



Specification and guidelines for HazWasteOnline™ .hwol laboratory data files

Version 2.1.3

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List of changes from previous version

Revision Date	Version	Description of Revision
17 Mar. 2025	2.1.3	<ul style="list-style-type: none"> Minor edit to reference the Upper \calibration Point
7 Feb. 2025	2.1.2	<ul style="list-style-type: none"> Refinement to management of lab results that exceed the Upper Calibration Point e.g. pH >12. See page 9 and section 2.6
27 Sept. 2024	2.1.1	<ul style="list-style-type: none"> <i>mc_type</i> expanded - Yes/No qualifier added to REM_MAT_AD to confirm case where lab has corrected for mass of removed materials, minor edits and explanations (p.10,11 & section 2.5)
16 Sept. 2024	2.1	<ul style="list-style-type: none"> New field <i>result_accreditation</i> and <i>reg_no</i> to capture laboratory's accreditation, p.12
25 January 2024	2.0	<ul style="list-style-type: none"> New field <i>basis_test</i> to record which testing is done on the as-received versus the dried sample material. Also described is its relationship to the <i>basis</i> field and moisture corrections (page 7 & sections 2.4 & 2.5). New determinand (<i>cas_rn</i>: REM_MAT_AD) to record what % of material (e.g. "non-grindables"/"inert") has been removed from the sample prior to testing (p. 8 & section 2.5). Requirement to properly reference both preparation <i>prep_method</i> and analysis <i>lab_anal_method_name</i> methods Removal of limitation of field sizes Revised .hwol example file. Updated EPA Electronic Data Deliverable (EDD) specification references to current version. Edits to improve understanding, renumbering of sections, reformatted tables.
15 Nov. 2021	1.4.3	correction of typo for numbering of columns 23 to 33
8 January 2021	1.4.2	minor edits - Section 1.2 updated with table numbers; Table 1.2.1, #1, #2: word "extracted" changed to "mathematically subtracted" for greater clarity
25 Oct. 2020	1.4.1	minor edit – CAS no. of chromium(III)
21 October 2020	1.4	Addition of extra column to define HWOL Acronyms. Section 1.2 detailing acronyms and examples More detail for <i>sys_sample_code</i> correction to AGS P-numbers for PCB and phenol correct mailing address.
13 December 2017	1.3	New <i>report_type</i> TOP_SOIL added to Appendix A - It is a requirement that labs inform us as to any other reports that they may include in a .hwol file (e.g. Topsoil) so that we can a) add them to the specification and b) understand how we might need to process the data (or not) for waste classification purposes. New <i>cas_rn</i> SAMPLE_DEPTH – sample depth should be reported with <i>cas_rn</i> SAMPLE_DEPTH, depth in the <i>result_comment</i> column and units e.g. "m" in the <i>result_unit</i> column.
12 July 2017	1.2.1	Requirement for descriptive determinands for Sample Name, Depth, Date, Type removed Example .hwol file improved to provide some better examples of the unique <i>sys_sample_code</i>
3 July 2017	1.2	Analysis date and time combined into one field; Clearer definition for <i>sys_sample_code</i> added;
20 June 2017	1.1	Requirement to order <i>sys_sample_code</i> in same order as the sample names presented on PDF laboratory reports

Glossary

.hwol	HazWasteOnline™ laboratory data file (www.hazwasteonline.com)
AGS	Association of Geotechnical and Geoenvironmental Specialists (http://ags.org.uk)
CAS	Chemical Abstracts Service (www.cas.org)
CSV	Comma-Separated Values
EDD	Electronic Data Delivery
EPA	United States Environmental Protection Agency
LIMS	Laboratory Information Management System
TIC	Tentatively Identified Compounds
WAC	Waste Acceptance Criteria

Import of HazWasteOnline™ .hwol EDD files

1. Introduction & Background

HazWasteOnline™ uses Electronic Data Delivery (EDD) tools to automate the import of laboratory data into the HazWasteOnline™ database and to create an audit trail between the laboratory and the HazWasteOnline™ classification report. Whilst laboratory data can be entered manually, the issues related to volume, time and accuracy/quality control are significant. This document defines the format of a HazWasteOnline™ .hwol data file required to deliver chemical analysis data from accredited laboratories to HazWasteOnline™.

Only .hwol data files from laboratories that have been accredited by One Touch Data, and maintain that accreditation, can be accepted by HazWasteOnline™.

The up-to-date list of accredited laboratories is published on www.hazwasteonline.com/hwol-file-format.

The basic requirements for the HazWasteOnline™'s EDD file are outlined below:

- The file must be encoded using the CSV standard (Network Working Group, 2005); the fields must be tab or comma delimited.
- The original data model was based on the US EPA standard for the submission of chemistry data to a database (EPA 2019, 2022) with a number of extra fields including:
 - An extra field to document the type of report (*report_type*)
 - An extra field to define the type of moisture correction or mass correction applied by the laboratory (*MC_type*)
 - An extra field to capture the HWOL Acronyms for “TPH” tests (*hwol_acronym_system*)
 - An extra field to capture the basis of the testing – on the as-received material or on the dried material (*basis_test*)

- The file extension must be .hwo
- the following character encodings are supported
 - Unicode UTF-8 - preferred format
 - ANSI (Windows-01252)
- AGS version 4 P-Numbers can be used to define **cas_rn** identifiers for some determinands such as pH or C5-C6.

A description of each of the fields is detailed below (spread over several pages) and is followed by an example of an .hwo data file. Note that this demonstration .hwo file only contains a small subset of all the potential results.

We don't have any limitation on field sizes but do ask that entries are a sensible length strings for usability; we have to display them on a computer screen and users have to be able to read them.

File naming convention

Each .hwo EDD file must have a unique name. Typically these file names will relate to the laboratory report identifier, for example:

23_1234_1.hwo to indicate year, report number and report version.

Order of samples in the .hwo data file

The first occurrence of each **sys_sample_code** in the .hwo data file should be presented in the same order as the sample names would be published in the laboratory's PDF report e.g. TP1, TP2, TP3.

2. Description of the content of a HazWasteOnline™ .hwol EDD file.

The field names shown in red are fields where the data are required by HazWasteOnline™. Entries in the remaining fields are not currently required by HazWasteOnline™ but may be required in the future. The placeholder “,” must be retained for all empty fields. An example of an .hwol file can be found in Appendix A and can be supplied on request. More information and valid values for certain fields such as ***fraction***, ***lab_matrix_code*** etc. can be found in the tables in the original EPA guidance (EPA 2019, 2022).

Description	1) Sample Reference Name	2) Labs analytical method	3) Lab analysis date	4) Total or Dissolved	5) Test Type	6) Sample matrix
Field Name in .hwol file	sys_sample_code	lab_anl_method_name	analysis_date	fraction	test_type	lab_matrix_code
Example 1	TP1/0.5m/2023-04-06	PM4	26/04/2023 07:36	N	Initial	SOI
Example 2	TP1/0.5m/2023-04-06	PM4	25/04/2023 12:55	N	Initial	SOI
Example 3	TP1/0.5m/2023-04-06	TM16	28/04/2023 09:43	T	Initial	SOI
Example 4	TP1/0.5m/2023-04-06	TM16	28/04/2023 09:43	T	Initial	SOI
Example 5	TP1/0.5m/2023-04-06	TM17_B1	26/04/2023 11:29	T	Initial	SOI
Example 6	TP1/0.5m/2023-04-06	TM30	26/04/2023 16:18	T	Initial	SOI
Example 7	TP1/0.5m/2023-04-06	TM30	26/04/2023 16:20	T	Reanalysis	SOI
Example 8	TP1/0.5m/2023-04-06	PMX	25/04/2023 07:01	N	Initial	SOI
Example 9	TP1/0.5m/2023-04-06	TM36	26/04/2023 07:36	T	Initial	SOI
Example 10	TP1/0.5m/2023-04-06	TM38	26/04/2023 15:04	T	Initial	SOI
Example 11	TP1/0.5m/2023-04-06	TM5	26/04/2023 13:47	T	Initial	SOI
Example 12	TP1/1.0m/2023-04-06	TM5/TM36	27/04/2023 11:21	T	Initial	SOI
Example 13	TP1/1.0m/2023-04-06	TM73	26/04/2023 08:45	T	Initial	SOI
Example 14	TP1/1.0m/2023-04-06	TM38	26/04/2023 08:45	D	Initial	WL

Explanation of the fields

- The field ***sys_sample_code*** refers to a **unique** Sample Reference Name (including those sample names for any duplicates, replicates, blanks etc.). Examples above are for a soil and the sample name is created by concatenating the sample site name, the sample depth and sampling date.
 - The separator can be a different character than “/” but it should be obvious it is a separator.
 - If “sample_depth” and/or “sample_date” were not supplied by the customer they can be omitted – as long as the ***sys_sample_code*** is unique; (in the same way that the lab’s ***lab_sample_id*** value is unique).
 - Some LIMS use more than one field to store the “customer_sample_name”. In this case all the relevant fields should be used to help compose the ***sys_sample_code***.

- Laboratory assigned identifiers like the value recorded in the **lab_sample_id**, should not be used (in **sys_sample_code**) on their own, as they would not be easily understood by the customer.
 - For WAC results, the eluates and the solids belonging to the same sample must use the same value as in the **sys_sample_code** field in order for HazWasteOnline™ to tie the results together.
- 2) The field **lab_anl_method_name** references the laboratory's analytical method for a given test; the field **prep_method** references the laboratory's preparation method for a given test. The same preparation and analysis method identifiers should be referenced in the .hwol file where they are also published in the lab's PDF report,.
 - 3) **analysis_date** – the date and time that the laboratory analysed the sample – date must be in format: dd/mm/yyyy or international ISO 8601 date format: yyyy-mm-dd.
 - 4) The field **fraction** can contain "D" for dissolved or filtered (metal) concentration, "T" (Total) or "N" for not applicable. (EPA 2022, Table A-24)
 - 5) **test_type** – Valid results include: Initial, Reanalysis, Reextract1, Dilution1, Dilution2 etc. (EPA 2022, Table A-25)
 - 6) **lab_matrix_code** identifies different types of matrix. Examples: SOI: soil analysed in the lab; SL: sludge, ST: solid waste, WL: leachate (EPA 2022 Table A-1)

Sheet cont'd

	7)	8) Test Basis	9) Report basis	10) Dilution Factor Float (number)	11) Lab prep. method	12)	13) DD/MM/YYYY	14) HH:MM:SS
	analysis_location	basis_test	basis	dilution_factor	prep_method	leachate_method	leachate_date	leachate_time
1	LB	AR	NA	1	PM0			
2	LB	AR	NA	1	PM0			
3	LB	AR	DRY	10	PM8			
4	LB	AR	DRY	10	PM8			
5	LB	AR	DRY	1	PM8			
6	LB	AD	DRY	1	PM15			
7	LB	AD	DRY	5	PM15			
8	LB	AD	DRY	1	PMX			
9	LB	AR	DRY	1	PM12			
10	LB	AR	DRY	1	PM20			
11	LB	AR	DRY	1	PM8			
12	LB	AR	DRY	5	PM8/PM12/PM16			
13	LB	AR	WET	5	PM11			
14	LB	AR	DRY	1	PM0			

- 7) *analysis_location* will be LB for results from a commercial laboratory
- 8) **basis_test** relates to whether the analysis is undertaken on the as-received (AR) material or the material after drying (AD), or 'NA' for tests for which this distinction is not applicable. (see also section 2.4 & 2.5)
- 9) **basis** relates to whether the published result is 'WET' for wet_weight basis reporting or 'DRY' for dry_weight basis reporting, or 'NA' for tests for which this distinction is not applicable. (see also section 2.4)
- 10) The field **dilution_factor** should be supplied if the sample was diluted (default=1; no dilution).
- 11) The field **prep_method** should reference the labs technical documentation that describes their preparation method. It should match the method code in the lab report where present.
- 12) Laboratory leachate generation method name or description
- 13) Beginning date of leachate preparation. Date must be in date format: dd/mm/yyyy or international ISO 8601 date format: yyyy-mm-dd
- 14) Time of leachate preparation in time format HH:MM:SS

Sheet cont'd

	15) Lab Name	16) Lab Sample ID	17) CAS Number	18) Determinand	19) Concentration	20) Units
					Float (number)	
	lab_name_code	lab_sample_id	cas_rn	chemical_name ¹	result_value	result_unit
1	EMT	23-1234-1	MOIST_CONT_DRY	Natural Moisture Content	11.4	%
2	EMT	23-1234-1	P1942	Natural Moisture Content	12.9	%
3	EMT	23-1234-1	INTERPRETATION	Interpretation		None
4	EMT	23-1234-1	50-32-8	Benzo(a)pyrene		µg/kg
5	EMT	23-1234-1	PCBTOT_AR1254	PCB Total (vs Aroclor 1254)		µg/kg
6	EMT	23-1234-1	7440-47-3	Chromium	201.6	mg/kg
7	EMT	23-1234-1	7440-66-6	Zinc	5642	mg/kg
8	EMT	23-1234-1	REM_MAT_AD	Removed Material	10	%
9	EMT	23-1234-1	71-43-2	Benzene	6	µg/kg
10	EMT	23-1234-1	18540-29-9	Hexavalent Chromium		mg/kg
11	EMT	23-1234-1	EPHC08C40	EPH >C8-C40	14735	mg/kg
12	EMT	23-1234-2	GTC05C44ALAR	>C5-C44 Aliphatics/Aromatics	11454	mg/kg
13	EMT	23-1234-2	P1334	pH	7.92	pH units
14	EMT	23-1234-2	14808-79-8	Sulphate (soluble)	79.9	mg/l

15) The field **lab_name_code** must contain the unique identifier of the testing laboratory; identifier to be agreed with One Touch Data.

16) Laboratory LIMS sample identifier

17) The field **cas_rn** must contain legitimate CAS Registry numbers for all substances. For other determinands, such as pH, C6-C10 etc. these will be agreed with each laboratory in turn. They can be a laboratory's internal (unique) identifiers or AGS P numbers. Please note that these codes have to be accepted by One Touch Data before EDD files from a particular lab can be accepted.

Warning – if you save data from Excel in CSV format, some data may be altered by Excel. For example the CAS # for potassium (7440-09-7) may be saved by Excel as the date 07/09/7440. This will flag as an error during import.

18) **chemical_name** is the name of the determinand, it must match the name in the lab's PDF report.

19) The field **result_value** must not contain any qualifiers such as <. If the result is less than the Limit of Detection then the **result_value** field should be empty and the **lab_qualifiers** field should be set to < (See #25). See also section 2.6 for results above the method quantification limit.

20) The field **result_unit** should contain SI units where applicable. The "mu" character (eg in µS/cm) should be the micro sign and not the letter "u".

¹ Unless the file is tab delimited, it is important to use **double** quotes around all the variables in the .hwo data file. This is because comments or organic compounds often contain commas (e.g. "1,1,2-trichloroethene") and any importation could fail if supplied without the double quotes.

Sheet cont'd

	21)	22) Reportable result	23) Above LOD	24) Qualifier	25)	26) LOD (Limit of detection)	27)
		(Yes/No)	(Y/N)			Float (Number)	Float (Number)
	result_type_code	reportable_result	detect_flag	interpreted_qualifiers	lab_qualifiers	reporting_detection_limit	method_detection_limit
1	TRG	Yes	Y		>	0.1	0.1
2	TRG	Yes	Y		>	0.1	0.1
3	TRG	Yes	Y				
4	TRG	Yes	N		<	100	10
5	TRG	Yes	N		<	10	10
6	TRG	Yes	Y		>	0.5	0.5
7	TRG	Yes	Y		>	25	5
8	TRG	Yes	Y		>	0.1	0.1
9	TRG	Yes	Y		>	5	5
10	TRG	Yes	N		<	0.3	0.3
11	TRG	Yes	Y		>	30	30
12	TRG	Yes	Y		>	52	52
13	TRG	Yes	Y		>	0.01	0.01
14	TRG	Yes	Y		>	0.5	0.5

- 21) **result_type_code** must be either 'TRG' for a target or regular result, 'TIC' for a tentatively identified compound, 'SUR' for surrogates, 'IS' for internal standards, 'SC' for spiked compounds, 'CAL' for calculated. For sample_depth this can be left leave blank.
- 22) **reportable_result** must be either 'Y' (Yes) for results which are considered to be reportable, or 'N' (No) for other results.
- 23) **detect_flag** indicates whether the analyte was detected i.e. above or below the limit of detection (LOD): Y = True, N = False.
- 24) **interpreted_qualifiers** (see EPA 2022 Table A-10).
- 25) **lab_qualifiers** should contain
- "" (empty) for non-numerical results where LOD doesn't exist/make sense
 - "<" for results not detected because below LOD
 - ">" for results reported, above LOD but below the Upper Calibration Point
 - ">>" for results above the Upper Calibration Point (may be reported in the pdf as > or >> value). See also section 2.6.
 - "=" for results equal in value to the LOD
 - "NDP" or "ND": no detection possible/not detected. Use NDP for REM_MAT_AD where no material was removed."
- 26) **reporting_detection_limit** = method detection limit x Dilution is the minimum concentration of an analyte that can be measured and reported – which is equal to or greater than the **method_detection_limit** (The limit of detection or LOD).

27) *method_detection_limit* is the minimum concentration of an analyte that can be measured and reported

Note - The “mu” character in units such as $\mu\text{S/cm}$ should be the micro sign and not the letter “u”. See Appendix C for Unicode values.

Sheet cont'd

	28)	29) <i>LOD_UNITS</i>	30)	31) <i>Comments</i>	32)	33)	34)
	Float (Number)		Float (Number)				
	<i>quantitation_limit</i>	<i>detection_limit_unit</i>	<i>tic_retention_time</i>	<i>result_comment</i>	<i>MC_type</i>	<i>report_type</i>	<i>hwol_acronym_system</i>
1		%			DRY_WEIGHT	SOLID	
2		%				WAC_GEN_10_1	
3		None		degraded diesel		SOLID	
4		µg/kg				SOLID	
5		µg/kg				SOLID	
6		mg/kg				SOLID	
7		mg/kg				SOLID	
8		%			YES	SOLID	
9		µg/kg				SOLID	
10		mg/kg				SOLID	
11		mg/kg				SOLID	EH_1D_Total
12		mg/kg				SOLID	EH_CU+HS_1D_Total
13		pH units				SOLID	
14		mg/l				LEACH_CEN_10_1	

28) *quantification_limit* refers to the minimum concentration of an analyte that can be measured within specific limits of precision and accuracy.

29) *detection_limit_unit* should contain SI units where applicable and match the units given in the *result_unit* field.

30) *tic_retention_time* required when *result_type_code* = TIC.

31) *result_comment* Field to contain the text for a descriptive result such as for *chemical_name*: "TPH Interpretation" with text: "degraded diesel and lubricating oil" in the *result_comment* field. This field shouldn't be used for comments regarding a reported result (with the exception of NDP (no detection possible)). i.e. these determinands must not also contain a numerical result in the *result_value* field.

32) *MC_type* Variables to capture type of moisture calculation **and/or** whether the lab has corrected the results for the mass of any removed materials.
 a. **Moisture Correction:** the variables are DRY_WEIGHT or WET_WEIGHT. Entry used to define which moisture correction is needed to convert dry weight results back to their equivalent wet weight (As-Received) results. Entry is only placed on rows where a relevant moisture result is also reported.

DRY_WEIGHT states that for the moisture content reported for this sample, a Dry Weight correction must be used to convert the dry weight results back to their As-Received equivalent (based on BS 1377 and ISO 11465). DRY_WEIGHT should only be present in the row(s) of the .hwol file where a moisture content is also reported.

WET_WEIGHT states that for the moisture content reported for this sample, a Wet Weight correction must be used to convert the dry weight results back to their As-Received equivalent (based on EN12880). WET_WEIGHT should only be present in the row(s) of the .hwol file where the moisture content is also reported.

- b. **Mass Correction:** Entry is only placed on rows where a REM_MAT_AD is present (Examples - see section 2.5). The variables are
- YES for the case where the lab has corrected their published results for the mass of any removed materials.
 - NO for the case where the lab has not corrected their published results for the mass of any removed materials.

- 33) **report_type** This column is used to identify different report types (Solid report, WAC report) produced by the laboratories so the data can be matched to the same reports in HazWasteOnline™ (See section 2.1). For example, pH may be in both the Solid and WAC reports but present a different result because one pH test was completed on the air-dried material, while the WAC was on the as-received material.
- 34) **hwol_acronym_system** This column is used to describe the steps in the analysis of hydrocarbons. The acronyms also need to be duplicated on the SOLID, WATERS and WAC sections of a given lab PDF report. Examples from a PDF report are shown below with the acronyms highlighted in green. See Section 1.3 for full list of acronyms and their meanings. A white paper discussing the HWOL Acronym System can be downloaded from <https://www.hazwasteonline.com/category/publications/>.

Determinand	Units	Accreditation	Sample 1
EPH (>C10 - C40) EH_1D_Total	mg/kg	MCERTS	2700
EPH cleaned-up (>C10 - C40) EH_CU_1D_Total	mg/kg	u	499
TPH CWG >C5 - C40 EH_CU+HS_1D_Total	mg/kg	u	375
WAC Mineral Oil >C10 - C40 EH_2D_Total_#1	mg/kg	u	450

Table 2. Examples of the presentation of hwol acronyms in a lab's PDF report

	35)	36)
	result_accreditation	reg_no
1	N	1234
2	N	1234
3	N	1234
4	U	1234
5	M	1234
6	U	1234
7	M	1234
8	N	1234
9	U	1234
10	N	1234
11	M	1234
12	N	1234
13	M	1234
14	M	1234

35) *result_accreditation* refers to accreditation for a particular result as presented in the laboratory report

36) *reg_no* refers to the lab's registration number with the national accrediting authority

Examples of result accreditations

- ISO17025 accreditation : U, 17025, ISO17025, #, ^, *, to indicate results accredited by government organisation (e.g. UKAS) for ISO17025
- MCERTS accreditation : M, MCERTS – to indicate that result is further accredited by UKAS for MCERTS - If a lab only references MCERTS it also means they are accredited for 17025
- Not accredited: N, NA, None, blank – to indicate those results that do not hold accreditation

Examples of government accreditation bodies:

- Ireland INAB Irish National Accreditation Board
- Netherlands RvA Raad voor Accreditatie
- South Africa SANAS South African National Accreditation System
- UK UKAS National Accreditation Body for the United Kingdom

2.1 Detail for column 33: **report_type**

Acceptable entries are shown below, along with a description. Further entries can be found in Appendix B.

If a laboratory has other report types other than those listed below or in Appendix B (e.g. Topsoil); these will need to be added to this specification so that we can understand how to process the extra data (or not) during importation.

Test type	report_type	Explanation
Analysis of whole waste		
	SOLID	means that the results are for solid waste analysis: units mg/kg or similar plus non solid units such as pH (pH units) and moisture content (%).
	LIQUID	means that the results are for liquid waste analysis: units mg/l or similar plus non liquid units such as pH (pH units) and conductivity (mS/m)
	PRODUCT	means that the results are for the analysis of products
	GAS	means that the results are for the analysis of gases
Single stage WAC results		
	WAC_CEN_10_1	Solid and Leachate Prep Analyses (WAC) - indicates that the results are for the analysis of the solid waste (and any other WAC parameters not described below such as Loss on Ignition (%))
	WAC_CEN_10_1_C10	indicates the results are for the 10:1 leached C10 column (mg/l)
	WAC_CEN_10_1_A10	indicates the results are for the 10:1 leached A10 column (mg/kg) [This column is the one compared to the WAC limits]
Two Stage WAC results		
	WAC_CEN_10_1	Solid and Leachate Prep Analyses (WAC) - indicates that the results are for the solid waste analysis (and any other WAC parameters not described below such as Loss on Ignition (%))
	WAC_CEN_10_1_C2	indicates the results are for the 2:1 eluate C2 column (mg/l result) (1 st Step)
	WAC_CEN_10_1_C8	indicates the results are for the 8:1 eluate C8 column (mg/l result) (2 nd step)
	WAC_CEN_10_1_A2	indicates the results are for the 2:1 leached A2 column (mg/kg) (1 st step)
	WAC_CEN_10_1_A2-10	indicates the results are for the cumulative 10:1 leached A2-10 column (mg/kg) (2 nd step) [This column is the one compared to the WAC limits]

Table 2.1.1 **report_type** entries for various type of lab report

2.2 WAC Determinands

In HazWasteOnline™, WAC data are managed using a simpler process than that employed to process the data for waste classification (i.e. to determine whether the waste is hazardous or non-hazardous).

WAC data are imported directly into a standard WAC report format for presentation purposes. To make sure the WAC determinands are identified correctly, the following CAS/ID numbers should be used in the **cas_rn** field.

<i>cas_rn</i>	<i>chemical_name</i>
P1340	Total Organic Carbon
P1226	Loss on Ignition
P1330	Sum of BTEX
P1434	Sum of PCB (actually PCB EC7 congeners)
P1406	Mineral Oil >C10-40
P1858	PAH Total 17
P1334	pH
P1114	ANC at pH 4
P1115	ANC at pH 7
16984-48-8	Fluoride
16887-00-6	Chloride
14808-79-8	Sulphate as SO4
P1132	Total Dissolved Solids
P1839	Dissolved Organic Carbon
P1187	Phenol (index)
P1840	Conductivity (µS/cm)
P1325	Temperature (°C)
P1870	Leachant Volume / Volume of Eluate (litres)
P1869	Mass of raw test portion / Mass of sample taken kg
P1871	Mass of Dry Sample
P1942	Moisture Content Ratio (%) / Natural Moisture Content 105C
P1831	Dry Matter Content (%)

Table 2.2.1 Suitable **cas_rn** entries for the standard WAC determinands [The P-numbers are taken from AGS-4 maintained by the AGS].

2.3 Detail for column 34 *hwol_acronym_system* and examples of “TPH” determinands published in PDF reports

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Chemical clean-up - e.g. by Florisil, silica gel : EH_CU_1D_Total
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	Mathematical clean-up with humics subtracted : e.g. EH_2D_Total_#1
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH_CU+HS_1D_Total
MS	Mass Spectrometry: e.g. HS_1D_MS_Total

Table 2.3.1 List of HWOL Acronyms and operators

#	Terms used in a lab's PDF Report	Acronyms – PDF Report & .hwol
1	GRO >C5-C10	HS_1D_Total
2	EPH Range >C10-C40	EH_1D_Total
3	TPH1 (C10-C40)	EH_1D_Total
4	TPH (C10-C40)	EH_CU_1D_Total
5	EPH(C5-C40)	EH_CU+HS_1D_Total
6	Total Aliphatics >C10-C44	EH_CU_1D_AL
7	Total Aromatics >C10-C44	EH_CU_1D_AR
8	Total Aliphatics & Aromatics >C10-C44	EH_CU_1D_Total
9	Total Petroleum Hydrocarbons	EH_2D_Total
10	Total Aliphatics & Aromatics >C10-C44	EH_2D_Total_#1_#2
11	Mineral Oil (mg/kg)	EH_1D_Total
12	Mineral Oil >C10-C40	EH_CU_1D_AL

Table 2.3.2 Examples of the use of hwol Acronyms in the .hwol file and the PDF report

2.4 *basis* field and the Moisture Correction

The **basis** field records whether the concentration published in the PDF report and the .hwol file, for a given determinand, is published in dry weight terms or in wet weight (as-received) terms.

[This is different to the **basis_test** field which records whether the analysis was **conducted on** the as-received material or on the dried material.]

Having this knowledge (**basis**: WET, DRY, NA) allows us to correct any results where **basis** = DRY to their wet weight (as-received) equivalent. It does this based on the determinand "moisture" and the entry published in the **MC_Type** column i.e. the published moisture result is based on either the WET_WEIGHT or the DRY_WEIGHT calculation.

2.5 Removed Material Correction

This correction is for adjusting the measured concentrations of relevant determinands following any removal of material (and the removed material is not subsequently crushed and reintroduced into the sample), after the sample has been dried. Depending on the laboratory, removed materials might include: massive metals (e.g. wire, nails, screws, hinges, cutlery, metal fittings), stones, glass, concrete, bricks, ceramics, batteries, wood, twigs, fabric etc.

For a given waste stream, some labs crush everything sent to them while others remove certain materials (using terms such as non-grindables, inert materials). What is removed and what is crushed varies from lab to lab (soils labs, fuel labs etc.) and may not be clearly documented in a laboratory's PDF report.

Table 2.5.1 gives three examples of how the data should be reported; the first where everything is retained in the sample (even crushed materials); the second where 10% of material has been removed and not included in the analysis; the third where 10% of the material has been removed but the lab has corrected the reported results.

.hwo field	1) Nothing Removed	2) 10% removed, no lab correction	3) 10% removed, lab corrected
<i>cas_rn</i>	REM_MAT_AD	REM_MAT_AD	REM_MAT_AD
<i>chemical_name</i>	% Stones >10mm	Inert/Non-grindables	Metal Removed during sample preparation
<i>result_value</i>	0 or blank	10	10
<i>result_unit</i>	%	%	%
<i>reportable_result</i>	YES	YES	YES
<i>detect_flag</i>	N	Y	Y
<i>lab_qualifiers</i>	<	>	>
<i>reporting_detection_limit</i>	0.1	0.1	0.1
<i>detection_limit_unit</i>	%	%	%
<i>MC_type</i>	NO	NO	YES

Table 2.5.1. Examples of data for three cases; 1) where no material has been removed, 2) where 10% of the material has been removed but the lab has not corrected their reported data and 3) where 10% of the material has been removed and the lab has corrected their reported data.

The calculation to calculate a value for REM_MAT_AD is: $100 \times (\text{MassSample_before (removal)} - \text{MassSample_after}) / \text{MassSample_before}$

The *basis_test* field in the .hwo data file documents which tests are undertaken on the as-received materials (AR) versus the dried materials (AD). For a given determinand (where the *basis* column is DRY), the removed material correction (REM_MAT_AD) is applied only to those results marked AD. (The moisture correction is applied by HazWasteOnline™ after this removed material correction).

We are not currently aware of any lab removing materials from the as-received sample i.e. before drying (apart from sample material discarded during the sample reduction process e.g. via cone and quartering). If materials were removed before drying, the **cas_{rn}** for this removed material should be: **REM_MAT_AR**. (This correction would be applied by HazWasteOnline™ after any moisture correction.) **Please advise us if this could be the case for your laboratory** so we can check the import of your data accordingly.

Any description of the removed material (e.g. nails, quartz, pebbles etc.) should be on an independent row in the .hwol data file.

It is assumed that unless the lab supplies a result for **REM_MAT_AD**, that no material is removed before drying.

Assuming a soil-based waste stream, the expected preparation steps are:

- Sample containers (plastic tub, glass jar, volatile jar) received from a customer
 - a. Glass jar(s) go off for testing as is (i.e. As-Received testing)
- For the material in the plastic tub
 - i. Sample weighed
 - b. If material is hand-picked (removed) from the original sample (e.g. twigs, glass, plastics, large stones, litter, lumps of metal)
 - i. The removed material is weighed
 - ii. **REM_MAT_AR** is calculated
 - c. Sample reduction step e.g. cone & quartering to reduce sample to 100-250 g
 - i. The reduced sample is weighed
- The reduced sample is then dried at ~ 35°C
 - i. Reduced, dried sample is weighed to calculate the Moisture Content
- Reduced sample is then sieved using 2 mm or 10 mm sieves
 - a. Some labs remove material that doesn't pass through the sieve
 - b. Other labs crush the oversize material and repass it through the sieve
 - i. Removed material is weighed
 - ii. **REM_MAT_AD** is calculated
- Materials passing through the sieve then goes for grinding to a powder and testing

2.6 Managing a result that exceeds the maximum or Upper Calibration Point

There will be cases where the measured result exceeds the Upper Calibration Point, reported as for example; pH >12 or zinc >5,000 mg/kg.

To report this in the .hwol file:

.hwol field	pH	zinc
<i>chemical_name</i>	pH	zinc
<i>result_value</i>	12	5000
<i>result_unit</i>	pH	mg/kg
<i>reportable_result</i>	YES	YES
<i>detect_flag</i>	Y	Y
<i>lab_qualifiers</i>	>>	>>
<i>interpreted_qualifiers</i>	>>	>>

Table 2.6.1. Two examples showing the data for results above the Upper Calibration Point.

Appendix A Example of the HazWasteOnline™ format HWOL file.

Below is a partial example of a HazWasteOnline™ format .hwol file for a suite of tests carried out on a trial pit TP1 from two sample depths. This example data set is available as a .hwol file.

```

sys_sample_code,lab_anl_method_name,analysis_date,fraction,test_type,lab_matrix_code,analysis_location,basis_test,basis,dilution_factor,prep_method,leachate_method,leachate_date,leachate_time,lab_name_code,lab_sample_id,cas_rn,chemical_name,result_value,result_unit,result_type_code,reportable_result,detect_flag,interpreted_qualifiers,lab_qualifiers,reporting_detection_limit,method_detection_limit,quantitation_limit,detection_limit_unit,tic_retention_time,result_comment,mc_type,report_type,hwol_acronym_system,result_accreditation,reg_no
TP1/0.5m/2023-04-06,PM4,26/04/2023 07:36,N,Initial,SOI,LB,AR,NA,1,PM0,,EMT,23-1234-1,MOIST_CONT_DRY,Natural Moisture Content,11.4,%,TRG,Yes,Y,>,>0.1,0.1,,%,,,DRY_WEIGHT,SOLID,,N,1234
TP1/0.5m/2023-04-06,PM4,25/04/2023 12:55,N,Initial,SOI,LB,AR,NA,1,PM0,,EMT,23-1234-1,P1942,Natural Moisture Content 105C,12.9,%,TRG,Yes,Y,>,>0.1,0.1,,%,,,,WAC_CEN_10_1,,N,1234
TP1/0.5m/2023-04-06,TM5/TM36,28/04/2023 09:43,T,Initial,SOI,LB,AR,DRY,10,PM8/PM12/PM16,,EMT,23-1234-1,INTERPRETATION,Interpretation,,None,TRG,Yes,Y,,,,,None,,diesel and lubricating oil,,SOLID,EH_CU+HS_1D_Total,N,1234
TP1/0.5m/2023-04-06,TM16,28/04/2023 09:43,T,Initial,SOI,LB,AR,DRY,10,PM8,,EMT,23-1234-1,50-32-8,Benzo(a)pyrene,,µg/kg,TRG,Yes,N,<,<100,10,,µg/kg,,SOLID,,U,1234
TP1/0.5m/2023-04-06,TM17_B1,26/04/2023 11:29,T,Initial,SOI,LB,AR,DRY,1,PM8,,EMT,23-1234-1,PCBTOT_AR1254,PCB Total (vs Aroclor 1254),µg/kg,TRG,Yes,N,<,<10,10,,µg/kg,,SOLID,,M,1234
TP1/0.5m/2023-04-06,TM30,26/04/2023 16:18,T,Initial,SOI,LB,AD,DRY,1,PM15,,EMT,23-1234-1,7440-47-3,Chromium,201.6,mg/kg,TRG,Yes,Y,>,>0.5,0.5,,mg/kg,,SOLID,,U,1234
TP1/0.5m/2023-04-06,TM30,26/04/2023 16:20,T,Reanalysis,SOI,LB,AD,DRY,5,PM15,,EMT,23-1234-1,7440-66-6,Zinc,5642,mg/kg,TRG,Yes,Y,>,>25,5,,mg/kg,,SOLID,,M,1234
TP1/0.5m/2023-04-06,PMX,25/04/2023 08:55,N,Initial,SOI,LB,AD,DRY,1,PMX,,EMT,23-1234-1,REM_MAT_AD,Removed Material,10,%,TRG,Yes,Y,>,>0.1,0.1,,%,,YES,SOLID,,N,1234
TP1/0.5m/2023-04-06,TM36,26/04/2023 07:36,T,Initial,SOI,LB,AR,DRY,1,PM12,,EMT,23-1234-1,71-43-2,Benzene,6,µg/kg,TRG,Yes,Y,>,>5,5,,µg/kg,,SOLID,,U,1234
TP1/0.5m/2023-04-06,TM38,26/04/2023 15:04,T,Initial,SOI,LB,AR,DRY,1,PM20,,EMT,23-1234-1,18540-29-9,Hexavalent Chromium,,mg/kg,TRG,Yes,N,<,<0.3,0.3,,mg/kg,,SOLID,,N,1234
TP1/0.5m/2023-04-06,TM5,26/04/2023 13:47,T,Initial,SOI,LB,AR,DRY,1,PM8,,EMT,23-1234-1,EPHC08C40,EPH >C8-C40,14735,mg/kg,TRG,Yes,Y,>,>30,30,,mg/kg,,SOLID,EH_1D_Total,M,1234
TP1/1.0m/2023-04-06,TM5/TM36,27/04/2023 11:21,T,Initial,SOI,LB,AR,DRY,1,PM8/PM12/PM16,,EMT,23-1234-2,GTC05C44ALAR,>C5-C44 Aliphatics/Aromatics,11454,mg/kg,TRG,Yes,Y,>,>52,52,,mg/kg,,SOLID,EH_CU+HS_1D_Total,N,1234
TP1/1.0m/2023-04-06,TM73,26/04/2023 08:45,T,Initial,SOI,LB,AR,WET,1,PM11,,EMT,23-1234-2,P1334,pH,7.92,pH units,TRG,Yes,Y,>,>0.01,0.01,,pH units,,SOLID,,M,1234
TP1/1.0m/2023-04-06,TM38,26/04/2023 08:45,D,Initial,WL,LB,AR,DRY,1,PM0,,EMT,23-1234-2,14808-79-8,Sulphate (soluble),79.9,mg/l,TRG,Yes,Y,>,>0.5,0.5,,mg/l,,LEACH-CEN_10_1,,M,1234

```

Appendix B – other known report types

Test Types	report_type	Explanation
	LEACH_NRA	National Rivers Authority leachate (NRA 1994)
	LEACH_CEN_10_1	CEN 10:1 (1 Batch) Leachate (NON-WAC)
	LEACH_CEN_2_1	CEN 2:1 Leachate
	LEACH_TCLP	Toxicity Characteristic Leaching Procedure Leachate (US EPA)
	LEACH_SPLP	Synthetic Precipitation Leaching Procedure Leachate (US EPA)
	TOP_SOIL	Topsoil report based on BS3882:2015

Appendix C - Unicode character encoding

Micro μ : U+00B5 (181)

Degree $^\circ$: U+00B0 (176)

References

AGS – Association of Geotechnical & Geoenvironmental Specialists: <http://ags.org.uk/>

Network Working Group, 2005. Common Format and MIME Type for Comma-Separated Values (CSV) Files: <https://tools.ietf.org/html/rfc4180>

EPA 2019: Electronic data Deliverable (EDD): Comprehensive Specification Manual 6 May 2019, United States Environmental Protection Agency: www.epa.gov/sites/default/files/2019-05/documents/r2comprehensivemanual_may2019.pdf

EPA 2022: ELECTRONIC DATA DELIVERABLE, VALID VALUES, REFERENCE MANUAL, Region 2; Appendix to EPA Electronic Data Deliverable (EDD) Comprehensive Specification Manual, Region 2:

Part I – Table A-1 to A-13 And Figure A-1 and A-2: www.epa.gov/system/files/documents/2022-03/r2validvaluesreferencemanual_appendixa-1_to_a-13.pdf

Part II – Table A-14 to A-32: www.epa.gov/system/files/documents/2022-03/part2_r2validvaluesappendix-a-14_toa-32.pdf