.e., nitrile gloves)	X	X	X
PREPOD sample containers (i.e., 1L amber glass bottle with a Teflon® lined lid)	X	X	X
Deionized water	X	X	X
Stainless steel bucket for equipment rinsing	X	X	X
Stainless steel bucket for sampling of effluent from a pipe or similar outfall (the bucket must provide a low hydraulic retention time)			X
Stainless steel sample rod with glass sample collection jar to collect grab samples from out-of-reach locations	X	X	
Waste bucket to collect rinse water	X	X	X
Flashlight	X	X	X
Measuring tape	X	X	X

Equipment	Grab Sample	Manual Composite Sample	Automatic Composite Sample
All required PPE (safety glasses, traffic cones, safety boots, hard hats, high-visibility vests, hearing protection, etc.)	X	X	X
Camera	X	X	X
Cooler with ice/cold packs	X	X	X
Thermometer	X	X	X
pH meter	X	X	X
Ice		X	X

5.2 Sample Containers

Given that organics such as PREPOD typically adsorb onto plastic surfaces, it is recommended that PREPOD samples be collected in new, pre-cleaned 1-L amber glass bottles with a Teflon®-lined lids. For automatic samplers, new silicone peristaltic pump tubing is needed for sample collection. Samples collected using this method should be accompanied by equipment blank samples (see section 7.2.1.).

5.3 Personal Protective Equipment

Prior to conducting a sampling event, the sample collector should identify the type of PPE required. The following list provides examples of the type of PPE that may be needed for sampling:

- First aid kit;
- Drinking water;
- Mobile phone/communication equipment;
- Wet weather gear;
- Waders/rubber boots;
- Disposable coveralls;
- Hard hat;
- Safety glasses;
- Splash shield;
- Hearing protection;
- High-visibility vest;
- Traffic cones;
- Steel-toed boots;
- Warm clothing for cold weather work;
- Disposable gloves;
- Antiseptic hand wash;
- Lifejackets; and
- Emergency Position Indicating Radio Beacon (EPIRB).

5.4 Decontamination

Decontamination is the cleaning of sampling equipment to avoid cross contamination of samples. In order to minimize the chance and consequence of contamination, it is important to use good sampling design. When planning a sampling event, the individual collecting the samples should consider the following:

- Use dedicated sampling equipment (i.e., sampling equipment that is always used to sample effluent or receiving-environment) that is PREPOD-free;

- Complete as many tasks as possible in a clean laboratory environment rather than in the field;
- Eliminate the need for unnecessary equipment or sample transfers. Where possible, collect the sample directly in the sample container; and
- Use single-use equipment (e.g. sample bottles) wherever possible.

If multiple-use equipment is being used, it should be decontaminated prior to sampling and between collection of samples.

Since all sampling equipment presents a risk of cross-contamination, it must be thoroughly cleaned between sampling. Small equipment should be cleaned thoroughly using a laboratory-grade detergent solution and a scrubbing brush. Specifically, the equipment should be:

- Rinsed in tap water to remove visible residues,
- Soaked in laboratory-grade detergent solution for at least 1 hour and preferably overnight,
- Scrubbed to ensure all residues are removed,
- Rinsed multiple times with tap water so that no soap residue is left;
- Triple-rinsed using laboratory-grade methanol;
- Triple-rinsed using deionized water; and
- Sealed in new aluminum foil to prevent contamination from the environment. For containers, ensure aluminum foil covers the opening.

It is important for the individual collecting the sample to consider the following:

- Do not decontaminate equipment near the sampling site. For example, plastic sheets can be used to contain the cleaning procedure and prevent contamination from ground material;
- Wear new gloves and appropriate PPE while performing the decontamination process;
- Change gloves frequently,
- Collect all waste rinse for proper disposal.

6.0 Sampling Methods

The following sections provide information regarding sampling methods for PREPOD.

Upon arrival at the sampling site the individual collecting the samples should document the following activities and observations, referred to collectively as “field notes”:

- Time, date, location, names of sampling team members and other pertinent project information;
- Major tasks carried out;
- Field temperature and pH of the collected samples;

- Significant observations with respect to the samples themselves (e.g., suspended solids), the sample location (e.g., end-of-pipe or earlier in the process), and weather conditions if relevant; and
- Sample identification numbers and their corresponding locations.

6.1 Collection

Once the sampling procedure as outlined in Section 4 has been determined, the individual collecting the samples can use the information provided in this section to ensure that the samples are collected properly.

During sample collection, the sample collector must take care to ensure sample homogeneity, as results may vary if the sample is not adequately mixed during collection. The sample collector should take note of whether the collected samples visually contain suspended solids, as they may have an impact on the levels of PREPOD contained in the sample.

Three composite or grab samples (one plus two duplicate) of effluent are required per sampling event, equipment blanks are also recommended at the start of each event to ensure there are no residues of PREPOD from the equipment.

6.2 Sampling Location

Effluent samples should be collected at the final discharge point. A final discharge point is an identifiable discharge point beyond which the industrial facility owner or operator no longer exercises control over the quality of the effluent. If sampling at this point is not possible, sampling can be taken earlier in the process, provided that effluent at the sampling location is as close as possible to the expected concentration of PREPOD resulting from normal operating conditions or could lead, by using an estimation method, to the concentration of PREPOD components at the final discharge point.

As part of their monitoring plan, facilities should record sampling site information such as identifying the sampling location and the rationale for the site location.

6.3 Manual Grab Sample

A grab sample is the collection of a representative sample from a particular location over a short time period. In some cases, a sample point may be very difficult to safely reach in order to obtain a grab sample (i.e., sampling from a manhole). The individual collecting the samples should use a stainless steel sample rod to extend his/her reach in order to safely obtain the sample. The rod may also allow the sample collector to directly use the sample container to collect the sample. If the sample container cannot be used, a glass, stainless steel, or Teflon® jar should be used, and the sample collector can pour the effluent sample from the collection jar into the appropriate sample container.

6.4 Detailed Sample Collection and Recovery Procedures

Procedures for grab sampling, manual composite sampling and automatic sampling are described below.

6.4.1 Location Preparation

If the final discharge point occurs in a manhole, remove manhole lid using a pickaxe and assess the water flow through the manhole:

a. If there appears to be sufficient flow to keep the strainer completely submerged at all times, continue with sample collection procedures.

b. If there is insufficient flow to take samples, the flow path needs to be partially obstructed using a sandbag or other inert object[3] to create a pool of water from which to collect the sample.

If the final discharge point occurs at the discharge from a pipeline, use a stainless-steel bucket to provide a pool of sample water so that samples can easily be taken. The sample collector will need to use his/her judgment in the selection of the bucket size. For larger flow rates (>10 L/min), a larger bucket (20 L) will be required to reduce splashing; for smaller flow rates (10 L/min), a smaller bucket (5 L) will be required to ensure adequate turnover of the collected effluent in the bucket.

If the final discharge point occurs at a discharge ditch, ensure that the flow through the ditch is sufficient to collect a sample at all times during the sampling event. Refer to the instructions above for flow obstruction if the flow through the ditch appears too low to collect the samples.

6.4.2 Sample Collection Procedures

Manual grab sampling:

a. Collect a similar volume of deionized water using the chosen, cleaned sampling equipment and pour it into a labelled sample container for the equipment blank (refer to Section 7.2.1 for more information); and,
b. Collect the sample using the sample container and the appropriate technique described in Section 6.3. Each sample must be of sufficient volume to fill the required 1L sample containers.

6.5 Sample Transportation and Delivery

After samples are collected, they must be packed securely using ice packs or ice and delivered to the analytical laboratory as quickly as possible (i.e., within 24 hours) so that they can be properly stored in a refrigerator at the required holding temperature. The cooler with ice/cold packs should only be used as temporary storage during transportation to the laboratory. Closed cell foam, Styrofoam, or bubble wrap should be used to wrap or cushion sample bottles to prevent any breakage during transportation. Cold packs, if used, should be enclosed in Ziploc® or equivalent freezer bags to prevent contamination of samples in case of pack breakage. Filled sample bottles should be enclosed in Ziploc® (or equivalent) bags to prevent leakage.

Prior to relinquishing custody of the samples to the analytical laboratory, it is imperative that the Chain of Custody (COC) forms be completely filled out by the individual who performed the sampling and transported the samples to the lab. As per Section 9.4, COC

[3] The object must not block the manhole. Blocking the manhole discharge can cause the sewer line to become backed up and may flood the facility. The pool of water created by the object will allow for sampling during low effluent flows. Lower it into the flow path using rope and tie it to the top rung of the manhole access ladder, keeping the rope taut so the object does not have any slack to move if the flow increases. The object should be installed such that the flow channel retains a small pool of water, approximately halfway down the flow channel to ensure that pooled water can still flow around the object and through the manhole discharge.

forms demonstrate the integrity of the samples and instill confidence in the sample results. If responsibility for the samples needs to be transferred at any time, this information should be captured on the COC to ensure sample integrity.

All samples will be sent to the following address:

- Environment and Climate Change Canada National Laboratory for Environmental Testing (NLET)
  867 Lakeshore Road, Burlington L7S 1A1, attention Pat Falletta

It is the responsibility of the sample collector to notify the laboratory to advise that samples are in transit, and to ensure that samples have arrived on time and intact.

7.0 Quality

7.1 Quality Assurance

Quality Assurance (QA) consists of the policies, actions and procedures established to provide and maintain a degree of confidence in data integrity and accuracy. In order to achieve consistent data collection during a sampling event, a QA system should be created and followed.

7.2 Quality Control

Quality Control (QC) is a sample or procedure intended to verify the performance characteristics of a system. The goal of QC procedures is to identify any significant change in or contamination to the sample, due to containers, handling and transportation. Typical QC components include field equipment blanks and duplicates.

Data quality objectives are used to establish the type and number of QC samples that must be collected. The greater the number of QC samples, the greater the degree of confidence in the reliability of results.

7.2.1 Equipment Blanks

Contamination introduced to the sample through contact with the sampling equipment is detected and measured using equipment blank. The equipment blank must be prepared by the sample collector prior to starting a sampling event, to illustrate that no PREPOD is being introduced to the sample from the sampling equipment. The individual collecting the samples should use the sampling equipment to collect a sample of deionized water for PREPOD analysis as described in Section 5. Equipment blank should be submitted once per sampling event.

If analysis of the blanks identifies elevated concentrations of target analytes, a thorough review of the portions of the sampling plan that may be introducing contamination should be initiated, as this will affect results and corresponding conclusions.

7.2.2 Duplicates

To contribute to sample quality assurance/quality control, at least one set of duplicate samples should be taken annually at the final discharge point of the facility.

Compare duplicate samples results (if required): The variation between duplicate samples should be within the tolerances for the analytical procedure. Typically, differences between duplicates are quantified as a relative percentage difference (RPD), which is calculated using the following formula:

$$RPD = \left[(R1 - R2) \div \frac{(R1 + R2)}{2} \right] \times 100$$

where R1 is the result of sample and R2 is the result of duplicate sample.

If the RPD is greater than 20%, an investigation into the cause should be initiated and documented.

8.0 Documentation and Reporting

8.1 Record Keeping

Facilities must keep their P2 Plan and any records pertaining to the Plan while engaged in the manufacture or use of PREPOD and for a minimum of five years after they have ceased these activities. Please refer to the Notice Requiring the Preparation and Implementation of Pollution Prevention Plans with Respect to PREPOD in Industrial Effluents published by the Minister of the Environment under Part 4 of CEPA 1999 for details on record keeping requirements.

Facilities should keep all records up-to-date and accessible for inspections. Records pertinent to sampling and analysis may include:

- Monitoring plan;
- Date and time of sampling activities;
- Sample collection type (grab or composite) and sampling method;
- Sampling location;
- Identification of sampling staff;
- Malfunctions and corrective actions taken;
- Maintenance log, including the frequencies and types of maintenance performed;
- Calibration, cleaning and repair logs;
- Date that the samples were sent to the laboratory for analysis;
- Date that the analysis test was performed;
- Laboratory test method, including detection limit;
- Laboratory accreditation number where available;
- Laboratory address and phone number; and,
- Any other relevant information.

8.2 Labelling and Identification

Samples should be labelled so that they can be readily identified at all times. Sample labels should be durable, and be able to stay on the sample container even when wet. The ink used to mark a sample container label should be insoluble in water.

Labelling on samples should contain as much information as possible. The labels should specify a clear and unique identifying code that can be cross-referenced to the monitoring location and time of sampling. Labels may also contain the following:

- Date and time of sampling;
- Location and name of sampling site;
- Job or project number;
- Name of the sample collector;
- Container pre-treatment and preservatives added; and,
- Observations that may affect the method or results of analysis.

The information listed above should also be recorded on the sampling sheet and retained as a permanent record.

8.3 Chain of Custody

Chain of Custody (COC) procedures and documentation give confidence that the sample integrity has not been compromised. The COC documentation is a record used to trace possession and handling of a sample from collection, analysis, and reporting to disposal.

COC control is based on the principle that a sample is always in someone's custody and as such they are responsible for it. If the sample is far away from the location of the analytical laboratory, the sample collector may make use of a courier service to deliver the samples to the laboratory. The sample collector must ensure that the samples are not tampered with, by securing the lid of the sample cooler with tape so that it is obvious if the items have been tampered with. When the samples change custody, the new person who is responsible for them will sign and date the seal on the cooler so that the custody chain can be easily traced.

Prior to packing the samples, the sample collector must complete the COC form. The original form remains with the samples at all times to enable the completion of custody details at each stage of progression through transportation, analysis and reporting.

In order to confirm receipt and appropriate transfer and handling, a final copy of the COC form should be obtained from the laboratory. The laboratory should also include a copy of the completed COC form as part of their analytical report.

9.0 Bibliography

This guidance document was based on:

Guide for Sampling and Analysis of Bisphenol A in Industrial Effluent. Environment and Climate Change Canada, available from https://www.canada.ca/en/environment-climate-change/services/pollution-prevention/publications/guide-sampling-analysis-bisphenol-a-industrial.html [Accessed March 2018].

For additional sampling information and best practices, the sample collector may wish to consult the following references:

Kim M., P. Guerra, M. Theocharides, K. Barclay, SA. Smyth, M. Alaee. 2013. Parameters affecting the occurrence and removal of polybrominated diphenyl ethers in twenty Canadian wastewater treatment plants. Water Research 47, 2213-2221.

Municipal/Industrial Strategy for Abatement (MISA) Protocol for Sampling and Analysis of Industrial/Municipal Wastewater published by the Ministry of the Environment (MOE).

Ort, C., M.G. Lawrence, J. Rieckermann, A. Joss. 2010. Sampling for pharmaceuticals and personal care products (PPCPs) and illicit drugs in wastewater systems: are your conclusions valid? A critical review. Environmental Science and Technology, 44, 6024–6035.