ZDHC Wastewater Guidelines Version 1.1

Ø ZDHC

The Roadmap To Zero Programme

July 2019

Signatory Brands

Chemical Industry

Textile and Footwear Industry

Solution Provider

Associates

Contents

1.0.0 Revision History

In the spirit of continuous improvement, the ZDHC Wastewater Guidelines will be reviewed on a regular basis and revised as needed to incorporate learnings and opportunities identified during the practical application and implementation of these guidelines. This update contains no changes to the sampling locations, parameters, limits (except for sludge), comparison criteria, or frequency of testing. The changes are limited to clarifications of procedures and expanded instructions. A historical record of the updates to these guidelines is noted in the figure below.

Figure 1: Revision History of the ZDHC Wastewater Guidelines

Version Number	Changes	Time of publication
Version 1.0	Initial publication of the ZDHC Wastewater Guidelines	November 2016
Version 1.1	▪ No changes made to the parameters and limit values for wastewater (*Appendix A Tables 1A-1B* and *Tables 2A-2N*), however, the conventional parameters in *Appendix A Table 1* were reformatted into two sub-tables: *Table 1A* covers sum parameters and anions, and *Table 1B* covers metals. ▪ No changes made to the parameters for sludge. However, the reporting limits, standard methods for sludge analysis, and lab description methods have been specified in *Appendix A Table 3.* ▪ Integrated the requirements from the ZDHC Interim Guidelines for suppliers with an on-site Zero Liquid Discharge (ZLD) treatment system - released in February 2019. In addition, the scope of metals testing for raw wastewater is expanded. Please refer to section 9.5.0	July 2019
	▪ Removed sampling and testing of incoming water[1] from the Guidelines requirements. Instead, this could be part of the root cause analysis when there is non-conformance to test results of the ZDHC MRSL parameters. ▪ Expanded the standard methods for analysis for conventional parameters to allow suppliers to use legal compliance testing data/results for ZDHC reporting requirements, following certain conditions and exceptions as specified in section 9.6.0 ▪ Added testing guidelines for Persistent Foam in section 9.6.0 ▪ Restructured the content to improve the logic and flow of information. ▪ Re-numbered paragraphs and sections to facilitate easy reference to parts of the document. ▪ Re-formatted the text of the document to clarify requirements on sampling, testing, and reporting.	

[1] Incoming water: water that is supplied to a manufacturing process, usually withdrawn from surface water bodies, groundwater, collected from rainfall, supplied by municipalities, etc.

2.0.0 Introduction

The ZDHC Roadmap to Zero Programme (**ZDHC**) is a collaboration of brands, value chain affiliates and associates committed to eliminating hazardous chemicals from the textile, apparel and footwear value chain. ZDHC recognises that achieving this goal requires collaborative efforts in the industry, capacity building, time, technology, and innovation.

In 2015, ZDHC commissioned a study to better understand the regulatory landscape of wastewater discharge regulations and guidelines across the textile industry. This study concluded:

a. Wastewater discharge quality regulations vary greatly from country to country and region to region.
b. Current wastewater regulations do not necessarily focus on the management of hazardous chemicals.
c. Wastewater guidelines published by different brands, as well as amongst multi-brand consortia, vary greatly, resulting in duplication of testing for suppliers.
d. There is a need for uniform, global guidance pertaining to wastewater discharge quality, as well as testing and reporting, to enable a more sustainable industry.

The purpose of the ZDHC Wastewater Guidelines (**these Guidelines**) is to set a single, unified expectation across the textile and footwear industries for wastewater discharge quality, which goes beyond regulatory conformance. This is not only for conventional wastewater parameters, but also for hazardous chemicals.

To achieve a unified approach for the textile, apparel and footwear industry, ZDHC encourages global adoption of these Guidelines by any organisation, consortia, or supplier interested in a more sustainable future.

It is important to streamline efforts within the value chain. **It is the intent of these Guidelines that on completion of testing as per these Guidelines, and at the request of one ZDHC Brand, results will be accepted by all ZDHC Brands. This will be regardless of the sampling and testing approach chosen (see sections 9.4.0 and 9.5.0)**. Through

the implementation of these Guidelines, we aim to minimise duplication of testing. Instead, we want to enable suppliers with wet processing facilities (**supplier**) to focus on actual improvements. The supplier scope is described in section 8.0.0.

3.0.0 Related ZDHC Documents

The related ZDHC guidance and documents listed below compliment and support these Guidelines.

a. ZDHC Manufacturing Restricted Substances List (ZDHC MRSL) Version 1.1 (released in December 2015) click here.

b. ZDHC Textile Industry Wastewater Discharge Quality Standards Literature Review (released in May 2015).
c. ZDHC Gateway Laboratory Acceptance Programme – Wastewater Guidelines. The details of this programme, such as minimum acceptance criteria, subcontracting principles, application and review processes are available on the online laboratory application form, which is accessible for public.
d. ZDHC List of Accepted Laboratories for testing according to ZDHC Wastewater Guidelines.
e. ZDHC Wastewater and Sludge Laboratory Sampling and Analysis Plan (SAP).

The latest version of documents specified in point b to e (above) are available on the ZDHC Output Focus Area webpage click here.

f. ZDHC Gateway User Terms and Conditions.
g. ZDHC Root Cause Analysis and Corrective Action Plan Template.

The latest version of documents specified in point f and g (above) are available on the ZDHC Gateway platform.

4.0.0 Objectives

ZDHC recognises the importance of addressing hazardous substances that may be discharged into the environment during the manufacturing processes of textile, apparel and footwear products. That is, hazardous substances that could be used deep within the value chain and not just substances that could be present in finished products. The discharge of wastewater containing hazardous chemicals could have a significant impact on the environment and human health. Therefore, besides addressing conventional wastewater discharge parameters such as total suspended solids (TSS), biological oxygen demand (BOD), and chemical oxygen demand (COD), these Guidelines also address the priority hazardous chemical substances identified in the ZDHC Manufacturing Restricted Substances List (ZDHC MRSL) Version 1.1 (**ZDHC MRSL V1.1**). The ZDHC MRSL V1.1 is a list of chemical substances banned from intentional use in the textile, apparel and footwear industries.

These Guidelines specify a unified set of testing parameters, limit values and recommended analytical test methods. They also make a reference to sampling and analysis procedures, which is the ZDHC Wastewater and Sludge Laboratory Sampling and Analysis Plan (**SAP**).

ZDHC Brands and the suppliers they work with are encouraged to share their testing results in a systematic, efficient manner via an online platform called the ZDHC Gateway – Wastewater Module.

The expected outcomes of implementing these Guidelines are to:

a. Ensure wastewater discharges do not have an adverse impact on communities and the environment.
b. Harmonise expectations for wastewater monitoring and testing, and to aid suppliers with sharing wastewater discharge data with the brand(s) they work with, and other interested parties.
c. Eliminate duplicative testing and improve operational efficiency within the value chain by defining a standard cadence for wastewater and sludge sampling, testing and reporting requirements, applicable to all brands and suppliers adopting these Guidelines.

5.0.0 Definitions

Central Effluent Treatment Plant (CETP): A wastewater remediation facility that collects and treats wastewater from multiple suppliers and is not owned or operated by any of the users. CETP is not under direct control of the supplier and located outside of the supplier's property boundaries. Examples of CETPs are municipal wastewater treatment plants, and wastewater treatment plants that provide wastewater treatment services for entire industrial parks.

Conventional Wastewater Parameters: These are parameters that are amenable to treatment by the effluent treatment plant, meaning proper operation is critical to controlling their discharge. These parameters are mostly related to properly operating an effluent treatment plant (including not overloading the capacity). The parameters include those such as temperature, pH, biological oxygen demand, or chemical oxygen demand (*Appendix A Tables 1A-1B*). ZDHC Signatory Brands acknowledge that these parameters are relevant and very important for the textile, apparel and footwear industry. Therefore, these Guidelines align on these parameters with foundational, progressive and aspirational limit values.

Detection Limit: The minimum concentration of a substance that can be measured by a specific piece of laboratory equipment and reported with 99% confidence that the analyte concentration is greater than zero. Detection limits are expected to be approximately one tenth of a reporting limit. A ZDHC Accepted Laboratory is expected to clearly state the detection limits for each analyte in each final test report. If no detection limits are listed, the report shall be considered non-conformant with these Guidelines.

Direct Discharge: A point source that discharges wastewater to streams, lakes, oceans, or other receiving bodies. Distribution of wastewater onto land is also considered a type of direct discharge. Municipal bodies and suppliers that introduce pollution through a defined conveyance or system such as outlet pipes are direct dischargers.

Discharged Wastewater: Wastewater that is released from a supplier, either directly to the environment (including but not limited to: water bodies, land application/irrigation), or to a wastewater treatment system beyond the supplier’s property boundaries.

Domestic Wastewater: Wastewaters originating from plumbing fixtures and appliances that support human life such as sanitary systems (toilets), baths, and kitchens.

Effluent Treatment Plant: See Wastewater Treatment Plant definition.

Hazardous Chemicals: Hazardous chemicals are not just those that have been regulated or restricted. They also include those exhibiting the intrinsically hazardous properties of being persistent, bio-accumulative and toxic (PBT), very persistent and very bio-accumulative (vPvB), carcinogenic, mutagenic and toxic for reproduction (CMR), endocrine disruptors (ED), or properties of equivalent concern.

Indirect Discharge: The discharge of wastewater through a sanitary or industrial wastewater sewer system to a central or common effluent treatment plant (CETP) not owned and/or operated by the supplier discharging the pollutants.

Industrial Wastewater: Water that has been used for manufacturing processes and no longer meets the quality standard for beneficial use. Where domestic wastewater is blended with industrial wastewater within the boundaries of a supplier that is the source of both wastewater types, the resultant flow is considered industrial wastewater.

Pretreatment: The reduction, alteration, or elimination of pollutants in wastewater prior to its discharge into a central or common wastewater treatment plant (CETP) that is not owned and operated by the supplier. Examples of pretreatment are pH adjustment, filtration, other physical/chemical processes, and biological treatment of the wastewater.

Raw Wastewater (Untreated Wastewater): Wastewater that has not yet been treated prior to direct or indirect discharge, or recycling efforts. This wastewater therefore does not meet the quality standards for beneficial use.

Reporting Cycle: The six-month periods ending on April 30 and October 31 each year. Sampling, testing and reporting (i.e. data submission) of laboratory results to the ZDHC Gateway – Wastewater Module must be completed by the end of each cycle.

Reporting Limit: Lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. This limit takes into consideration the variability associated with analysing samples from a wide variety of sources with many potential complicating factors, e.g. matrix effects. The reporting limits must be at least as low as the limits in these Guidelines. Good laboratory practice dictates that a reporting limit is ten times the detection limit.

Reverse Osmosis: Reverse osmosis is a water purification technology that uses a semipermeable membrane to remove ions, molecules and larger particles from water.

Sludge: The solid or semi-solid material separated during the wastewater treatment process, including septic and Zero Liquid Discharge (ZLD) systems.

Treated Wastewater: Wastewater that has been treated prior to its discharge. The treatment includes reduction, alteration, or elimination of pollutants.

Wastewater: Water no longer considered usable for a given operational purpose that is directly or indirectly discharged from the supplier.

Wastewater Treatment Plant: A treatment plant that reduces, alters, or eliminates pollutants in wastewater discharges prior to the release of the water into water receiving bodies. Wastewater treatment plants may be privately owned and operated by the enterprise creating the wastewater, or they may be owned and operated by a private or public third party. A wastewater treatment plant may also be called an effluent treatment plant (ETP).

Wet Processing: Manufacturing processes that use water as a carrier that contacts the product being manufactured. For example, dyeing, finishing, printing, washing, and laundry processes. Non-contact, closed-loop boiler or cooling water are not considered wet processing.

ZDHC Accepted Laboratories: Laboratories that have demonstrated that they can attain and maintain the performance and quality standards of the ZDHC Foundation. The minimum acceptance criteria and application process are described in the online application form of the ZDHC Gateway Laboratory Acceptance Programme – Wastewater Guidelines.

ZDHC Foundation: The ZDHC Foundation oversees the implementation of the ZDHC Roadmap to Zero Programme.

ZDHC Gateway - Wastewater Module: A global web-based data platform for storing, reporting and sharing wastewater and sludge test data based on the requirements of the ZDHC Wastewater Guidelines. For more information on the ZDHC Gateway - Wastewater Module, please visit the ZDHC website.

ZDHC MRSL (Manufacturing Restricted Substances List): The ZDHC MRSL is a list of chemical substances banned from intentional use in the production of materials and trim parts for the textile, apparel and footwear industries. The ZDHC Wastewater Guidelines Version 1.1 specifically refers to the ZDHC MRSL V1.1.

Zero Liquid Discharge (ZLD): The concept that no water leaves a supplier in liquid form. At a supplier with an on-site ZLD treatment system, almost all the wastewater is treated and recovered such that the only water discharged from the supplier exits by evaporation or as moisture in the sludge from treatment plant operations. A supplier is not considered to have a ZLD treatment system if there is a liquid discharge.

6.0.0 Abbreviations

AOX	Adsorbable Organic Halogens, where 'X' represents the halogens chlorine, bromine and iodine
AP	Alkylphenol
APEOs	Alkylphenol Ethoxylates
APHA	American Public Health Association
As	Arsenic
ASTM	American Society for Testing and Materials
BOD_5	Biochemical Oxygen Demand (5 days)
˚C	Degree Celsius
CAS	Chemical Abstracts Service (Registry Number)
Cd	Cadmium
COD	Chemical Oxygen Demand
Cr	Chromium
CETP	Central or Common Effluent Treatment Plant
DIN	Deutsches Institut für Normung (German Institute of Standards)
EN	European Norm
ETP	Effluent Treatment Plant
FTOH	Fluorotelomer Alcohols, these are a subset of PFCs
GC	Gas Chromatography
GB	Guojia Biaozhun (Chinese required national standard)
GB/T	Guojia Biaozhun/Tuījiàn, (Chinese recommended national standard)
Hg	Mercury
HJ	Chinese required environmental protection standard (Chinese industry standard)
HJ/T	Chinese recommended environmental protection standard (Chinese industry standard)
IPE	Institute of Public & Environmental Affairs, a Chinese non-profit environmental research organisation registered and based in Beijing, China. Click here

ISO	International Organisation for Standardisation
KOH	Potassium Hydroxide
LC	Liquid Chromatography
LWG	Leather Working Group
mg/kg	Milligram(s) per kilogram
mg/L	Milligram(s) per litre
ml	Millilitre
µg/L	Microgram(s) per litre
MRSL	Manufacturing Restricted Substances List
MS	Mass Spectrometry
MSMS	Tandem Mass Spectrometry
N	Nitrogen
OIA	Outdoor Industry Association
P	Phosphorous
PAHs	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PFCs	Per- and Polyfluorinated Chemicals
Pt-Co	Platinum-Cobalt scale (colour index)
RL	Reporting Limit
RO	Reverse Osmosis
SAC	Sustainable Apparel Coalition
SIWI	Stockholm International Water Institute
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds
WWTP	Wastewater Treatment Plant
ZLD	Zero Liquid Discharge

7.0.0 Disclaimer

- The ZDHC Foundation has prepared these Guidelines to support environmental stewardship initiatives. These Guidelines are not intended as a statement of legal requirements.

- The ZDHC Foundation makes no warranty, expressed or implied, concerning the contents of these Guidelines and assumes no legal responsibility for those contents.

- At a minimum, suppliers that discharge wastewater and/or sludge are required to be consistently compliant with the applicable legal requirements and permits issued by the authorities having jurisdiction over individual suppliers. Where stricter legal, local or regional wastewater limits are in place, those limit values shall supersede the limit values as set forth in these Guidelines.

- It is not the intent of the ZDHC Foundation to act as an agency reporting wastewater and sludge discharge data to governments or authorities having jurisdiction. It is expected that suppliers are accountable for reporting on their wastewater and sludge discharges, in accordance with applicable laws.

8.0.0 Scope

8.1.0 In Scope

These Guidelines apply to industrial wastewater discharges and sludge produced from wastewater treatment operations of textile, apparel and footwear suppliers with wet processing facilities including, but not limited to:

a. Textile dyeing and finishing
b. Yarn dyeing
c. Fabric mills
d. Laundry, washing and finishing facilities
e. Printing facilities
f. Vertical finished goods manufacturing facilities where any of the above wet processes occur

These Guidelines apply to suppliers with direct discharge, indirect discharge and on-site Zero Liquid Discharge (ZLD) treatment plants.

Where a supplier combines their industrial wastewater with domestic wastewater, the combined wastewater is classified as industrial wastewater, to which these Guidelines would apply.

8.2.0 Out of Scope

Discharges of domestic wastewater alone (for instance from a sewing/garmenting facility that employs workers but has NO in-house wet processing unit), that is not blended with industrial wastewater, are out of the scope of these Guidelines.

These Guidelines do not apply to wastewater management and treatment systems beyond the property boundaries of the suppliers. This includes any third-party, off-site, central or common effluent treatment plants (CETP) that are not under direct control and/or ownership of the suppliers.

These Guidelines do not currently apply to wastewater discharge from suppliers such as, but not limited to:

a. Cotton farming
b. Cattle ranching
c. Polymer production
d. Fibre production (including man-made cellulosic fibres)
e. Leather processing (including beam house, tanning, dyeing and finishing)
f. Raw wool scouring
g. Production of chemicals or mixing of chemical formulations for commercial sale

8.3.0 Scope of Expansion Plan

At the time of publication of these Guidelines, work is currently underway to define specific guidelines for:

a. Man-made cellulosic fibres production
b. Leather processing (including beam house, tanning, dyeing and finishing)
c. PU coated fabric production

9.0.0 Requirements

9.1.0 Minimum Requirements

Each supplier must, at a minimum:

a. Have a valid licence to operate.
b. Be compliant with applicable wastewater and sludge discharge permits at all times.
c. Ensure there are no unpermitted bypasses for untreated wastewater around wastewater treatment systems.
d. Follow generally accepted process engineering best practices with respect to wastewater treatment and overall supplier water efficiency management.
e. Not dilute wastewater discharge with incoming water or cleaner wastewater as a means to achieve conformance to concentration-based discharge permits.
f. Properly classify sludge produced from a wastewater treatment or a Zero Liquid Discharge (ZLD) treatment system as either hazardous or non-hazardous, as defined by local legal regulations.
g. Contract out sludge hauling and disposal to licenced/permitted and qualified third parties[2] that have appropriate facilities to properly dispose of the sludge wastes to ensure sludge and leachates from the sludge meet local regulatory requirements and do not adversely impact the environment.

[2] We acknowledge that the governments of some countries do not have any authorised waste contractors to dispose of the sludge.

9.2.0 Parameters and Limits

A. Wastewater Parameters

a. Conventional

These parameters, their limits (foundational, progressive and aspirational), and recommended standard methods for analysis are defined in *Appendix A Tables 1A* (Sum Parameters and Anions) – *1B* (Metals).

The three-level approach.

- As suppliers are not identical in terms of capabilities, knowledge, strategic priorities, or resources, these Guidelines provide a three-level (foundational, progressive, aspirational) approach for wastewater discharge limits of conventional parameters.
- It is expected that suppliers proactively develop and manage a data-driven, continuous improvement plan to achieve the next level, because higher quality of treated wastewater enables cost-effective water recycling, which leads to an overall smaller freshwater footprint for the supplier.

Where local legislation and/or permits cover conventional parameters that are additional to those listed in these Guidelines, suppliers are expected to test for the additional parameters according to the requirements of the applicable local law (legal discharge permit) and the timeline identified by local authorities.

b. ZDHC MRSL V1.1

The Wastewater Guidelines Version 1.1 specifically refers to the ZDHC MRSL V1.1.

- These ZDHC MRSL parameters, their reporting limits, and standard methods for analysis are defined in *Appendix A Tables 2A-2N*.
- Reporting limits for these parameters, as stated in *Appendix A Tables 2A-2N*, are based on good laboratory practice criteria and capabilities for achieving these reporting limits globally.

- While in some cases these parameters may be amenable to treatment by the effluent treatment plant, they are best controlled by eliminating them at the source and not using them in production. These wastewater parameters are analysed in order to check the effectiveness of process input control to show conformance with the ZDHC MRSL V1.1.

B. Sludge Parameters

Testing of sludge resulting from the wastewater treatment process is considered another factor in the verification of ZDHC MRSL V1.1 conformances.

- The sludge parameters, their reporting limits, and standard methods for analysis/ testing are defined in *Appendix A Table 3*.
- Reporting limits for these parameters, as stated in *Appendix A Table 3*, are based on good laboratory practice criteria and capabilities for achieving these reporting limits globally.

C. Parameters for suppliers with an on-site ZLD treatment system

For these suppliers:

- Testing the ZDHC MRSL V1.1 parameters (*Appendix A Tables 2A-2N*) and metals (*Appendix A Table 1B*) for raw wastewater would apply.
- Testing parameters as specified in *Appendix A Table 3* for sludge would apply.

9.3.0 General Principles for Sampling, Testing and Reporting

- Sampling, testing and reporting requirements are the same for suppliers whether they directly or indirectly discharge wastewater. The only difference is what the resulting concentration data is compared to in order to determine conformance to these Guidelines.
- To minimise effort, suppliers are encouraged to align sampling and testing per these Guidelines with the sampling and testing required per their legal discharge permit.
- Suppliers are expected to allow brands to conduct unannounced sampling by ZDHC Accepted Laboratories.
- To ensure consistency between sampling events each supplier is expected to develop written procedures that clearly identify and document the sampling points, sampling methodologies and reporting frequency to meet the expectations of these Guidelines. Documentation should include:
  - Written description of sampling procedures
  - Photographs of the sampling location
  - Posted signs at the sample locations identifying the points as sample points

IS THE SUPPLIER DIRECT OR INDIRECT DISCHARGE? DOES IT MATTER?

Indirect Discharge: Wastewater is discharged to a central or common effluent treatment plant (CETP) that is not under direct control and/or ownership of the supplier.

Direct Discharge: Wastewater is discharged to streams, lakes, oceans, or other receiving water bodies. Distribution of wastewater onto land is also considered a type of direct discharge.

Sampling, testing and reporting requirements are the same for suppliers whether they directly or indirectly discharge wastewater. The only difference is what the resulting concentration data are compared to in order to determine conformance to these Guidelines (see section 12.0.0).

It is important to note that the following two sections regarding sampling (9.4.0) and testing (9.5.0) are complemented and supported by the ZDHC Wastewater and Sludge Laboratory Sampling and Analysis Plan (SAP) document available on the ZDHC website.

When conducting sampling and analysis the laboratories should refer to the requirements of both the ZDHC Wastewater Guidelines and the SAP document. The SAP is specifically developed for laboratories and includes requirements and procedures on, but not limited to, sample collection, containers, preservatives, shipments, sample receipt, handling and custody at laboratory, holding time, storage, and minimum quality assurance.

9.4.0 Sampling Requirements

A. Sampling for Conventional Parameters (*Appendix A Tables 1A-1B*)

- Type of sample to be analysed for the conventional parameters is discharged wastewater.
- Sampling for discharged wastewater:
  - Sampling shall occur at a point closest to the location where the industrial wastewater leaves the property boundaries of the supplier.
  - It should be the same location used to obtain samples to demonstrate legal compliance.
  - Wastewater being sampled must be of the same quality as the wastewater being discharged.
  - If a supplier has multiple discharge points/locations for industrial wastewater, samples must be taken and analysed for each discharge point.
  - Samples from multiple discharge points are to be tested separately and not blended together.
  - Please refer to the SAP for more detailed sampling requirements.

- For suppliers with an on-site Zero Liquid Discharge (ZLD) treatment system, there is no need to test for the conventional parameters as there should not be any liquid discharge. If for any reason there is a liquid discharge, the supplier is not considered a ZLD supplier/facility.

B. Sampling for ZDHC MRSL V1.1 Parameters (*Appendix A Tables 2A-2N* for Wastewater and *Table 3* for Sludge)

- In all cases, collect enough sample volume (for details please refer to the SAP document) to allow for two replicate ZDHC MRSL and metals tests where a re-test might be needed.
- There are two testing options (as follows), and depending on the option chosen, the respective sample types should be collected:
  - Analysing discharged wastewater and sludge (this is Option 1) OR
  - Analysing discharged wastewater and raw wastewater (this is Option 2)
- For both options, a sample of discharged wastewater should be collected, and it should be the same sample as the one used for testing the conventional wastewater parameters.
- If Option 1 is chosen, a sample of sludge from the wastewater treatment plant should be collected, and there is no need to sample and test the raw wastewater. Sampling for sludge:
  - Collected samples should represent all of the sludge generated by the effluent treatment plant (ETP) that are disposed of or reused. It may be necessary to collect various types of sludge samples throughout a given factory's ETP.
  - Sludge results shall be reported on a "dry weight" basis.
  - Please refer to the SAP for more detailed sampling requirements.
- If Option 2 is chosen, a sample of raw wastewater (prior to the wastewater treatment plant) should be collected, and there is no need to sample and test the sludge. Sampling for raw wastewater:
  - For indirect discharge suppliers, samples from multiple raw wastewater points are to be tested separately and not blended together.
  - Please refer to the SAP for more detailed sampling requirements.
- For suppliers with an on-site ZLD system, collect samples for both raw wastewater and sludge.

9.5.0 Testing Requirements

A. Testing requirements for suppliers with NO on-site Zero Liquid Discharge (ZLD) treatment system

The requirements described in this section apply for both direct discharge and indirect discharge suppliers.

a. ZDHC Conventional Parameters and Any Additional Legal Permit and/or CETP Parameters

- Test discharged wastewater sample for each of the conventional parameters in *Appendix A Tables 1A and 1B.*

- Test discharged wastewater sample for parameters from the legal wastewater discharge permit and/or receiving central ETP (in the case of indirect discharge suppliers) that are not listed in *Appendix A Tables 1A* and *1B*.

b. ZDHC MRSL V1.1 Parameters and Metals

- Test the discharged wastewater sample in accordance with *Appendix A Tables 2A-2N*, and also test either:
  - the sludge sample (according to *Appendix A Table 3*) if Option 1 is chosen OR
  - the raw wastewater sample (according to *Appendix A Tables 2A-2N* and *Table 1B*) if Option 2 is chosen.
  - Please refer to section 9.4.B for more information about the two testing options.

- Where any ZDHC MRSL V1.1 parameter is above the reporting limits set forth in *Appendix A Tables 2A-2N* or metal is above the foundational limits set forth in *Appendix A Table 1B* in the wastewater in the first sample tested, and the sample is within the specified holding time (according to the SAP document), then re-test a portion of the remaining wastewater sample for that parameter.

- If the second test for the parameter indicates a concentration is below the reporting limit, the parameter for the entire wastewater sample is considered below the reporting limit.

B. Testing requirements for suppliers with an on-site Zero Liquid Discharge (ZLD) treatment system

a. ZDHC MRSL V1.1 Parameters and Metals

- Test:
  - the raw wastewater sample (according to *Appendix A Tables 2A-2N* and *Table 1B*) AND
  - the sludge sample (according to *Appendix A Table 3*)

- Where any ZDHC MRSL V1.1 parameter is above the reporting limits or metal is above the foundational limits in the wastewater in the first sample tested, and the sample is within the specified holding time (according to the SAP document), then re-test a portion of the remaining wastewater sample for that parameter.

- If the second test for the parameter indicates a concentration is below the reporting limit, the parameter for the entire wastewater sample is considered below the reporting limit.

- A supplier with a ZLD treatment system is expected to not have any liquid discharge. If for any reason there is a liquid discharge, this supplier is **not** considered as a ZLD supplier/ facility and therefore this section does not apply to them.

In the following *Figure 2*, sampling and testing requirements described in Section 9.4.0 and 9.5.0 are summarised. The figure shows what parameters are to be tested, on which samples, as well as the two different testing options with regards to ZDHC MRSL V1.1 parameters. The main difference with these two options is, on top of testing the discharged wastewater sample for these ZDHC MRSL parameters, the supplier should also test either the sludge sample (Option 1) OR the raw wastewater sample (Option 2).

Figure 2: Summary of Sampling and Testing Requirements as Described in Section 9.4.0 and 9.5.0

Type of sample (see *Appendix B* for sampling points)	Direct and Indirect Discharge Supplier (with NO on-site ZLD Treatment System)						Supplier with on-site ZLD Treatment System	
	Option 1			Option 2				
	ZDHC Conventional Parameters (*Tables 1A-1B*)	Legal Parameters (any additional parameters required by legal wastewater discharge permit and/or receiving central effluent treatment plant (CETP) not listed in *Tables 1A-1B*)	ZDHC MRSL Parameters (*Tables 2A-2N* for wastewater and *Table 3* for sludge)	ZDHC Conventional Parameters (*Tables 1A-1B*)	Legal Parameters (any additional parameters required by legal wastewater discharge permit and/or receiving central effluent treatment plant (CETP) not listed in *Tables 1A-1B*)	ZDHC MRSL Parameters (*Tables 2A-2N*)	Metals (*Table 1B*)	ZDHC MRSL Parameters (*Tables 2A-2N* for wastewater or *Table 3* for sludge)
1. Raw Wastewater	Not applicable			C & T Test **only** according to *Table 1B*	Not applicable	C & T	C & T	C & T
2. Discharged Wastewater	C & T	C & T	C & T	C & T	C & T	C & T**	Not applicable***	
3. Sludge	Not applicable	Not applicable	C & T*	Not applicable			Not applicable	C & T

C & T = Collect and Test sample.

** For an Indirect Discharge Supplier: test sludge sample **only** if it is available (meaning if the supplier in question generates sludge), such as when there is primary (flocculation) treatment done.*

***For an Indirect Discharge Supplier: Test the discharged wastewater sample **only** if there is any pretreatment, otherwise no need to test as it is the same as raw wastewater.*

****A supplier with an on-site ZLD system is expected to not have any liquid discharge.*

9.6.0 Methods for Analysis/Testing

The methods for analysis/testing recommended in these Guidelines are based on internationally-recognised standard water and wastewater testing methodologies, as well as government-recognised testing requirements in the European Union, the United States of America, and China.

A. Conventional Parameters for Wastewater

Recommended standard methods for analysing these parameters are specified in *Appendix A Tables 1A-1B*.

- For some of the parameters, validated cuvette methods can be used alternatively, as indicated in *Appendix A Table 1A*.
- However, if a supplier is required to utilise other standard test methods to demonstrate legal compliance, and wishes to optimise sampling and testing to demonstrate both legal compliance and conformance to the ZDHC Wastewater Guidelines, those methods are acceptable to ZDHC if the following conditions are met:
    a. The laboratory is ISO 17025 accredited.
    b. The detection limits are below the foundational limit values specified in *Appendix A Tables 1A-1B*.
    c. The units of the reported data are the same as those listed in *Appendix A Tables 1A-1B*.
    d. Methods are equivalent to those identified in *Appendix A Tables 1A-1B.*
    e. The standard method has a well-defined quality assurance/quality control plan, which can be validated as part of the ZDHC Gateway Laboratory Acceptance Programme – Wastewater Guidelines.
- Important to note with regards to the above, there is an exception for colour and COD.
    a. Colour must be tested in accordance with standard method ISO 7887-B (as stated in *Appendix A Table 1A*).
    b. COD must be tested in accordance with standard method ISO 6060, USEPA 410.4, APHA 5220D or GB/T 11914 – validated cuvette methods can be used alternatively (as stated in *Appendix A Table 1A*).

- Testing for Persistent Foam.
    a. Foam is a naturally occurring phenomena in aeration basins that enable biological wastewater treatment. To ensure accurate accounting of foam, laboratory personnel are expected to take a digital photo of the foam they witness within the wastewater treatment system. They should include photographs of the foam they witnessed in the final lab report, along with the time and date of taking such photos.
    b. The presence of foam is acceptable and meets the requirements of these Guidelines if its colour is similar to the liquid in the aeration basin, dissipating, no thicker than 45 centimetres (by visual estimation), and is contained within the aeration basin.
    c. If the foam is higher than 45 centimetres (by visual estimation) or is not contained within the aeration basin, then it does not meet the requirements of these Guidelines.

B. ZDHC MRSL V1.1 Parameters for Wastewater

Recommended standard methods for analysing these parameters are specified in *Appendix A Tables 2A-2N* and must be used to be considered valid..

C. Sludge Parameters

Recommended standard methods for analysing these parameters are specified in *Appendix A Table 3.*

9.7.0 Sampling, Testing and Reporting by ZDHC Accepted Laboratories

To support the implementation of the ZDHC Wastewater Guidelines in the supply chain and to ensure a consistent level of quality for wastewater and sludge test data submitted in the ZDHC Gateway – Wastewater Module platform, ZDHC has established the ZDHC Gateway Laboratory Acceptance Programme – Wastewater Guidelines.

a. ZDHC acceptance means a laboratory has the qualified personnel, equipment and processes in place to analyse wastewater and sludge samples. It does not however give any assurance that data is acceptable for any given sample. That can only be assured by examination of the associated quality control samples.
b. Information on the minimum acceptance criteria, subcontracting principles, application and review process, etc. is described in the laboratory online application form on the ZDHC website (accessible to all).
c. The latest list of ZDHC Accepted Laboratories is available on the ZDHC website.
d. Only ZDHC Accepted Laboratories can submit test data on behalf of suppliers to the ZDHC Gateway – Wastewater Module platform.
e. ZDHC expects all of its accepted laboratories to conduct sampling and testing/ analysis following the procedures specified in the ZDHC Wastewater and Sludge Laboratory Sampling and Analysis Plan (SAP) document publicly available on the ZDHC website.

10.0.0 Minimum Frequency for Sampling, Testing and Reporting

- Sampling, testing and reporting on both conventional parameters and ZDHC MRSL V1.1 parameters specified in these Guidelines is to be completed at least twice per year, at the latest by April 30 and October 31 (hereafter referred to as reporting deadlines).
- Sampling, testing and reporting is to be conducted by a ZDHC Accepted Laboratory (see section 9.7.0).
- Reporting here means the submission of test results onto the ZDHC Gateway – Wastewater Module by a ZDHC Accepted Laboratory on behalf of the supplier.
- Sampling, testing and reporting can occur anytime during each of the reporting cycles, so long as there are at least three months between sampling for the two reporting deadlines. Example:
  - For the April 30 reporting deadline
    - **Sampling:** March 30
    - **Testing:** April 1
    - **Reporting:** April 18
  - For the October 31 reporting deadline
    - **Sampling:** July 2 (this is at least three months after the above example sampling date for the April 30 reporting deadline)
    - **Testing:** July 3
    - **Reporting:** July 30
- To be counted as meeting a reporting deadline, all samples must be tested and reported to the ZDHC Gateway before that deadline date.
- Permit or regulatory requirements for more frequent sampling, testing and reporting may be required independent of these Guidelines.
- Where a test shows that a supplier does not meet the requirements of these Guidelines, it is expected that the supplier will identify root cause, resolve the issue and re-test their wastewater as often as necessary to demonstrate the issue has been resolved. This applies to both conventional parameters and ZDHC MRSL V1.1. parameters specified in these Guidelines.

11.0.0 Data Reporting in the ZDHC Gateway – Wastewater Module Platform

Reporting here means the submission of test results onto the ZDHC Gateway – Wastewater Module by a ZDHC Accepted Laboratory on behalf of the supplier.

- The ZDHC Gateway – Wastewater Module is a global web-based platform that is designed:
  - For suppliers to share wastewater and sludge test results based on testing against these Guidelines.
  - To provide suppliers with a convenient and practical way to disclose test results with their multiple clients (brands/retailers), rather than responding to clients' requests one by one, with the assurance that their data is secure. This helps to reduce duplication of testing.
  - As a transparent tool to allow both suppliers and brands to measure, track and improve the level of conformance with these Guidelines.
- Only ZDHC Accepted Laboratories can submit test results/data into the Gateway on behalf of suppliers. That data must be from a ZDHC Accepted Laboratory.
- Once submitted, the suppliers need to review the information. After reviewing, suppliers need to either approve or reject the release of the data to ZDHC Brands. When suppliers give approval, the test data will be available to all ZDHC Brands.
- Suppliers are responsible for keeping their supplier profile in the Gateway up to date. Supplier profile information includes, but is not limited to, full company name, address, type of production processes, type of raw materials and type of discharge (direct, indirect or ZLD).

For more information on how test data will be used, please refer to the ZDHC Gateway User Terms and Conditions document, available in the ZDHC Gateway platform.

12.0.0 Determining Conformance to These Guidelines

Sampling, testing and reporting requirements are the same for suppliers whether they directly or indirectly discharge wastewater. The only difference is what the resulting concentration data is compared to in order to determine conformance with these Guidelines.

Suppliers with direct discharge are expected to have:

- All conventional parameters complying with their legal wastewater discharge permit
  AND
- Achieved the foundational limits for conventional parameters set forth in *Appendix A Tables 1A-1B*
  AND
- All ZDHC MRSL V1.1 parameters in discharged wastewater and in either sludge (if Option 1 is chosen) OR in raw wastewater (if Option 2 is chosen) to be at concentrations that are at, or below the reporting limits set forth in *Appendix A Tables 2A-2N* for wastewater, and *Table 3* for sludge.

Suppliers with indirect discharge are expected to have:

- All conventional parameters complying with their legal wastewater discharge permit and/or commercial agreements with the receiving central effluent treatment plant (CETP)[3]
  AND
- All ZDHC MRSL V1.1 parameters in discharged wastewater and in either sludge (if Option 1 is chosen) OR in raw wastewater (if Option 2 is chosen) to be at concentrations that are at, or below the reporting limits set forth in *Appendix A Tables 2A-2N* for wastewater and *Table 3* for sludge.

[3] To clarify, testing is to be done for all conventional parameters in *Appendix A Tables 1A-1B* plus any additional parameters required by legal wastewater discharge permit and/or receiving central effluent treatment plant (CETP) that are not listed in *Tables 1A-1B*, but the comparison is **only** to be done against the legal wastewater discharge permit and/or commercial agreements with the receiving central effluent treatment plant (CETP). Therefore, there should not be any negative consequences if these suppliers do not meet the requirements of the conventional parameters set forth in *Appendix A Tables 1A-1B*. ZDHC aims to use the collected test data to define a set of conventional parameters and limits specific for indirect discharge suppliers.

Suppliers with an on-site ZLD treatment system to have:[4]

- All ZDHC MRSL V1.1 parameters in raw wastewater and sludge to be at concentrations that are at, or below the reporting limits set forth in *Appendix A Tables 2A-2N* for wastewater and *Table 3* for sludge.

13.0.0 Resolution of Non-Conformance

A. Definition of Non-Conformance

After testing is completed the test results may indicate non-conformance, which is defined below.

- **For Wastewater Conventional Parameters**
  This is when test results exceed the foundational limits set forth in these Guidelines (*Appendix A Tables 1A-1B*) and/or exceed the applicable legal discharge permit limits, or a receiving CETP's requirements for indirect discharge suppliers.
- **For Wastewater ZDHC MRSL V1.1 Parameters**
  This is when test results exceed the reporting limits set forth in these Guidelines (*Appendix A Tables 2A-2N*).
- **For Sludge Parameters**
  This is when test results exceed the reporting limits set forth in these Guidelines (*Appendix A Table 3*).

B. Expectations for Suppliers with Non-Conformance(s)

If a test report indicates non-conformance as defined above, the supplier is expected to:

- Notify the applicable authorities about any legal permit violations, as well as the ZDHC Brand(s) and/or other clients.

[4] A supplier with an on-site ZLD treatment system is expected to not have any liquid discharge. If for any reason there is a liquid discharge, this supplier is **not** considered as a supplier with a ZLD treatment system.

- Develop a root cause analysis and corrective action plan with a defined completion date. An input stream management review could be part of the initial root cause analysis, with actions such as checking if chemical formulations used in the production processes conform to the ZDHC MRSL; sending out specifications to textile raw material suppliers; or checking chemicals used in non-production related areas, e.g. APEOs used in cleaning products.
- Submit the root cause analysis and corrective action plan with defined completion date on the ZDHC Gateway – Wastewater Module. Submission is expected to happen within thirty (30) days from the date of the laboratory report.
- Suppliers are encouraged to use the ZDHC Root Cause Analysis and Corrective Action Plan templates available in the ZDHC Gateway.
- Suppliers may resolve non-compliances and non-conformances in ways they deem best. For instance, they could contact clients (i.e. brands/retailers) to see if they can offer any advice; or reach out to technical experts to help determine the root cause and identify suitable solutions.

14.0.0 Expectations

The sampling, testing and reporting requirements of these Guidelines have in principle remained the same since Version 1.0, which was published in November 2016. In this section, ZDHC outlines its expectations with regards to progress in the industry.

a. Suppliers that directly discharge their wastewater into the environment are expected to achieve the foundational limits of the conventional wastewater parameters (*Appendix A Tables 1A-1B*). They are expected do so within a period of one year from the date of first testing against these Guidelines.

b. Suppliers are encouraged to proactively develop and manage a written, data-driven plan to continuously improve their operations. This goes from meeting the foundational limits of the conventional wastewater parameters and moves towards achieving the progressive and aspirational limits.

c. Suppliers testing as per these Guidelines must demonstrate that the concentration of ZDHC MRSL V1.1 parameters (*Appendix A Tables 2A-2N* for wastewater, *Table 3* for sludge) are below reporting limits no later than January 1, 2021. As of January 2018, ZDHC expects suppliers to be able to provide evidence of a detailed schedule to phase out hazardous chemicals by the end of 2020.

15.0.0 Relevant Organisations and Contributions

- Best Available Techniques Reference Document on the Textiles Industry click here
- Blue Angel click here
- bluesign System click here
- Business for Social Responsibility (BSR) Guidelines 2010 click here
- EU Eco Label click here
- GOTS click here
- STeP by Oeko-Tex® STEP click here
- World Health Organization – Making Water a Part of Economic Development click here
- ZDHC Roadmap to Zero Programme click here

16.0.0 Acknowledgements

The sampling, testing and reporting requirements of these Guidelines have in principle remained the same since Version 1.0, which was published in November 2016.

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Appendix A
Tables 1A-1B: Conventional Parameters for Wastewater

Table 1A: Sum Parameters and Anions

The conventional parameters showing foundational, progressive and aspirational limits, and the standard methods for analysis.

* Δ is the degree above ambient temperature of receiving water body.

** Validated cuvette methods can be used alternatively.

mg/L unless otherwise noted	Limits			Standard Method for Analysis/Testing			
	Foundational	Progressive	Aspirational	ISO	European Union	United States	China
Sum parameters							
Temperature [°C] *	Δ15 or max. 35	Δ10 or max. 30	Δ5 or max. 25	No standard	No standard	US EPA 17.01	GB/T 13195
TSS	50	15	5	ISO 11923	ISO 11923	US EPA 160.2, APHA 2540D	GB/T 11901
COD	150	80	40	ISO 6060**	ISO 6060**	US EPA 410.4, APHA 5220D**	GB/T 11914**
Total-N	20	10	5	ISO 5663, ISO 29441	ISO 5663, ISO 29441	US EPA 351.2, APHA 4500P-J, APHA 4500N-C	HJ 636, GB 11891
pH	6-9			ISO 10523	EN ISO 10523	US EPA 150.1	GB/T 6920
Colour [m^{-1}] (436nm; 525; 620nm)	7; 5; 3	5; 3; 2	2; 1; 1	ISO 7887-B	-	-	-
BOD_5	30	15	5	ISO 5815-1, -2 (5 days)	EN 1899-1 (5days)	US EPA 405.1 (5 days), APHA 5210B (5 days)	HJ 505
Ammonium-N	10	1	0.5	ISO 11732, ISO 7150	EN ISO 11732	US EPA 350.1, APHA 4500 NH_3-N	HJ 535, HJ 536
Total-P	3	0.5	0.1	ISO 11885, ISO 6878	EN ISO 11885	US EPA 365.4, APHA 4500P-J	GB/T 11893
AOX	5	1	0.1	ISO 9562	EN ISO 9563	US EPA 1650	HJ/T 83-2001
Oil and Grease	10	2	0.5	ISO 9377-2	EN ISO 9377-2	US EPA 1664	HJ 637
Phenol	0.5	0.01	0.001	ISO 14402	EN ISO 14402	APHA 5530 B, C&D	HJ 503
Coliform [bacteria/100 ml]	400	100	25	ISO 9308-1	EN ISO 9308-1	US EPA 9132	GB/T 5750.12
Persistent Foam	Refer to respective information in section 9.6.A			N/A	N/A	N/A	N/A
Anions							
Cyanide - Total	0.2	0.1	0.05	ISO 6703-1,-2,-3, ISO 14403-1,-2	ISO 6703-1,-2,-3, ISO 14403-1,-2	US EPA 335.2, APHA 4500-CN	HJ 484
Sulfide	0.5	0.05	0.01	ISO 10530	ISO 10530	APHA 4500-S2-D	GB/T 16489
Sulfite	2	0.5	0.2	ISO 10304-3	EN ISO 10304-3	US EPA 377.1	**

Table 1B: Metals

The conventional parameters showing foundational, progressive and aspirational limits, and the standard methods for analysis.

*** Data collection only for polyester production.

mg/L unless otherwise noted	Limits			Standard Method for Analysis/Testing			
	Foundational	Progressive	Aspirational	ISO	European Union	United States	China
Metals							
Antimony***	0.1	0.05	0.01	ISO 11885	EN ISO 11885	US EPA 200.7, US EPA 200.8, US EPA 6010c, US EPA 6020a	GB 7475, HJ 700
Chromium, total	0.2	0.1	0.05				GB 7466, HJ 700
Cobalt	0.05	0.02	0.01				HJ 700
Copper	1	0.5	0.25				GB 7475, HJ 700
Nickle	0.2	0.1	0.05				GB 11907, HJ 700
Silver	0.1	0.05	0.005				GB 11907, HJ 700
Zinc	5.0	1.0	0.5				GB 7472, GB 7475, HJ 700
Arsenic	0.05	0.01	0.005	ISO 11885	EN ISO 11885	US EPA 200.7, US EPA 200.8, US EPA 6010c, US EPA 6020a	GB 7475, HJ 700
Cadmium	0.1	0.05	0.01	ISO 11885	EN ISO 11885	US EPA 200.7, US EPA 200.8, US EPA 6010c, US EPA 6020a	GB 7475, HJ 700
Chromium (VI)	0.05	0.005	0.001	ISO 18412	EN ISO 18412	US EPA 218.6	GB 7467
Lead	0.1	0.05	0.01	ISO 11885	EN ISO 11885	US EPA 200.7, US EPA 200.8, US EPA 6010c, US EPA 6020a	GB 7475, HJ 700
Mercury	0.01	0.005	0.001	ISO 12846 or ISO 17852	EN ISO 18412 or ISO 17852	US EPA 200.7, US EPA 200.8, US EPA 6010c, US EPA 6020a	HJ 597

ZDHC Wastewater Guidelines

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Appendix A
Tables 2A-2N: ZDHC MRSL V1.1 Parameters for Wastewater

Reporting limits mentioned in the following tables apply to each single chemical substance of the respective substance group.

Table 2A:

Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs): Including All Isomers

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
Nonylphenol (NP), mixed isomers	104-40-5 11066-49-2 25154-52-3 84852-15-3	5	NP/OP: ISO 18857 -2 (modified dichloromethane extraction) or ASTM D7065 (GC/MS or LC/MS(-MS) OPEO/NPEO (n>2): ISO 18254-1 OPEO/NPEO (n=1,2): ISO 18857-2 or ASTM D7065
Octylphenol (OP), mixed isomers	140-66-9 1806-26-4 27193-28-8		
Octylphenol ethoxylates (OPEO)	9002-93-1 9036-19-5 68987-90-6		
Nonylphenol ethoxylates (NPEO)	9016-45-9 26027-38-3 37205-87-1 68412-54-4 127087-87-0		

Table 2B:

Chlorobenzenes and Chlorotoluenes

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
Monochlorobenzene	108-90-7	0,2	USEPA 8260B, 8270D. Dichloro-methane extraction followed by GC/MS
1,2-Dichlorobenzene	95-50-1		
1,3-Dichlorobenzene	541-73-1		
1,4-Dichlorobenzene	106-46-7		
1,2,3-Trichlorobenzene	87-61-6		
1,2,4-Trichlorobenzene	120-82-1		
1,3,5-Trichlorobenzene	108-70-3		
1,2,3,4-Tetrachlorobenzene	634-66-2		
1,2,3,5-Tetrachlorobenzene	634-90-2		
1,2,4,5-Tetrachlorobenzene	95-94-3		
Pentachlorobenzene	608-93-5		
Hexachlorobenzene	118-74-1		
2-Chlorotoluene	95-49-8		
3-Chlorotoluene	108-41-8		
4-Chlorotoluene	106-43-4		
2,3-Dichlorotoluene	32768-54-0		
2,4-Dichlorotoluene	95-73-8		
2,5-Dichlorotoluene	19398-61-9		
2,6-Dichlorotoluene	118-69-4		
3,4-Dichlorotoluene	95-75-0		
3,5-Dichlorotoluene	25186-47-4		
2,3,4-Trichlorotoluene	7359-72-0		
2,3,6-Trichlorotoluene	2077-46-5		
2,4,5-Trichlorotoluene	6639-30-1		
2,4,6-Trichlorotoluene	23749-65-7		
3,4,5-Trichlorotoluene	21472-86-6		
2,3,4,5-Tetrachlorotoluene	76057-12-0		
2,3,5,6-Tetrachlorotoluene	29733-70-8		
2,3,4,6-Tetrachlorotoluene	875-40-1		
Pentachlorotoluene	877-11-2		

Table 2C:

Chlorophenols

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
2-chlorophenol	95-57-8		
3-chlorophenol	108-43-0		
4-chlorophenol	106-48-9		
2,3-dichlorophenol	576-24-9		
2,4-dichlorophenol	120-83-2		
2,5-dichlorophenol	583-78-8		
2,6-dichlorophenol	87-65-0		USEPA 8270 D. Solvent extraction, derivatisation with KOH, acetic anhydride followed by GC/MS ISO 14154:2005
3,4-dichlorophenol	95-77-2		
3,5-dichlorophenol	591-35-5		
2,3,4-trichlorophenol	15950-66-0	0.5	
2,3,5-trichlorophenol	933-78-8		
2,3,6-trichlorophenol	933-75-5		
2,4,5-trichlorophenol	95-95-4		
2,4,6-trichlorophenol	88-06-2		
3,4,5-trichlorophenol	609-19-8		
2,3,4,5-tetrachlorophenol	4901-51-3		
2,3,4,6-tetrachlorophenol	58-90-2		
2,3,5,6-tetrachlorophenol	935-95-5		
Pentachlorophenol	87-86-5		

Table 2D:

Dyes – Azo (Forming Restricted Amines)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
4,4′-methylene-bis-(2-chloro-aniline)	101-14-4		
4,4′-methylenedianiline	101-77-9		
4,4′-oxydianiline	101-80-4		
4-chloroaniline	106-47-8		
3,3′-dimethoxylbenzidine	119-90-4		
3,3′-dimethylbenzidine	119-93-7		
6-methoxy-m-toluidine	120-71-8		
2,4,5-trimethylaniline	137-17-7		
4,4′-thiodianiline	139-65-1		
4-aminoazobenzene	60-09-3		EN 14362-1 EN 14362-3
4-methoxy-m-phenylenediamine	615-05-4		
4,4′-methylenedi-o-toluidine	838-88-0	0.1	Reduction step with sodium dithionite, solvent extraction, GC/MS or LC/MS
2,6-xylidine	87-62-7		
o-anisidine	90-04-0		
2-naphthylamine	91-59-8		
3,3'-dichlorobenzidine	91-94-1		
4-aminodiphenyl	92-67-1		
Benzidine	92-87-5		
o-toluidine	95-53-4		
2,4-xylidine	95-68-1		
4-chloro-o-toluidine	95-69-2		
4-methyl-m-phenylenediamine	95-80-7		
o-aminoazotoluene	97-56-3		
5-nitro-o-toluidine	99-55-8		

Table 2E:

Dyes – Carcinogenic or Equivalent Concern

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
C.I. Direct Black 38	1937-37-7	500	Liquid extraction, LC/MS
C.I. Direct Blue 6	2602-46-2		
C.I. Acid Red 26	3761-53-3		
C.I. Basic Red 9	569-61-9		
C.I. Direct Red 28	573-58-0		
C.I. Basic Violet 14	632-99-5		
C.I. Disperse Blue 1	2475-45-8		
C.I. Disperse Blue 3	2475-46-9		
C.I. Basic Blue 26 (with Michler's Ketone > 0.1%)	2580-56-5		
C.I. Basic Green 4 (Malachite Green Chloride)	569-64-2		
C.I. Basic Green 4 (Malachite Green Oxalate)	2437-29-8		
C.I. Basic Green 4 (Malachite Green)	10309-95-2		
Disperse Orange 11	82-28-0		

Table 2F:

Dyes – Disperse (Sensitising)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
Disperse Yellow 1	119-15-3	50	Liquid extraction, LC/MS
Disperse Blue 102	12222-97-8		
Disperse Blue 106	12223-01-7		
Disperse Yellow 39	12236-29-2		
Disperse Orange 37/59/76	13301-61-6		
Disperse Brown 1	23355-64-8		
Disperse Orange 1	2581-69-3		
Disperse Yellow 3	2832-40-8		
Disperse Red 11	2872-48-2		
Disperse Red 1	2872-52-8		
Disperse Red 17	3179-89-3		
Disperse Blue 7	3179-90-6		
Disperse Blue 26	3860-63-7		
Disperse Yellow 49	54824-37-2		
Disperse Blue 35	12222-75-2		
Disperse Blue 124	61951-51-7		
Disperse Yellow 9	6373-73-5		
Disperse Orange 3	730-40-5		
Disperse Blue 35	56524-77-7		

Table 2G:

Flame Retardants

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
Tris(2-chloroethyl)phosphate (TCEP)	115-96-8	5	US EPA 8270 ISO 22032, USEPA 527 and USEPA 8321B. Dichloro-methane extraction GC/MS or LC/MS (-MS)
Decabromodiphenyl ether (DecaBDE)	1163-19-5		
Tris(2,3,-dibromopropyl) phosphate (TRIS)	126-72-7		
Pentabromodiphenyl ether (PentaBDE)	32534-81-9		
Octabromodiphenyl ether (OctaBDE)	32536-52-0		
Bis(2,3-dibromopropyl) phosphate (BIS)	5412-25-9		
Tris(1-aziridinyl) phosphine oxide (TEPA)	545-55-1		
Polybromobiphenyls (PBB)	59536-65-1		
Tetrabromobisphenol A (TBBPA)	79-94-7		
Hexabromocyclododecane (HBCDD)	3194-55-6		
2,2-bis(bromomethyl)-1,3-propanediol (BBMP)	3296-90-0		
Tris(1,3-dichloro-isopropyl) phosphate (TDCP)	13674-87-8		
Short-chain chlorinated Paraffins (SCCP) (C10-C13)	85535-84-8		

Table 2H:

Glycols

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
Bis(2-methoxyethyl)-ether	111-96-6	50	US EPA 8270 Liquid extraction, LC/MS GC-MS
2-ethoxyethanol	110-80-5		
2-ethoxyethyl acetate	111-15-9		
Ethylene glycol dimethyl ether	110-71-4		
2-methoxyethanol	109-86-4		
2-methoxyethylacetate	110-49-6		
2-methoxypropylacetate	70657-70-4		
Triethylene glycol dimethyl ether	112-49-2		

Table 2I:

Halogenated Solvents

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
1,2-dichloroethane	107-06-2	1	USEPA 8260B Headspace GC/MS or Purge-and-Trap-GC/MS
Methylene chloride	75-09-2		
Trichloroethylene	79-01-6		
Tetrachloroethylene	127-18-4		

Table 2J:

Organotin Compounds

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
Mono-, di- and tri-methyltin derivatives	Multiple	0.01	ISO 17353 Derivatisation with NaB(C2H5) GC/MS
Mono-, di- and tri-butyltin derivatives	Multiple		
Mono-, di- and tri-phenyltin derivatives	Multiple		
Mono-, di- and tri-octyltin derivatives	Multiple		

Table 2K:

Perfluorinated and Polyfluorinated Chemicals (PFCs)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
PFOS	1763-23-1	0.01	DIN 38407-42 (modified) Ionic PFC: Concentration or direct injection, LC/MS(-MS); Non-ionic PFC (FTOH): derivatisation with acetic anhydride followed by GC/MS
PFOA	335-67-1		
PFBS	375-73-5 29420-49-3 29420-43-3		
PFHxA	307-24-4		
8:2 FTOH	678-39-7	1	
6:2 FTOH	647-42-7		

Table 2L:

Ortho-Phthalates – Including all ortho esters of phthalic acid

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
Di(ethylhexyl) phthalate (DEHP)	117-81-7	10	US EPA 8270D, ISO 18856 Dichloromethane extraction GC/MS
Bis(2-methoxyethyl) phthalate (DMEP)	117-82-8		
Di-n-octyl phthalate (DNOP)	117-84-0		
Di-iso-decyl phthalate (DIDP)	26761-40-0		
Di-isononyl phthalate (DINP)	28553-12-0		
Di-n-hexyl phthalate (DnHP)	84-75-3		
Dibutyl phthalate (DBP)	84-74-2		
Butyl benzyl phthalate (BBP)	85-68-7		
Dinonyl phthalate (DNP)	84-76-4		
Diethyl phthalate (DEP)	84-66-2		
Di-n-propyl phthalate (DPRP)	131-16-8		
Di-isobutyl phthalate (DIBP)	84-69-5		
Di-cyclohexyl phthalate (DCHP)	84-61-7		
Di-iso-octyl phthalate (DIOP)	27554-26-3		
1,2-benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP)	68515-42-4		
1,2-benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHP)	71888-89-6		

Table 2M:

Polycyclic Aromatic Hydrocarbons (PAHs)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/ Testing
Benzo[a]pyrene (BaP)	50-32-8	1	US EPA 8270 DIN 38407-39 Solvent extraction GC/MS
Anthracene	120-12-7		
Pyrene	129-00-0		
Benzo[ghi]perylene	191-24-2		
Benzo[e]pyrene	192-97-2		
Indeno[1,2,3-cd]pyrene	193-39-5		
Benzo[j]fluoranthene	205-82-3		
Benzo[b]fluoranthene	205-99-2		
Fluoranthene	206-44-0		
Benzo[k]fluoranthene	207-08-9		
Acenaphthylene	208-96-8		
Chrysene	218-01-9		
Dibenz[a,h]anthracene	53-70-3		
Benzo[a]anthracene	56-55-3		
Acenaphthene	83-32-9		
Phenanthrene	85-01-8		
Fluorene	86-73-7		
Naphthalene	91-20-3		

Table 2N:

Volatile Organic Compounds (VOC)

Substance or Substance Group	CAS	Reporting Limit (µg/L)	Standard Method for Analysis/Testing
Benzene	71-43-2	1	ISO 11423-1 Headspace- or Purge-and-Trap-GC/MS US EPA 8260
Xylene	1330-20-7		
o-cresol	95-48-7		
p-cresol	106-44-5		
m-cresol	108-39-4		

Appendix A
Table 3: Sludge Parameters

Table 3: Sludge Parameters

For information on single substances and CAS numbers please refer to *Tables 2A - 2N*.

Sludge Parameter	Reporting Limit (mg/kg - Dry Weight)	Description of Lab Method	Standard Method for Analysis/Testing			
			ISO	European Union	United States	China
Conventional						
Dry Mass (total solids)	-	**Analysis:** Dry @ 105°C, gravimetric			US EPA 160.3 / 209A	
Anions						
Cyanide	1 mg/kg	**Preparation:** CN converted to HCN by reflux-distillation to NaOH			US EPA 9013	
		Analysis: Colourimetry (EPA 9014), or ISE (EPA 9213)	ISO 11262, 2011		US EPA 9014 US EPA 9213	HJ 745
Metals						
Arsenic	2 mg/kg	**Preparation:** Acid/peroxide digestion			US EPA 3050	
		Analysis: ICP/OES (EPA 6010 D), or ICP/MS (EPA 6020 B)			US EPA 6010 D US EPA 6020 B	
Cadmium	2 mg/kg	**Preparation:** Acid/peroxide digestion			US EPA 3050	
		Analysis: ICP/OES (EPA 6010 D), or ICP/MS (EPA 6020 B)			US EPA 6010 D US EPA 6020 B	
Lead	2 mg/kg	**Preparation:** Acid/peroxide digestion			US EPA 3050	
		Analysis: ICP/OES (EPA 6010 D), or ICP/MS (EPA 6020 B)			US EPA 6010 D US EPA 6020 B	
Chromium (VI)	2 mg/kg	**Preparation:** Alkaline digestion			US EPA 3060a	
		Analysis: Colourimetric UV/VIS (EPA 7196), or Colourimetric IC (EPA 7199)			US EPA 7196 US EPA 7199	
Mercury	0.2 mg/kg	**Preparation:** Dissolution, acid digestion			US EPA 7471 b, US EPA 3051a	
		Analysis: CVAA (EPA 7471 b), or ICP MS (EPA 6020 b)		US EPA 7471 b, US EPA 6020b	US EPA 7471 b, US EPA 6020b	

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Table 3: Sludge Parameters (continued)

For information on single substances and CAS numbers please refer to *Tables 2A - 2N*.

Sludge Parameter	Reporting Limit (mg/kg - Dry Weight)	Description of Lab Method	Standard Method for Analysis/Testing			
			ISO	European Union	United States	China
ZDHC MRSL V1.1						
Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs): including all isomers	0.4 mg/kg	**Preparation:** Modified dichloromethane extraction with mechanical agitation			US EPA 3540/3541 soxhlet US EPA 3550 ultrasonic US EPA 3560 SFE	
		Analysis: NP/OP, GC/MS, LC/MS	ISO 18857-2	ASTM D7065		
		Analysis: OPEO/NPEO (n>2): GC/MS; LC/MS	ISO 18254-1			
		Analysis: OPEO/NPEO (n=1,2), GC/MS, LC/MS	ISO 18857-2	ASTM D7065		
Chlorobenzenes and Chlorotoluenes	0.2 mg/kg	**Preparation:** Dichloromethane extraction with mechanical agitation			US EPA 3540/3541 soxhlet US EPA 3550 ultrasonic US EPA 3560 SFE	
		Clean up: GPC			US EPA 3650	
		Analysis: GC/MS			US EPA 8270	
Chlorophenols	0.05 mg/kg	**Preparation:** Acid/base liquid extraction, acetylation, liq/liq extraction	ISO 14154			
		Analysis: GC/MS	ISO 14154			
Dyes – Azo (forming restricted amines)	0.2 mg/kg	**Preparation:** Reduction with sodium thionite, solvent extraction				
		Analysis: GC/MS (ISO 14362-1), or LC/MS (ISO 14362-3)	ISO 14362-1, 14362-3			
Dyes – Carcinogenic or equivalent concern	10 mg/kg	**Preparation:** Liquid extraction				
		Analysis: LC/MS	ISO 16373, 2014			
Dyes – Disperse (sensitising)	2 mg/kg	**Preparation:** Liquid extraction				
		Analysis: LC/MS	ISO 16373, 2014			
Flame Retardants	1 mg/kg	**Preparation:** Dichloromethane extraction	ISO 22032			
		Analysis: GC/MS or LC/MS-MS	ISO 22032			
Glycols	10 mg/kg	**Preparation:** Liquid extraction			US EPA 8270D	
		Analysis: LC/MS, GC/MS	ISO 22892, 2006			

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Table 3: Sludge Parameters (continued)

For information on single substances and CAS numbers please refer to *Tables 2A - 2N*.

Sludge Parameter	Reporting Limit (mg/kg - Dry Weight)	Description of Lab Method	Standard Method for Analysis/Testing			
			ISO	European Union	United States	China
ZDHC MRSL V1.1 (continued)						
Halogenated Solvents	2 mg/kg	**Preparation:** Purge and trap (EPA 5035), or headspace (EPA 5021)			US EPA 5035 US EPA 50211	
		Analysis: GC electrolytic conductivity HECD, GC/MS			US EPA 8010	
Organotin	0.2 mg/kg	**Preparation:** Derivatisation NaB (C2H5)	ISO 23161, 2009			
		Analysis: GC/MS	ISO 23161, 2009			
Perfluorinated and Polyfluorinated chemicals (PFCs)	0.10 mg/kg ionic 1 mg/kg non-ionic	**Preparation:** ***Ionic:*** concentration. ***Non-ionic:*** derivatisation with acetic anhydride.				
		Analysis: ***Ionic:*** LC/MS-MS. ***Non-ionic (FTOH):*** GC/MS		DIN 38407-42		
Ortho Phthalates - including all ortho esters of phthalic acid	2 mg/kg	**Preparation:** Dichloromethane extraction using soxhlet (EPA 3540/3541), or ultrasonic (EPA 3550), or SFE (EPA 3560)			US EPA 3540/3541 US EPA 3550 US EPA 3560	
		Analysis: GC/MS	ISO 18856			
Polycyclic Aromatic Hydrocarbons (PAHs)	0.2 mg/kg	**Preparation:** Dichloromethane extraction with mechanical agitation			US EPA 3540/3541 soxhlet US EPA 3550 ultrasonic US EPA 3560 SFE	
		Clean up: GPC			US EPA 3650	
		Analysis: GC/MS			US EPA 8270	
Volatile Organic Compounds (VOC)	2 mg/kg	**Preparation:** Solvent extraction, purge and trap (EPA 5035), or headspace (EPA 5021)			US EPA 5035 US EPA 5021	
		Analysis: GC/MS	DIN 38407 part 43		US EPA 8260	

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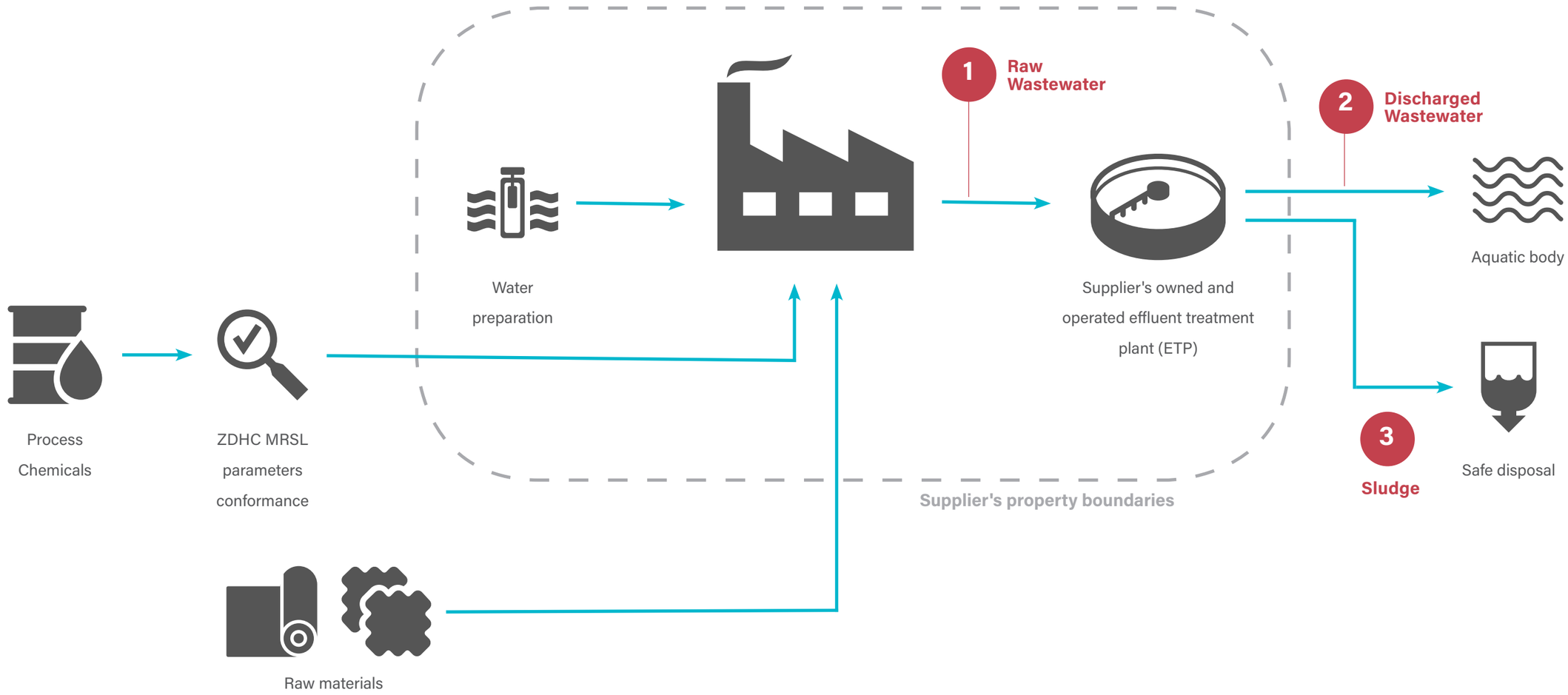
Appendix B
Figure 1: Sampling Points for *Direct* Discharge Suppliers

= sampling points

Important to note:

The sampling of raw wastewater and sludge would depend on the chosen testing option explained in section 9.4.0 and 9.5.0.

There is **NO** need to sample and test both raw wastewater and sludge.



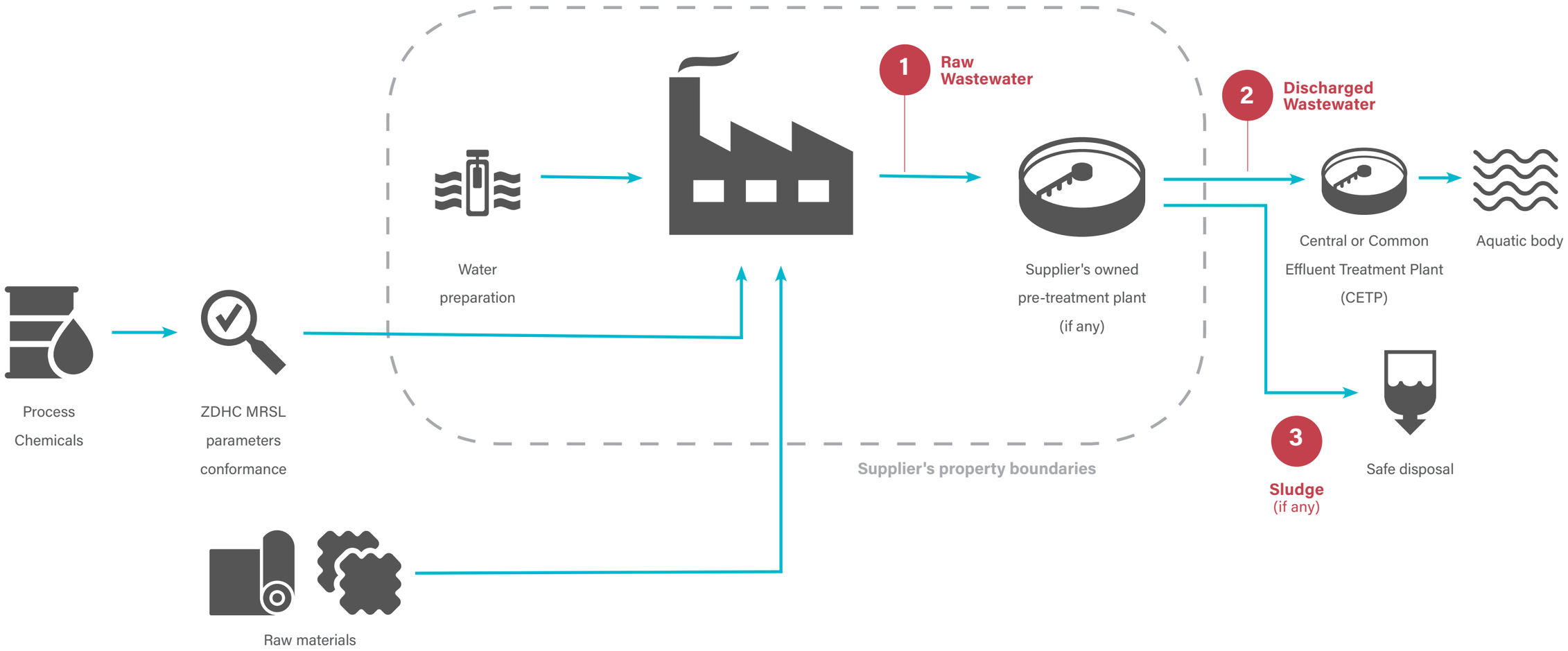
Appendix B
Figure 2: Sampling Points for *Indirect* Discharge Suppliers

= sampling points

Important to note:

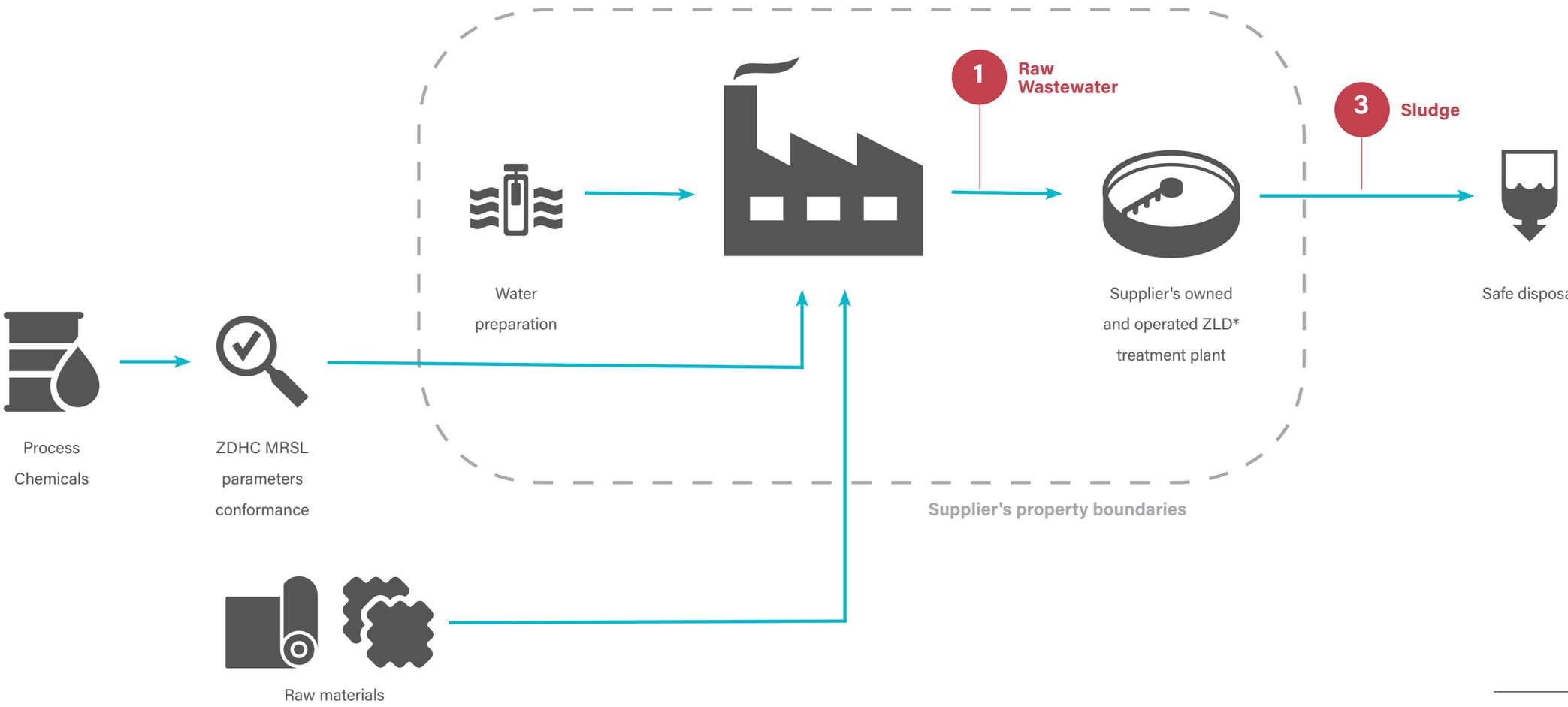
The sampling of raw wastewater and sludge would depend on the chosen testing option explained in section 9.4.0 and 9.5.0.

There is **NO** need to sample and test both raw wastewater and sludge.



Appendix B
Figure 3: Sampling Points for Suppliers with on-site ZLD* Treatment Syste

= sampling points



Important to note:

A supplier with an on-site ZLD* treatment system is expected to not have any liquid discharge. If for any reason there is a liquid discharge, this supplier is **NOT** considered as a supplier with a ZLD* treatment system.

* ZLD = Zero Liquid Discharge

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