1. PURPOSE

1.1. To detail the Policy and procedures for sampling, sample handling and sample receipt.

2. SCOPE

2.1. This procedure applies to the Consultant performing the sampling and the sample handling.

3. PROCEDURES

3.1. Sampling for license conditions

- The sampling points must be the same as that specified in the Water Use License conditions
- Conditions for exception would be:
  - Better and safer access to a sampling point (e.g. for WWTW between final treatment point and the discharge outfall point
  - If the effluent is chlorinated prior to discharge to the receiving waters, it may also be desirable to take samples prior to contact with the chlorine to determine toxicity of the un-chlorinated effluent, if required, if not the total effect will be assessed for the effluent as is, depending on the purpose of the testing – this should be clearly stipulated on the Request for Analysis sheet (QM7.1/R-19) by the Client
  - In the event that there is a desire to evaluate the toxicity of the influent to publicly owned treatment works or separate process waters in industrial facilities prior to them being combined with other process waters, additional sampling points may be chosen
  - The potential impacts and sources should always be considered during development of the sampling programme
  - The use of receiving water for testing sampling dilution can be considered

Any exceptions must be noted clearly on the analysis request form

3.2. Sampling Information

3.2.1. Quality Assurance

- Avoiding contamination during sampling is essential. All possible sources of contamination should be considered and the appropriate controls applied where applicable.
- Potential sources of contamination can include (but are not limited to), residues of earlier samples or on equipment used, personnel (e.g. cosmetic products or poor hygiene), markers used to label containers, bottle caps/tops, general handling (residues for hands, gloves), inappropriate sampling devices/bottles, exhaust fumes from sampling vehicles etc.
- Control and identification of contamination can be achieved by e.g. appropriate personnel training, appropriate procedures, techniques and sampling manuals, taking care to avoid disturbance at the sampling site, using different/cleaned equipment for different sampling sites, use of different equipment for different sampling activities, using the appropriate

personal protective equipment during sampling, thoroughly rinsing and cleaning the equipment, storing bottle caps and tops securely to avoid contamination, wiping and drying ropes or extension handles between sampling and prior to storage, avoiding touching the sample itself with hands or gloves, examining each sample or sample bottle for large particles such as leaves, detritus or live organisms – if these are observed, discard the sample and collect a new sample.

3.2.2. Handling, transport, storage, and delivery of samples

- Samples should be delivered to the laboratory within the stability window for the tests (<72hrs) to be carried out otherwise the samples will not remain representative – if this is not possible but testing should continue, it will be noted as such on the report.
- Samples should be kept cool (not frozen) @ 1-7°C (to inhibit microbial degradation, chemical transformations, and loss of highly volatile toxic substances) during storage and transport – keep samples preferably in mobile fridges or cooler boxes with ice packs in an upright position and tightly closed. Sufficient ice should be placed with the sample(s) in the shipping container to ensure that ice will still be present when the sample(s) arrive at the laboratory. Insulating material should not be placed between the ice and the sample in the shipping container unless required to prevent breakage of glass containers. Place the ice bricks vertically next to the sample or pack the ice pack around the sample.
- Composite samples should be chilled as they are collected.
- Grab samples should be chilled immediately following collection.
- To prevent contamination do not mix various types of samples in one cooler box, such as effluents and control waters, as far as is practicably possible.
- All sample containers should be rinsed with source water before being filled with the sample.
- Samples should be kept in an upright position and the lid securely placed to prevent leaking.
- All samples should be treated as potentially toxic and personal protective equipment should be used at all times when handling samples.
- Always note on the Request for Analysis form if samples have been chlorinated in order for the laboratory to dechlorinate the samples prior to toxicity testing.

3.2.3. General sampling recommendations

- Identify and use the appropriate container for sampling.
- Ensure that adequate and appropriate sampling equipment and techniques are used for the specific purpose of the assessment.
- Transfer of effluents should be minimized to reduce the loss of volatile chemicals.
- Ensure that the bottle is filled to the top and tightly closed.
- Date and name of the sample should be recorded on the sample bottle and the name on the bottle cap.
- In rivers grab samples should be collected at mid-stream and mid-depth, if accessible.
- At estuarine and marine sites, samples should be collected at mid-depth.

- To determine the extent of the zone of toxicity in the receiving water downstream from the outfall, receiving water samples are collected at several distances downstream from the discharge, where possible and/or applicable.

3.2.4. Retention of samples

Samples are retained in a refrigerator at 1-7 ° C in the laboratory until the tests have been completed and for a period of 2 weeks following submission of the report to the Client (during which time queries can be raised). After this, samples will be discarded. Note that retention of samples at the laboratory is purely for the purpose of verification/confirmation (e.g. extremely low/high pH/EC values) as a result of potential instability and re-testing will require re-sampling.

3.2.5. Sample identification

- The source of the sample and the conditions under which it was collected should be recorded on the Request for Analysis form.
- ISO5667-1 requires as part of the sampling report/program at least the location and name of sampling site, details of the sampling point including kind of sample, date of collection, time of collection, name of sampler, sample type, weather conditions, field observations, water temperature, nature of any pretreatment including preservation and the method of collection and any details of non-compliance with standard conditions or sampling practices.
- However, for BioToxLab records, only the unique sample name with the exact sampling date and any other relevant important information (e.g. weather conditions, flow conditions etc.) is needed.

3.2.6. Sampling equipment

- There are many sampling situations, some of which can be satisfied by taking simple spot samples, whereas others might require sophisticated instrumental sampling equipment. There is also a need to ensure any equipment required is prepared correctly before use (details provided in Annexure D (Table D.1) of ISO5667-1).
- Effective sampling equipment should minimize the contact time between the sample and the sample container, use materials such that no sample contamination occurs, be simply designed to ensure ease of cleaning, with smooth surfaces and the absence of flow disturbances such as bends and with as few taps and valves as possible and be designed with the suitability of the system in relation to the required water sample (i.e. chemical, hydrobiological, microbiological).
- Equipment used for grab sampling are described in section 10.2 of ISO5667-1. The simplest equipment for taking surface samples is a bucket or wide-mouthed bottle dropped into a body of water and hauled out after filling – it is best to take the sample directly into the sample container.

- Sediment can be sampled by grabs or dredges designed to penetrate the substrate as a result of their own mass or leverage or by using core samplers (e.g. when information concerning the vertical profile of a sediment is of interest).

3.2.7. Sampling containers

- Sample containers should be such as to preserve the composition of the sample from losses due to adsorption and volatilization, or from contamination by foreign substances.
- The sample container used to collect and store the sample should be chosen after considering, for example, resistance to temperature extremes, resistance to breakage, ease of good sealing and reopening, bottle neck width, bottle volume, size, shape, mass, availability, cost, potential for cleaning and re-use and ease of storage.
- Precautions should be taken to prevent unintentional sample freezing, particularly when glass sample containers are used.
- Always keep in mind chemical and biological inertness of the container material in order to prevent or minimize reaction between constituents of the sample and the container.
- Take into consideration sample containers which can cause errors by adsorption of chemical parameters which could have contributed to toxicity effects noted (e.g. trace metals are particularly liable to this effect), but other parameters (e.g. detergents, pesticides, phosphates) can also be subject to error.
- For toxicity testing purposes, sampling should take place using clean plastic (polyethylene) or glass (borosilicate) bottles filled to the top and tightly closed.
- For microbiology testing (outsourced by BioToxLab) sterile containers must be used and the samples should remain sealed until opened in the laboratory and should be covered to prevent contamination.

3.2.8. Sample volumes

- The volume of sample collected should be sufficient for the required analyses and for any repeat analyses. The use of very small sample volumes can cause the samples collected to be unrepresentative. In addition, small samples can also increase problems of adsorption because of the relatively high area to volume ratio.
- A 1 liter container will provide sufficient sample volume for screening toxicity tests and 2 liters for definitive testing (basic battery of tests including a bacteria, algae/duckweed, invertebrate and vertebrate), unless otherwise specified and/or requested. Care should be taken that sediments are not contained in the bottles during water sampling.
- For Ostracod and Phytotox analyses, as well as for leachate testing, at least 500g of dry sediment/soil/product should be submitted. Care should be taken to avoid large debris.

3.2.9. Sample preservation

For toxicity testing purposes, no sample preservation shall be done.

3.2.10. Sample types

- Separate samples should be taken for chemical, microbiological and hydrobiological analyses because the procedures and equipment for collection and handling are different and may be incompatible.
- It is necessary to differentiate between sampling from standing and flowing rivers. Grab samples and composite samples are applicable to both standing and flowing waters. Periodic sampling and continuous sampling are applicable to flowing waters, whereas series sampling is more applicable to standing water.
- Grab samples are discrete sample, usually collected manually, but which can also be collected automatically, for waters at the surface, at specific depths and at the bottom. Each sample will normally be representative of the water quality only at the time and place at which it is taken. Automatic sampling is equivalent to a series of such samples taken on a preselected time or flow-interval basis.
- Grab samples are recommended if the flow of the water to be sampled is not uniform, if the values of the parameters of interest are not constant and if the use of a composite sample would obscure differences of interest between individual samples due to either masking short-term variations or even reaction between them.
- The advantages of grab samples include (but are not limited to) easy collection, requiring a minimum of equipment and on-site time and toxicity spikes are not masked by dilution. The disadvantages of grab samples include (but are not limited to) the fact that such samples are collected over a very short period of time and on a relatively infrequent basis, and the chances of detecting a spike in toxicity would depend on the frequency of sampling, and the probability of missing spikes is high.
- The advantages of composite samples include (but are not limited to) the fact that a single sample (e.g. effluent) is collected over a 24 hour period but such sample is collected over a much longer period of time than grab samples and contains all toxicity spikes. However, the disadvantages of composite samples include the fact that sampling equipment is normally more sophisticated and expensive, and must be placed and left on-site for at least 24 hours. Toxicity spikes may also not be detected because they are masked by dilution with less toxic wastes.
- Other types of sampling include Continuous samples (taken at fixed flow rates or variable flow-rates), Periodic samples (taken at fixed flow-intervals (flow-dependent) or constant volume variable volume sampling as well as Series sampling (taking a number of samples from various depths of a water body at specific location (depth profile samples) or a series

of water samples taken from a particular depth of a body of water at various locations (are profile samples) – details of these sampling techniques are given in ISO5667-1 section 10.

3.2.11. References to sampli3ng standards

- ISO 5667-3:2018, *Water Quality – Sampling – Part 3: Preservation of handling of water samples*
- ISO 5667-4:2016, *Water Quality – Sampling – Part 4: Guidance on sampling rom lakes, natural and man-made*
- ISO 5667-5:2006, *Water Quality – Sampling – Part 5: Guidance on sampling of drinking water from treatment works and piped distribution systems*
- ISO 5667-6:2014, *Water Quality – Sampling – Part 6: Guidance on sampling of rivers and streams*
- ISO 5667-7:1993, *Water Quality – Sampling – Part 7: Guidance on sampling of water and steam in boiler plants*
- ISO 5667-8:1993, *Water Quality – Sampling – Part 8: Guidance on the sampling of wet deposition*
- ISO 5667-9:1992, *Water Quality – Sampling – Part 9: Guidance on sampling from marine waters*
- ISO 5667-10:1992, *Water Quality – Sampling – Part 10: Guidance on sampling of waste waters*
- ISO 5667-11:2009, *Water Quality – Sampling – Part 11: Guidance on sampling of groundwaters*
- ISO 5667-12:2017, *Water Quality – Sampling – Part 12: Guidance on sampling of bottom sediments from rivers, lakes and estuarine area*
- ISO 5667-13:2011, *Water Quality – Sampling – Part 13: Guidance on sampling of sludges*
- ISO 5667-14:2014, *Water Quality – Sampling – Part 14: Guidance on quality assurance and quality control of environmental water sampling and handling*
- ISO 5667-15:2009, *Water Quality – Sampling – Part 15: Guidance on the preservation and handling of sludge and sediment samples*
- ISO 5667-16:2017, *Water Quality – Sampling – Part 16: Guidance on biotesting of samples*
- ISO 5667-17:2008, *Water Quality – Sampling – Part 17: Guidance on sampling of bulk suspended solids*
- ISO 5667-19:2004, *Water Quality – Sampling – Part 19: Guidance on sampling of marine sediments*
- ISO 5667-20:2008, *Water Quality – Sampling – Part 20: Guidance on the use of sampling data for decision making – Compliance with thresholds and classification systems*
- ISO 5667-21:2010, *Water Quality – Sampling – Part 21: Guidance on sampling of drinking water distributed by tankers or means other than distribution pipes*
- ISO 5667-22:2010, *Water Quality – Sampling – Part 22: Guidance on the design and installation of groundwater monitoring points*
- ISO 5667-32:2011, *Water Quality – Sampling – Part 23: Guidance on passive sampling in surface water*

- ISO 5667-24:2016, *Water Quality – Sampling – Part 24: Guidance on the auditing of water quality sampling*

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