Scope:	Regulation Class:	Document Class:	
Division	Technical Requirement	Main Document	

Regulation Title

Generation and Archiving of Standard-Logs and Composite-Logs

Content

The Standard-Log acts as depth reference for all following activities after the drilling of the borehole is completed (e.g. Geological correlation) and throughout the lifecycle of a borehole.The Composite-Log acts as temporary product until the Standard-Log is available. It is a collection of the most important log curves, digitally available, for a borehole to be used by Geologists for correlation purposes or other activities considering the actual Composite-Log quality.

Target Group

Petrophysicists, Explorationists, Geophysicists, Production Geologists, Geomechanical Personnel, Reservoir Engineers, Operations Geologists, Wellsite Geologists, Production Technologists, Workover Personnel, Data Managers and Application Data Managers involved in subsurface workflows and data management processes, etc. OMV Exploration & Production and OMV Petrom Exploration & Production and all their affiliates, excluding SapuraOMV.

Please note that regulations are reviewed periodically. Only regulations published on REAL are valid and in force. Please refer to section 6 and to the last page of this document for a complete overview of the metadata and in particular approvals, including electronic approval information of this document.

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1. Introduction

The Standard-Log represents the most complete set of primary acquired electrical log data (unique curves that are truly representative of the borehole) and covers the greatest possible depth interval of a borehole (surface to total depth).

The Composite-Log acts as temporary product until the Standard-Log is available. It is a collection of the most important log curves available (digitally available) for a borehole to be used by Geologists for correlation purpose or other activities considering the actual Composite-Log quality. In ideal case the Composite-Log covers the maximum possible depth interval of a borehole (surface to total depth).

This technical requirement is used by different disciplines (e.g. Geologists, Petrophysicists, Geophysicists, Reservoir Engineers, etc.) for their work.

This regulation explains the difference between Standard-Log and various levels of log composites, with the Standard-Log (highest quality) and Composite-Log in main focus. Minimum requirements regarding generation process, naming conventions (e.g. curves, files, etc.), deliverable package, up to the archiving process are hereby set.

2. Content of Regulation

2.1. Composite Types

Composite types and quality levels:

- Standard-Log (HIGH)
- Petrophysical Composite (HIGH)
- Composite-Log (MEDIUM or LOW)
- Composite-General (MEDIUM or LOW)

2.1.1. Standard-Log

The Standard-Log is a continuous collection of the most common curve types, acquired during Wireline (WL) logging and/ or Measurement While Drilling/ Logging While Drilling (MWD/LWD). Relevant depth corrections and other necessary corrections (like removing of measurement artifacts in casing, etc.) are applied. All curves included in the **Standard-Log** are “on depth” and **act as depth reference for all following work in a borehole**. The **Standard-Log** dataset shall be generated **for all new wells drilled!** This includes Company operated wells and non-operated wells (all types of wells: e.g. Exploration-, Appraisal- and Development wells). In addition, Standard-Logs shall be generated for legacy wells, if not existing, based on priority and on request. The Standard-Log is generated as soon as the borehole drilling process is finalized, all final deliverables were received and data quality was verified (raw and processed data). The Standard-Log dataset includes full documentation about the generation process and data origin. A complete dataset includes a digital las file (standard log curve names), plot files and the info file.

2.1.1.1. Purpose

Standard-Log shall be used as:

- basis for geological well correlation, picking of formation tops, wellbore stability overview, etc.
- input for simple petrophysical interpretations (CPI) if in line with the petrophysical interpretation scope.

- basis for the selection of perforation interval/s and design of other workover programs.
- overview of all relevant logging performed in a borehole.

2.1.1.2. Main Characteristics

- All available logging runs (WL, MWD/LWD) acquired in the borehole shall be considered at the time of the Standard-Log generation.
- Best data from MWD/ LWD and WL, merged from the borehole top to bottom must be used for the Stahdardog generation process. Also Logs acquired in cased hole intervals must be considered.
- All Standard-Log standard naming conventions and formats shall be strictly followed.
- For each Standard-Log an audit trail must be available including all processing and editing details.
- A Standard-Log must be updated on a request basis in case additional relevant data are acquired/ available in a borehole, after the point of Standard-Log generation.
- All Standard-Logs must be archived in the corporate database and are made available in Company geotechnical applications.
- A Standard-Log is not the same as the Completion Log The log curves presented are ideally the same, but this is not a requirement.
- Quality Rating: HIGH

2.1.2. Composite-Log

Composite logs are a continuous set of collected log curves, potentially spliced and merged from several log runs. In general, the Composite-Log quality rating is lower than that of the Standard-Log due to the fact that not all data acquired in a borehole are available or the data origin and data editing steps are necessarily not known during the Composite-Log generation process. All merged datasets not following the Standard-Log standards but follow the Composite-Log Technical Requirements must be classified as Composite-Log. This has to be considered by the user community and interpreters.

2.1.2.1. Purpose

Composite-Log shall be used as:

- temporary solution until the Standard-Log is available.
- dataset for correlation so that overall project work is not delayed.
- input dataset for petrophysical or other analysis workflows, only after the data quality/ origin was verified.

2.1.2.2. Main Characteristics

- For the Composite-Log generation process not all available data or acquired data in a borehole must be considered.
- The data source for generating the Composite-Log must not necessarily be known.
- Hardcopy log plots from physical archives must not necessarily be considered for the Composite-Log generation process.
- All Composite-Log standard naming conventions and formats shall be strictly followed.
- Quality Rating: MEDIUM or LOW depending on the quality and completeness of raw data/ digital data available.

2.1.3. Composite-General

Composite-General logs are a continuous set of collected log curves, potentially “spliced” and “merged”. Documentation regarding the source or history (e.g. curve shift or editing) of the logs is necessarily not available. Before a Composite-General is used, the user has to verify the content and shall have an idea about how the product was generated to avoid misinterpretations or wrong assumptions. In general the Composite-General log quality rating is lower than that of the Standard-Log or Composite-Log due to missing conformity of standards. All merged datasets which do not follow the Standard-Log or Composite-Log standards are classified as Composite-General. This shall be considered by the user community and interpreters.

2.1.3.1. Purpose

Composite-General shall be used as:

- It is not always clear defined for what purpose the Composite-General was generated (e.g.: Quick dataset for correlation, combined product of different logging runs, operators official spliced/ merged dataset used as depth reference for all work done on a well, etc.). Therefore this product must be handled with caution.
- Shall not be used for petrophysical or other analysis without quality/ origin clarification.

2.1.3.2. Main Characteristics

- A Composite-General is generated for a lot of different purposes. This product does not have necessarily the same meaning as a Standard-Log or Composite-Log.
- Logging contractors often combine different logging runs into one product and call it Composite.
- Curves are not necessarily on depth.
- Curve naming conventions, digital file header information (e.g. .las, .dlis) or available plots are not in alignment with the Composite-Log standards.
- All curves/ curve from interval(s) not necessarily available.
- Data source is not necessarily known (final/ field, raw/ processed/ edited, producer/ tool type, etc.)
- Information about the generation process and data source is not necessarily available.
- Quality Rating: LOW or MEDIUM depending on the quality and completeness and available documentation about the generation process.

2.1.4. Petrophysical Composite

The Petrophysical Composite represents a dataset for petrophysical usage. It shall be used as basis for the Standard-Log generation and for generating the petrophysical input dataset for log interpretation purposes, if available. In most cases modifications have been applied on this data, such as special environmental corrections, de-spiking, pseudo curves, in-filling, etc. It is not mandatory that a Petrophysical Composite is generated for boreholes. Details about the Petrophysical Composite generation process are not included in this document.

2.1.4.1. Purpose

Petrophysical Composite shall be used as:

- basis for the Standard-Log generation.
- input dataset for conventional petrophysical interpretations.
- input dataset for advanced petrophysical interpretation (e.g. Thin Bed Analysis).

2.1.4.2. Main characteristics

- High sampling rate data and array data shall be included. All original depth increments must be kept.
- All MWD/ LWD and WL data must be depth shifted to match the defined reference depth.
- Minimum editing shall be applied to the curves in order to keep the data as original as possible.
- All original curve names must be preserved!
- As minimum, all curves presented on log plots must be included in the Petrophysical Composite dataset.
- Only curves with same raw curve names/ mnemonics and units shall be spliced.
- Petrophysical composite data shall be kept in a separate dataset and shall not combined with the Standard-Log dataset or petrophysical interpretation input dataset.
- Quality Rating: **HIGH**

2.2. Standard-Log Standards

2.2.1. Curve Standards

The Standard-Log for OMV includes curves as mentioned **in Table 1**, for OMVP as in **Table 2**, provided that relevant measurements are existing in the borehole. Curve naming conventions and unit specifications to be followed exactly as described.

Curve Mnemonic / Output Name	Color	Scale	Line style	Techlog Unit	Petrel Unit	Description
Primary Curves						
BS_STD	RGB: 0, 0, 0	6 to 26	dash	in	in	STANDARD-LOG BIT SIZE
CALI_STD	RGB: 0, 0, 255	6 to 26	solid	in	in	STANDARD-LOG CALIPER
DT_STD*	RGB: 50, 205, 50	240-40 or 800-130	solid	µs/ft or µs/m*	us/ft or us/m*	STANDARD-LOG ACOUSTIC SLOWNESS COMPRESSIONAL
GR_STD	RGB: 0, 190, 0	0 to 150	solid	gAPI	gAPI	STANDARD-LOG GAMMA RAY
NEU_STD	RGB: 0, 0, 255	0.45 to -0.15	dash	m3/m3	m3/m3	STANDARD-LOG NEUTRON POROSITY
PEF_STD	RGB: 165, 42, 42	0 to 10	solid	b/e	dimensionless	STANDARD-LOG PHOTOELECTRIC FACTOR
RD_STD	RGB: 255, 0, 0	0.2 to 2000	solid	ohm.m	ohm.m	STANDARD-LOG RESISTIVITY DEEP
RHO_STD	RGB: 255, 0, 0	1.95 to 2.95	dash	g/cm3	g/cm3	STANDARD-LOG FORMATION DENSITY
RM_STD	RGB: 255, 0, 255	0.2 to 2000	solid	ohm.m	ohm.m	STANDARD-LOG RESISTIVITY MEDIUM
RS_STD	RGB: 0, 0, 255	0.2 to 2000	solid	ohm.m	ohm.m	STANDARD-LOG RESITIVITY SHALLOW
RXO_STD	RGB: 0, 0, 0	0.2 to 2000	solid	ohm.m	ohm.m	STANDARD-LOG RESISTIVITY MICRO
SP_STD	RGB: 255, 0, 0	-160 to 40	solid	mV	mV	STANDARD-LOG SPONTANEOUS POTENTIAL
TVD_STD	RGB: 0, 190, 0			m	m	STANDARD-LOG TRUE VERTICAL DEPTH
TVDSS_STD	RGB: 0, 0, 255			m	m	STANDARD-LOG TRUE VERTICAL DEPTH SUBSEA
Secondary Curves						
DRHO_STD	RGB: 0, 0, 0	-0.75 to 0.25	dot	g/cm3	g/cm3	STANDARD-LOG FORMATION DENSITY CORRECTION
DTS_STD*	RGB: 255, 0, 0	460-60 or 1500-200	solid	µs/ft or µs/m*	us/ft or us/m*	STANDARD-LOG ACOUSTIC SLOWNESS SHEAR
DTST_STD*	RGB: 0, 0, 255		solid	µs/ft or µs/m*	us/ft or us/m*	STANDARD-LOG ACOUSTIC SLOWNESS STONELY
POTA_STD	RGB: 0, 0, 255	-10 to 10	solid	%	%	STANDARD-LOG POTASSIUM

THOR_STD	RGB: 255, 0, 255	-10 to 30	solid	ppm	ppm	STANDARD-LOG THORIUM
URAN_STD	RGB: 255, 0, 0	-10 to 30	solid	ppm	ppm	STANDARD-LOG URANIUM
VELC_STD	RGB: 255, 0, 255	0 to 8000	solid	m/s	m/s	STANDARD-LOG VELOCITY COMPRESSIONAL
VELS_STD	RGB: 165, 42, 42	0 to 5000	dash	m/s	m/s	STANDARD-LOG VELOCITY SHEAR
Vintage Logs (in addition)						
GR_UR/H_STD GR_CPS_STDGR_RADT_STD	RGB: 0, 190, 0	0 to 10 or 0 to 1000 or 0 to 10	dash	uR/h or cps or unitless		STANDARD-LOG GAMMA RAY MICRO ROENTGEN PER HOUR or STANDARD-LOG GAMMA RAY COUNT RATE PER SECOND or STANDARD-LOG GAMMA RAY MIRCOGRAM RADIUM EQUIVALENT PER TON
MINV_STD	RGB: 165, 42, 42	0.2 to 2000	solid	ohm.m	ohm.m	STANDARD-LOG RESISTIVITY MICRO INVERSE
MNOR_STD	RGB: 128, 0, 128	0.2 to 2000	dash	ohm.m	ohm.m	STANDARD-LOG RESISTIVITY MICRO NORMALE
NEU_API_STD NEU_CPS_STD	RGB: 0, 0, 255	0 to 5000 or 0 to 1000	long dash	api or cps		STANDARD-LOG NEUTRON IN API or STANDARD-LOG NEUTRON COUNT RATE PER SECOND

** Austrian wells in µs/m; International wells in µs/ft*

Table 1: OMV Standard-Log curve naming conventions and unit specification

Curve Mnemonic / Output Name	**Color**	**Scale**	**Line style**	**IP/ Techlog Unit**	**Petrel Unit**	**Description**
Primary Curves						
BS_STD	RGB: 0, 0, 0	6 to 26	dash	in	in	STANDARD-LOG BIT SIZE
CALI_STD	RGB: 0, 0, 255	6 to 26	solid	in	in	STANDARD-LOG CALIPER
DT_STD	RGB: 50, 205, 50	240-40	solid	µs/ft	µs/ft	STANDARD-LOG ACOUSTIC SLOWNESS COMPRESSIONAL
GR_STD	RGB: 0, 190, 0	0 to 150	solid	gAPI	gAPI	STANDARD-LOG GAMMA RAY
RES_STD	RGB: 255, 0, 0	0.2 to 2000	solid	ohm.m	ohm.m	STANDARD-LOG RESISTIVITY BEST
RHO_STD	RGB: 255, 0, 0	1.95 to 2.95	dash	g/cm3	g/cm3	STANDARD-LOG FORMATION DENSITY
SP_STD	RGB: 255, 0, 0	-100 to 0	solid	mV	mV	STANDARD-LOG SPONTANEOUS POTENTIAL
TVD_STD	RGB: 0, 190, 0			m	m	STANDARD-LOG TRUE VERTICAL DEPTH
TVDSS_STD	RGB: 0, 0, 255			m	m	STANDARD-LOG TRUE VERTICAL DEPTH SUBSEA

Table 2: OMVP Standard-Log specific curve naming conventions and unit specification

2.2.2. Standard-Log Creation Details

2.2.2.1. Quality

The Standard-Log creation shall be performed following standard petrophysical principles as described in the following chapters**.** For each primary measurement, the best curve version over a given depth interval is selected. The presented data is depth shifted, edited and merged. MWD/LWD data is typically spliced with the wireline data to give full data coverage. Artefacts leading to misinterpretations shall be removed and recorded in the Info File.

Standard-Logs are created for every wellbore including sidetracks (for each borehole a separate Standard-Log is generated)!

2.2.2.2. General

- The dataset shall cover the interval from Total Depth (TD) to the surface for each borehole, as far as data availability and quality allows.
- Data is cleaned up during the Standard-Log creation process.
- Spliced curve mnemonics to be renamed to meet Company Standard-Log curve naming conventions as explained in chapter 2.2.1.
- Curve output sampling rate: 0.1524m or 0.1m depending on the service company standard sampling rate. Sampling rate must be fixed within a well in order not to lose data resolution.
- Depth units in m MD (meter Measured Depth).
- Absent (or Null values) values: -999.25.
- All curves are presented with correct/ defined units.
- Next to the MD depth track, True Vertical Depth (TVD) and True Vertical Depth Sub Sea (TVDSS) are presented (final well deviation survey/ well path to be extracted and used from CWDB (OMV) and MDS (OMVP).
- Standard-Log curves have to be on depth within the depth tolerances: 0.2m!
- TVD and TVDSS are calculated with the minimum curvature method.
- All logging performed in the boreholes has to be considered for the Standard-Log (including hardcopy log plots from the different physical archives for legacy wells).
- If additional data becomes available at a later date, the Standard-Log shall be updated accordingly.

2.2.2.3. Data to be considered

The source of all used data to generate the Standard-Log shall be WLMS, the global leading system for storing Log data!

Raw and processed data for the following acquired data shall be considered for the Standard-Log generation process, if available. All processing steps must be documented and made available in the "Standard-Log Info File". Data to be used in following order (decreasing significance):

- Open hole Wireline data (FINAL data deliverables)
- Open hole Wireline data (Field data deliverables)
- RM (Recorded mode) open hole MWD/LWD data (Memory data)
- Cased hole Wireline data (FINAL data deliverables)
- Cased hole Wireline data (Field data deliverables)
- RM cased hole MWD/LWD data (Memory data)
- RT (Realtime) mode open hole MWD/LWD data
- RT mode cased hole MWD/LWD data

The usage of data with unknown origin and without documentation about data editing shall be avoided and only be considered in the case that nothing else is available.

2.2.2.4. Data editing/ manipulation details

2.2.2.4.1. General Curve Selection and Data Editing

- All curves are checked against each other for plausibility.
- All data editing is reported in the Info File.
- Final deliverables from the service providers have to be the basis for the Standard-Log. Only if not avoidable also Field deliverables have to be considered.

- Raw data are preferred to processed or edited data, except in those cases in which details about the processing and editing are available and verified by the Petrophysicist.
- Data gaps or data affected by “stick – pull” tool movement data must be replaced by data from down log, or repeat log whenever such data is available and suitable. (The term repeat section is used here in a broader sense and includes multiple logging runs over the same interval).
- It is not advised to perform additional environmental corrections; instead corrections done by the service company have to be checked for correctness. Applied environmental corrections, are mentioned in the Info File.
- Wells consisting of multiple boreholes: Data from the main borehole (e.g. UBHI: ATXXXXXXXX00) shall be used until the Kickoff Point (KOP) point. Starting from the KOP (e.g. UBHI: ATXXXXXXXX01, etc.) and below, data from the relevant borehole shall be used to ensure best data coverage for each borehole. Documentation in the Standard-Log Info File has to be adjusted accordingly.

Data editing:

- Data before tool ”Pick-up” recordings for the logging run shall be removed. If it is not possible to pick from the log or tool diagram data below first reading on wireline data, data shall remain in the file. Care must be taken to ensure the best assessment of valid formation data.
- Relevant data normalization (e.g. bring cased hole logs to open hole logs level, normalization to open hole key wells) shall be applied to the data and properly documented. Geological aspects (e.g. formation tops, etc.) shall be considered.
- Curve data recorded in casing shall be removed but valid formation data shall be maintained (e.g. GR or neutron measurements in casing). Valid data in casing must be kept if it is the best version available.
- Constant values at the top and bottom on Standard-Log curves must be removed.
- Corrupted data, e.g. data influenced by tool stick and pull, shall be replaced by better quality data (e.g. data from repeat runs if of better quality), if available. In case of not useable data, those sections shall be replaced by null values (-999.25).
- The remark section of log plots (raw and processed data) must be checked and all mentioned bad/invalid data be replaced.
- In general, invalid curve readings between two logging runs have to be removed before splicing activities take place.
- Resistivity data in casing is invalid and therefore to be removed.
- Gamma-Ray, neutron and sonic logs in casing responding to the actual formation (beside the casing influence) must be considered for the Standard-Log.
- Handling of Data gaps in curves:
  - Gaps <=1m: interpolation with a straight line.
  - Gaps > 1m: fill with null values (-999.25).

  Interpolated sections must be mentioned in the Info File.
- Unit conversions to be applied as specified in chapter 2.2.1.

2.2.2.4.2. Reference Curves

The choice of the reference curve is somewhat arbitrary but the first choice for Standard-Log generation is the **Gamma Ray log** (GR, in this case GR_STD), as it is the **most common correlation curve**. The second choice (especially for older logs) is the Spontaneous Potential log (SP, in this case SP_STD). The first run in the hole is normally the reference trace. In case of heavy stick and pull conditions, the curve least affected has to be used as the reference trace.

It shall be ensured that in a field/ area of interest **one common reference** is **agreed** on (Wireline or LWD) for the purpose of consistent data comparison, analysis and well correlation!

2.2.2.4.3. Depth Shifting

Following points have to be taken into consideration:

- The first gamma ray run in the hole is used as the reference log. In case of severe stick and pull conditions, the gamma ray least affected has to be selected as reference.
- When several log runs are performed separately in a borehole (e.g. density/neutron, sonic, resistivity) and depth discrepancies occur, it is necessary that the different runs are depth shifted through gamma ray to gamma ray correlations, if available. If a gamma ray curves is not available, the SP curve shall be used as reference. In case gamma ray and SP is not available, the best resistivity curve must be chosen and used as reference.
- Block shifting (linear) and continuous shifting (dynamic) is allowed for the generation of Standard-Logs, but has to be documented in the Info File.
- Shifts shall be made with respect to the reference curve. If a curve requires a shift, all curves recorded on that logging run require the same shift (exceptions are depth shifts due to tool stick and slip). If the same shift is not sufficient due to borehole environment implications, the curves shall be shifted point to point. This point to point shifting must be done by a knowledgeable Petrophysicist.
- Note: Some software packages perform stretch and squeeze automatically using various forms of cross-correlation between the curves. The Company does not accept computer automated shifting without strict user control!
- Tolerance of maximum allowed curve misalignment is equal to, or less than, 0.2 m, along the entire Standard-Log interval.

2.2.2.4.4. Curve Splicing

- The tie in of logging runs shall be done by comparing the gamma ray curve responses in the overlap sections. If necessary, depth shifts have to be applied. In case of wireline logs, the complete run must be shifted (e.g. block shifted). LWD logging has to be handled carefully and block shifting has to be avoided. Point to point shifting shall be applied in the overlap section and sections below (due to compression and stretch in drill-pipe during drilling and trip in, etc.).
- **Merging with missing overlap section:** There is no tie-in or depth shifting for logs without an overlap section.
- **Merging with overlap section:** Logs must be spliced at the deepest possible point (from upper run) in an overlap section (valid for WL and MWD/LWD).
- Merge depths to be selected visually. **Automatic splicing is not accepted!** Each curve must be merged individually. The splice depth shall be selected where two curves show approximately the same value to avoid data jumps and future incorrect interpretations (if possible, in shale sections). It is common to use different merge depths for different curves in the same tool combination since the depth of the first reading is different for each curve.
- **Editing between logging runs:** Merging two open hole logging runs can lead to a gap between two logging runs. In this event the first valid reading of the shallower, and the last reading of the deeper run, shall be identified. Invalid data in the gap have to be removed with null values (-999.25).
- **Petrom Specific (Best Resistivity Curve):**
  - Composite resistivity is called Best Resistivity in Petrom, recognizing that splicing of laterolog, induction and LWD propagation resistivity leads to a result curve that responds differently to anisotropy, relative formation dip, invasion and rock heterogeneity.
  - Splice points have to be considered in Shales.

- A 0.5 meter gap shall be kept between 2 spliced resistivity curves, if different measurement types, to avoid that changes are misinterpreted as lithological change.
- Information about resistivity tool types and log intervals used in generating Best Resistivity must be provided in the Info File.

2.2.2.5. Measurements/ Curve Details

2.2.2.5.1. SP Curves

Following editing shall be applied to Spontaneous Potential curves:

- SP logs have to be shifted to eliminate shifts between logging runs when spliced and to remove mechanical shifts.
- The SP curve must be plotted and normalized to a default scale range -160 to **40mV (OMV), -100 to 0mV (OMVP)** to encompass most of the SP log/s. But note, original mV span shall be maintained at all times!
- SP baseline shifts to be performed by using e.g. the trendline method in order to eliminate mechanical shifts.
- SP curves must be shifted to eliminate the shift between logging runs.

2.2.2.5.2. Acoustic Data

The following editing procedures shall be applied to acoustic curves:

- Vintage acoustic data must be edited for cycle skips and noise. Cycle skips shall only be removed after it was verified that those are not caused by fractures. For this, other log responses must be considered, like density and resistivity log responses.
- In case of the availability of modern digital full wave sonic datasets, data processing/ reprocessing must be considered in case the raw/ processed data quality is not sufficient (e.g. with inhouse available petrophysical software: OMV Techno and OMVP IP).
- Editing (remove/ replace) of all other sonic issues if they are not related to formation responses.
- If processed open hole and cased hole acoustic data are available in addition to raw data (e.g. Best DT processed data), those data have to be considered for the Standard-Log.

2.2.2.5.3. Cased Hole Logs

- Resistivity data in casing are invalid and must always be nulled (-999.25) over the interval.
- GR data must be presented in casing if there is no open hole GR available. This GR shall further be normalized to the open hole GR if possible, to avoid misinterpretations due to casing shoes, casing size changes, multiple casing along borehole sections, etc.
- NEU to be presented in casing if there is no open hole NEU available. Cased hole processed neutron data to be used if available.
- Acoustic logs respond, at times, correctly to the formation through casing. Thus, in this case the recording must be left intact.

2.2.2.6. Log Digitization

- If it is necessary to digitize log curves to be able to generate the Standard-Log, it must be ensured that the digitization data quality is high and follows all minimum requirements

for digitized data, as defined by OMV (see DPR-1380-Log-, Core-/Cutting- and Mudlog Data Archiving).

- All historic data must be considered (hardcopy plots from all relevant archives and digital available data) for the Standard-Log creation process.
- 1:200 scale is the preferred scale for log plot digitization.
- Digitization depth accuracy: 1:200 plots < 20cm, 1:1000 plots < 50cm.
- Preferably raw data or processed data, if the processing steps are known, to be used to ensure that all data manipulation steps done to the data are known and tracked in the Standard-Log Info File.
- The source of the digitized log curve used is to be documented in the Info File by including the BARCODE (Company) for the relevant log plot (scanned hardcopy plot).

2.2.2.7. Vintage Logs

- CE-SP curves were historically used as depth reference (“Standard Tiefe”) in Austria. If GR is also available, a decision must be made by the Petrophysicist which curve is best to be used as the depth reference.
- Gamma ray curves acquired in uR/h or counts per second (cps) are included as such and converted to gAPI. Conversion shall be done, if necessary information is available, depending on tool type for each interval. When conversion to other unit is performed, applied formula is mentioned in the Info File.
- Neutron curves acquired in counts per second (cps) or API are included in the Standard-Log as such and in addition must be converted to a porosity unit (m3/m3). Conversion shall be done depending on tool type (with relevant tool specific conversion charts/ algorithms) for each interval and afterwards spliced. Conversion formulas to be mentioned in the Standard-Log Info File. As the conversion of neutron data is not always straight forward, the following items (if available) have to be considered to verify that the conversion process is valid:
  - Core data (clean matrix)
  - Marker horizon(s)/ layer(s)
  - Comparable formations (similar properties) from neighbor wells with modern measurements.
- As most tools were logged as a separate logging run it has to be ensured that all data are on depth with the defined reference log.
- Neutron measurements, acquired during the lifetime of a field, do not necessarily reflect the initial reservoir conditions (due to fluid level changes during production) and therefore must be used with caution
- Laterolog resistivity must be used in hydrocarbon bearing zones, if available. CE and other resistivity measurements (e.g. Short Normal, Long Normal and Lateral) shall be used only as last choice due to measurement response.

Digitization and Standard-Log generation shall be linked via back loops to ensure best quality Standard-Log output.

2.2.3. Standard-Log Deliverables

2.2.3.1. Standard-Log dataset

The Standard-Log dataset shall consist of following components:

- Info file: .XLS or .DOC or .PDF document

- Data file: .LAS (version LAS 2.0)
- Plot file: .PDF format, scale 1:1000 and 1:200

In the event that one or more components is/are missing, the dataset shall not be qualified as a Standard-Log, and therefore must be downgraded to a Composite-Log.

2.2.3.2. File Naming Conventions

Following file naming conventions have to be used:

Info file:

XXXX[BOREHOLE ABBREV.]_PETRO-STD_XXX[WLC;MWD;LWD;MIX]_INF_#.DOC (or .XLS or .PDF)

Example: STBG-22_PETRO-STD_WLC_INF_1.doc

Data file:

XXXX[BOREHOLE ABBREV.]_PETRO-STD_XXX[WLC;MWDLWDMIX]_#.LAS (version LAS 2.0)

Example: STBG-22_PETRO-STD_WLC_1.las

Plot file:

XXX[BOREHOLEABBREV.]_PETRO-STD_XXX[WLC;MWD;LWD;MIX]_PLOT_XXX[STD]_SCXXX[1000;200]_#.PDF

Example: STBG-22_PETRO-STD_WLC_PLOT_STD_SC1000_1.pdf

STBG-22_PETRO-STD_WLC_PLOT_STD_SC200_1.pdf

Explanations:

- **[Borehole Name Abbrev.]:** Borehole name abbreviation (based on CWDB (OMV), MDS (OMVP), space/s to be replaced with dash! The full borehole name shall be used in case a borehole name abbreviation is not available (e.g. OMVP).
- **[PETRO-STD]:** Standard-Log is created or verified by Company Petrophysicist.
- **[WLC; MWD; LWD; MIX]:**
  - WLC: Wireline Conveyed
  - MWD: Measure While Drilling
  - LWD: Logging While Drilling
  - MIX: mixture of different services (e.g. Wireline and LWD)
- **[STD]:** The plot is presented in standard depth (STD).
- **[1000; 200]:** Scaling of the plot, e.g. 1:1000 or 1:200.
- **#:** Version number

2.2.3.3. Info file

The entire workflow is documented in the Standard-Log info file (see Annex A: Standard-Log Info File Template and Annex B: Standard-Log Info File Example). Relevant details regarding raw data, applied data processing steps, data editing, etc. shall be registered and documented.

The Info file consists of the following sections:

- Basic well information: It has to be ensured that all stated borehole header information is aligned with CWDB (OMV) and MDS (OMVP).
- Logging summary: Provides an overview of all log runs which have been performed in the well by the date of the Standard-Log creation.
- Mud info: Available mud information is stated for each logging run.
- Quality comments: Anomalies, missing data, poor quality sections, tool problems, environmental effects on data quality, etc. Remarks and log comments from both digital file(s) and log plot (s) including editing, correction details and other cleaning details are considered.
- Editing details: data manipulation, data processing details, etc.
- Renaming: Curve renaming details to be included.
- Depth shifting: Information about the depth reference and relevant depth shifts including depth shifting method(s). Tie in and merging details are documented.
- Curve Summary: Original curve names, sources of raw/ processed data and splicing depths for the different curves are documented.
- Plot information: Software used for the plot generation and TVD calculation method is stated.
- Completed: Standard-Log creation date, company (in case of external service provider) and name of creator. Standard-Log Procedures version used for the Standard-Log generation.
- Attachments: relevant screen shots are included in case it is necessary to explain additional details.

2.2.3.4. Plot File

Each Standard-Log dataset shall include Standard-Log plot files, Scale 1:200 and 1:1000. (see Annex C: Standard-Log Plot Example Scale 1:200 and Annex D: Standard-Log Plot Example Scale 1:1000).

The Standard-Log plot file consists of following sections:

- Plot Header
- Curve Section
- Footer

2.2.3.4.1. Plot Header

- Main Header: including borehole relevant information based on CWDB (OMV) and MDS (OMVP).
- File name information section: files created for the Standard-Log dataset.
- Details about Standard-Log creation location and name of creator.

- Remarks section: includes the most important data and relevant information that explains possible artifacts to avoid misinterpretation of the data e.g. casing shoe driller and logger, data logged in casing, etc. (see figure 1 and figure 2 for a header example).

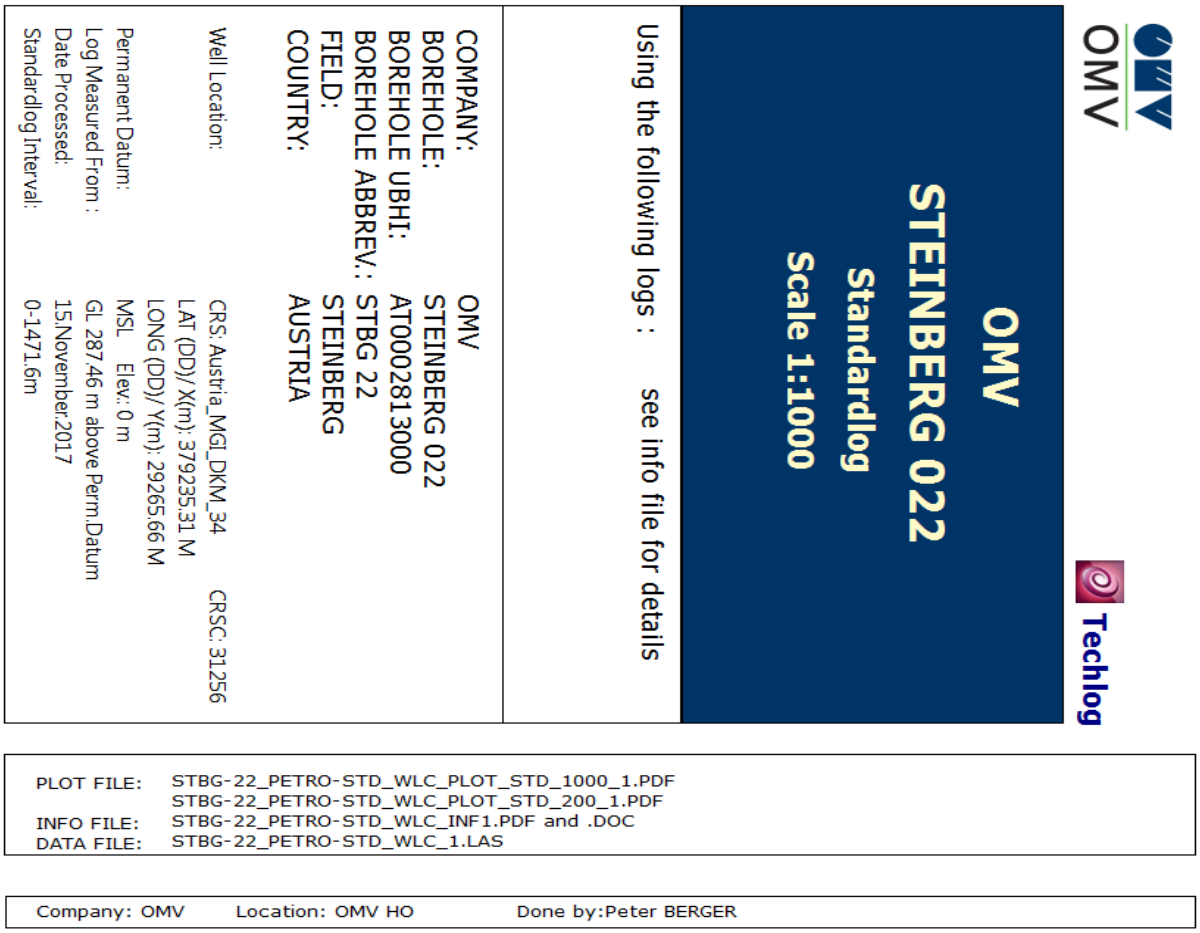

Figure 1: Standard-Log header (example: STBG 22)

REMARKS:

- DF Eleveation: 291.26m; GL Elevation: 287.45m
- The Wireline logging was performed by OMV and Schlumberger
- Casing shoe (driller depth): 18-5/8"@4.5m; 13-3/8"@103.7m; 9-5/8"@468m; 7"@1197m
- Casing shoe (logger): 18-5/8"@4.5m; 13-3/8"@104m; 9-5/8"@468m; 7"@1197m
- Gamma ray w as logged in casing: 88-104m (no normalization performed); 455.6-468.3m (normalized to open hole)
- Neutron w as logged in casing: 433-470m interval
- Raw data delivered by Schlumberger w ere renamed to OMV Standardlog curve naming standard
- TVD data have been calculated w ith the minimum curvature method in Techlog 2015.2
- Bad data in casing have been removed. Data till first reading are removed. Measurement artifacts below casing are removed
- All data have been depth correlated to the DIL-SFL-GR-SP log recorded on 3-Oct-1989

CURVE INFO:

GR_STD	STANDARDLOG GAMMA RAY
BS_STD	STANDARDLOG BIT SIZE
CALI_STD	STANDARDLOG CALIPER
SP_STD	STANDARDLOG SPONTANEOUS POTENTIAL
RXO_STD	STANDARDLOG RESISTIVITY MICRO
RS_STD	STANDARDLOG RESISTIVITY SHALLOW
RM_STD	STANDARDLOG RESISTIVITY MEDIUM
RD_STD	STANDARDLOG RESISTIVITY DEEP
RHO_STD	STANDRADLOG FORMATION DENSITY
DRHO_STD	STANDARDLOG FORMATION DENSITY CORRECTION
PEF_STD	STANDARDLOG PHOTOELECTRIC FACTOR
NEU_STD	STANDARDLOG NEUTRON POROSITY
DT_STD	STANDARDLOG ACOUSTIC SLOWNESS COMPRESSIONAL
DTS_STD	STANDARDLOG ACOUSTIC SLOWNESS SHEAR
DTST_STD	STANDARDLOG ACOUSTIC SLOWNESS STONELY
VELC_STD	STANDARDLOG ACOUSTIC VELOCITY COMPRESSIONAL
VELS_STD	STANDARDLOG ACOUSTIC VELOCITY SHEAR
POTA_STD	STANDARDLOG POTASSIUM
THOR_STD	STANDARDLOG THORIUM
URAN_STD	STANDARDLOG URANIUM
Vintage Logs: (in addition)	
MINV_STD	STANDARDLOG RESISTIVITY MICRO INVERSE
MNOR_STD	STANDARDLOG RESISTIVITY MICRO NORMALE
GR_URH_STD	STANDARDLOG GAMMA RAY MICRO ROENTGEN PER HOUR (curve in addition to GR_STD)
GR_CPS_STD	STANDARDLOG GAMMA RAY COUNT RATE PER SECOND (curve in addition to GR_STD)
NEU_API_STD	STANDARDLOG NEUTRON COUNTS IN API (curve in addition to NEU_STD)
NEU_CPS_STD	STANDARDLOG NEUTRON COUNTS IN CPS (curve in addition to NEU_STD)

(More curve information > Standardlog info file)

Figure 2: Standard-Log header remark section (example: STBG 22)

2.2.3.4.2. Curve Section

Curve naming conventions, units, color code and line style shall be followed, as explained in chapter 2.2.1. Order of tracks and curves included in tracks shall be followed, as specified in **figure 3** and **4**.

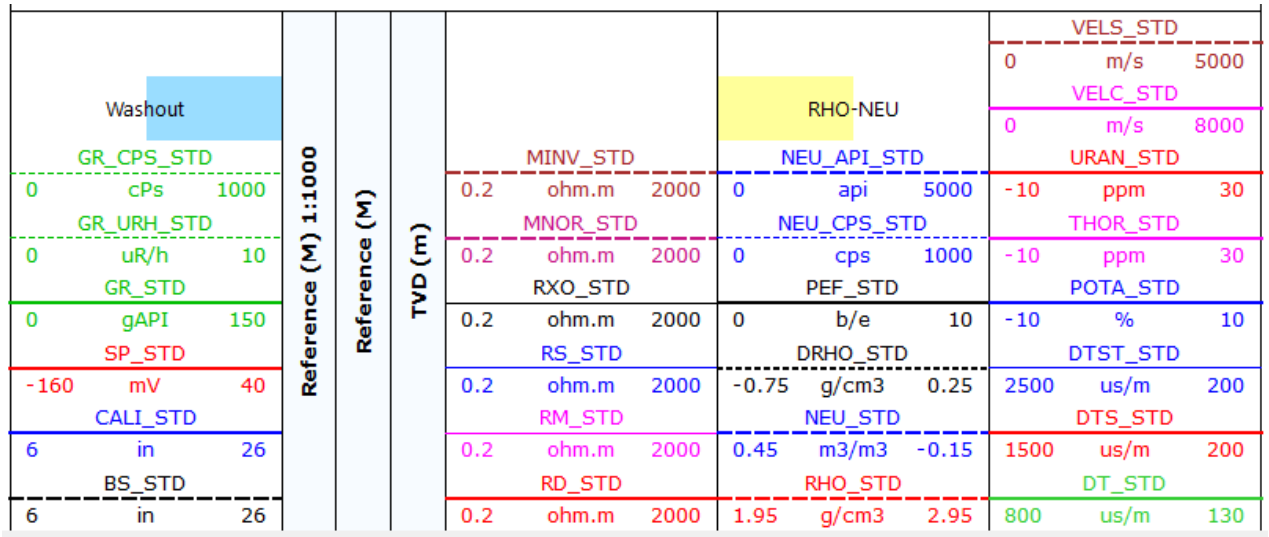

Figure 3: Standard-Log curve section, AT wells

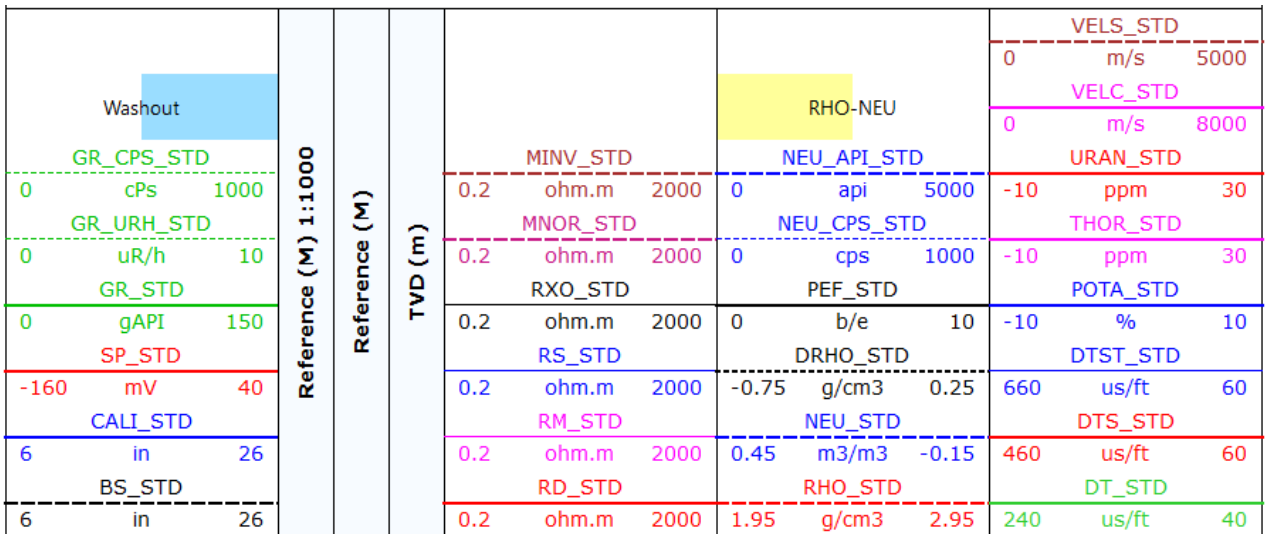

Figure 3: Standard-Log curve section, International wells

2.2.3.4.3. Footer

Standard-Log footer, as shown in figure 5 below is attached at the plot bottom.

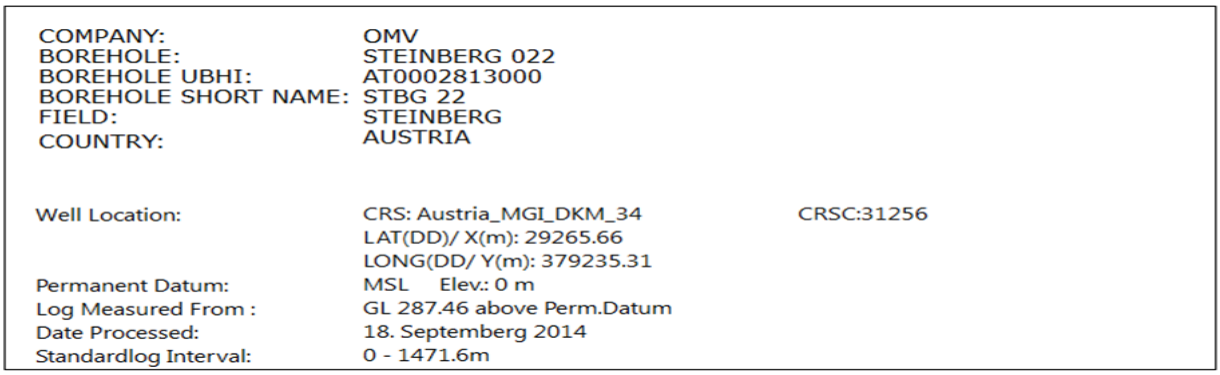

Figure 4: Standard-Log Footer (example STBG 22)

2.2.3.4.4. Standard-Log Plot properties

- Plot file format is PDF.
- Plot is on Scale (original size!).
- Plot is continuous (.pdf). No page breaks!

See chapter 2.2.3.6 for Techlog relevant details.

2.2.3.5. Digital Data File

2.2.3.5.1. File Format

The LAS file shall meet the following minimum requirements:

- LAS 2.0 format is used.
- All Standard-Log curves to be included as defined.
- File and curve naming conventions are followed.
- The LAS header includes all specified attributes as defined under section 2.4.5.2. Empty or not defined attributes are not included. LAS start and stop depth shall begin and end when at least one curve contains valid data (intervals including only null values for all curves above the first and below the last valid measurement must be removed).
- Lines with no content in the las header start with **#**.
- LAS follows the international LAS format standard and includes:
  - Version Information Block
  - Well Information Block (includes only borehole relevant attributes and in addition STRT, STOP, STEP and NULL. **table 3**: grey highlighted attributes (step increment and missing value): standard values.
  - Parameter Information Block (covers only log relevant attributes). **table 4**: Light blue highlighted attributes: Techlog relevant; blue highlighted: WLMS relevant; others are general attributes.
  - Curve Information Block (including curve information and relevant remarks)

2.2.3.5.2. File Header Information

Attribute.Unit	Description	Source	CWDB Source Attribute	Remark	Example
STRT.M	FIRST REFERNCE VALUE			Auto	0
STOP.M	LAST REFERNCE VALUE			Auto	1471.5744
STEP.M	STEP INCREMENT			Standard	0.1524
NULL.	MISSING VALUE			Standard	-999.25
WELL.	WELL NAME	CWDB/MDS	Borehole Name		STEINBERG 022
FLD.	GENERAL FIELD NAME	CWDB/MDS	General Field Name		STEINBERG
UBHI.	UNIQUE BOREHOLE IDENTIFIER	CWDB/MDS	UBHI		AT0002813000
UWI.	UNIQUE WELL IDENTIFIER	CWDB/MDS	UWI		AT00028130
CTRY.	COUNTRY	CWDB/MDS	Country		AUSTRIA
OPER.	OPERATOR	CWDB/MDS	Operator		OMV AG
COMP.	COMPANY	CWDB/MDS	Data Source		OMV
SRVC.	SERVICE COMPANY	Service Provider			HOL

DATE.	DATE OF SERVICE	Service Provider		YYYY-MM-DD	07-03-2017
SHWN.	SHORT WELL NAME	CWDB/MDS	Borehole Abbr		STBG 22
CRS.	ORIGINAL COORD SYSTEM NAME	CWDB/MDS	Original Coord System Name		Austria_MGI_DKM_34
CRSC.	ORIGINAL COORD SYSTEM CODE	CWDB/MDS	Original CRS		31256
LATI.DD	ORIGINAL LATITUDE	CWDB/MDS	Original Lat North	*	
LONG.DD	ORIGINAL LONGITUDE	CWDB/MDS	Original Long East	*	
X.M	ORIGINAL NORTHING	CWDB/MDS	Original Lat North	*	379235.31
Y.M	ORIGINAL EASTING	CWDB/MDS	Original Long East	*	29265.66

**Shall reflect Geodetic Coordinate System Information: To be filled in depending if the Geographic Coordinate system (ORIGINAL LATITUDE and ORIGINAL LONGITUDE) or the Projected System (ORIGINAL NORTHING and ORIGINAL EASTING) is stated in the CWDB.*

Table 3: Standard-Log Well Information section

Attribute.Unit	Description	Source	Remark	Example
HIDE.	LOG SERVICE NAME		Standard	PETRO-STD
RUN.	RUN NUMBER		MIX: in case of multiple runs	MIX
BS.IN	BIT SIZE		MIX: in case of multiple bit sizes	MIX
PDAT.	LOCAL PERMANENT DATUM	Log Info		MSL
LMF.	LOG MEASURED FROM	Log Info		GL
APD.M	ELEVATION OF DEPTH REFERENCE (LMF) ABOVE PERMANENT DATUM	Log Info		287.46
EPD.M	ELEVATION OF PERMANENT DATUM (PDAT) ABOVE MEAN SEA LEVEL	Log Info		0
EKB.M	ELEVATION OF KELLY BUSHING ABOVE PERMANENT DATUM	Log Info		-999.25
EDF.M	ELEVATION OF DRILL FLOOR ABOVE PERMANENT DATUM	Log Info		-999.25
ERT.M	ELEVATION ROTARY TABLE ABOVE PERMANENT DATUM	Log Info		-999.25
EGL.M	ELEVATION OF GROUND LEVEL ABOVE PERMANENT DATUM	Log Info		287.46
SET.	TECHLOG DATASET NAME		Standard	PETRO-STD
group.	TECHLOG GROUP		Standard	COMPOSITE
TYPE.	TYPE		Standard	PROCESSED
SERV.	SERVICE		Standard	MERGED-HOLE
ACTI.	ACTIVITY		Standard	COMPOSITE
CATE.	CATEGORY		Standard	STANDARDLOG
CLAS.	CLASSIFICATION		Standard	DIGITAL
AQSO.	ACQUISITION SOFTWARE		Application Name	TECHLOG
RTYP.	RUN TYPE		Standard	FINAL-OUTPUT
PLSC	PLOT SCALE		Standard	NA
DREF.	DEPTH REFERNCE		Standard	STD

Table 4: Standard-Log Las Header Information section

2.2.3.6. Techlog Specifics/ Deliverables

If the Standard-Log is created in Techlog, a cleaned Techlog project is part of the delivery. In addition to the digital Standard-Log dataset (same content as digital las file), the plot layout and

layout header (both are borehole specific) must be available in the Techlog environment (TL Working Reference Project or Studio) to ensure efficient adaption of updates at a later point in time.

Standard Techlog naming conventions are applied as following **(see figure 6):**

Standard-Log Dataset name: → PETRO-STD

Grouping: → COMPOSITE

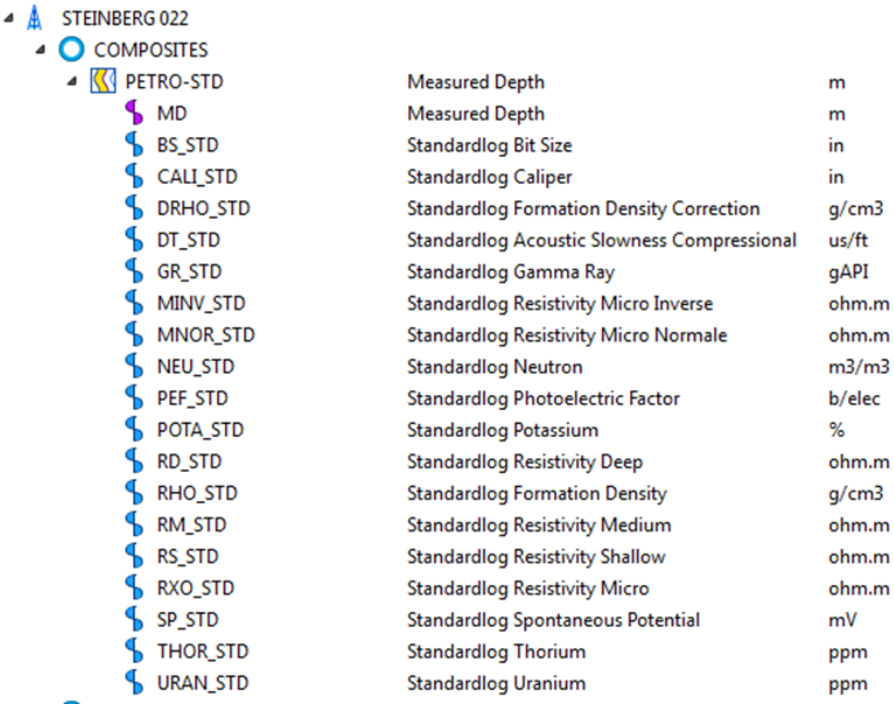

Figure 5: Techlog Grouping and Naming conventions for Standard-Log datasets (example STBG 022).

Templates:

Following Techlog templates are used for the Standard-Log creation (see figure 7):

TL Company folder:

Austrian boreholes: → OMV_PETRO-STD_AT

International boreholes: → OMV_PETRO-STD_INT

Layout:

For each Standard-Log created in Techlog (each borehole), a layout has to be available under:

TL Project folder:

XXXX[Borehole Abbrev]_OMV_PETRO-STD-PLOT

Example: STBG-22_OMV_PETRO-STD-PLOT

The layout has to consist of the Standard-Log header, footer and curve section:

XXXX[Borehole Abbrev]_OMV_HEADER_PETRO-STD_9in

XXXX[Borehole Abbrev]_OMV_FOOTER_PETRO-STD_9in

Example: STBG-22_OMV_HEADER_PETRO-STD_9in

STBG-22_OMV_FOOTER_PETRO-STD_9in

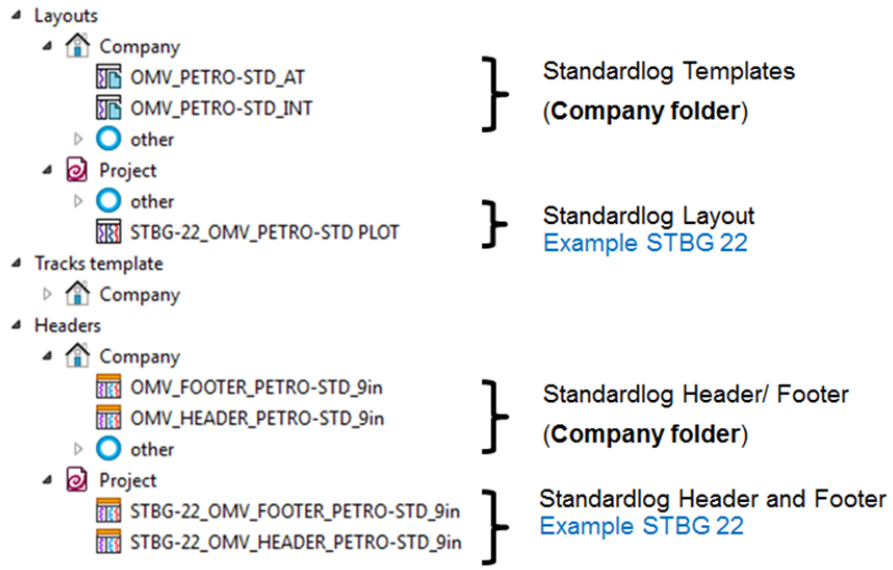

Figure 6: Techlog Template/ Layout naming conventions for Standard-Log datasets (example STBG 022).

2.2.4. Standard-Log Provider (internal, external)

A Standard-Log is created internally by a Company Petrophysicists or externally via service providers depending on resource availability.

2.2.4.1. Company Internal

Standard-Logs generated Company internally shall be verified by a Senior Petrophysicist before the final product is archived in WLMS and transferred into the relevant working databases. **No exceptions!** If this is not done, the dataset must be categorized as Composite-Log.

2.2.4.2. External Service Provider

External Standard-Log service providers shall follow the procedures as described here. An experienced Petrophysicist, from the service provider, verifies the Standard-Log creation process and that correct curves were chosen, considering all data available for a borehole. If the service provider uses Techlog for the Standard-Log creation process the following items must be considered.

Pre-requisites:

Items to be provided in advance to the external service providers for their work:

- CWDB well header extract as described in Annex M.
- Standard-Log Procedures, templates and examples (latest available version in REAL).
- Well Deviation surveys: final based on CWDB (OMV) and MDS (OMVP)
- Formation tops (corporate)

If the Standard-Log is created for historical boreholes including data digitization, relevant Company log/curve naming standards have to be followed as defined in: see DPR-1380-Log-, Core-/Cutting- and Mudlog Data Archiving.

When the service company is using Techlog, following information has to be provided in addition (Techlog project):

- Well header information (based on CWDB*)
- Corporate formation tops (based on CWDB*)
- Well deviation survey (based on CWDB*)
- Standard-Log template extract from Techlog Company folder:

Header: → OMV_HEADER_PETRO-STD_9in

Footer: → OMV_FOOTER_PETRO-STD_9in

Layout template: → OMV_PETRO-STD_AT (Austrian wells) or
OMV_PETRO-STD_INT (International wells)

*If not available in the CWDB, relevant verified information shall be provided from other sources.

Deliverables:
In addition to the Standard-Log deliverables (chapter 2.2.3), the service provider delivers a clean Techlog project including the final Standard-Log(s) (if the service provider uses Techlog!). Techlog naming conventions shall be followed (chapter 2.2.3.6).

OMV QC:

All Standard-Logs created by external Service Providers must be QCd by the responsible Company Senior Petrophysicist or Expert Petrophysicist! This is to verify that the Standard-Log completeness and quality is in alignment with the Standard-Log procedures. The final, complete, delivery package for each borehole shall be sent to the Company immediately after completion of the work.

2.2.5. Standard-Log Archiving

All Standard-Logs (created internally and externally) are archived in the relevant corporate system: **WLMS.** In addition, the latest version of Standard-Log must be available in the main working database environments:

- **OMV:** Petrel and Techlog environment (e.g. relevant Studio environments).
- **OMVP:** IP, Petrel, Open Works (Exploration).

2.2.5.1. WLMS

WLMS is the corporate storage archive for Standard-Logs. When a Standard-Log is uploaded to WLMS (via WLMS data drop site), after selecting the correct well/borehole (based on CWDB/ MDS), following mandatory attributes have to be populated (valid for all Standard-Logs):

ATTRIBUTE	STANDARD-LOG: PLOTS/ DIGITAL FILE/ INFO FILE (EXAMPLE)	General INFO/ Description
UBHI	AT0002813000	UBHI based on CWDB (correct borehole selected during the uploading process)
BOREHOLE NAME	STEINBERG 022	Borehole name based on the CWDB
TYPE	PROCESSED	spliced, merged, edited data
SERVICE	MERGED-HOLE	open hole/ cased hole/ multiple borehole intervals
ACTIVITY	COMPOSITE	

CATEGORY	STANDARDLOG	
NAME	PETRO-STD-PLOT PETRO-STD-REPORT PETRO-STD	Name for Standard-Log plots Name for Standard-Log Info files Name for Standard-Log digital las file
RUN NUMBER	MIX	combination of several runs
CLASSIFICATION	PLOT DIGITAL REPORT	Standard-Log Plot files Standard-Log digital las file Standard-Log Info files
PLOT SCALE	1:1000 or 1:200	only valid for plot files; reports and digital file: NA
DEPTH REFERENCE	STD	Standard depth
BIT SIZE	MIX	several bit sizes
APPLICATION NAME	TECHLOG	Techlog for OMV w/o OMVP; for external STD it depends on Software package used for the STD generation.
RUN TYPE	FINAL-OUTPUT	Final Product at the time of generation
SOURCE	OMV	Data source/ Operator during STD generation
SERVICE CONTRACTOR	OMV	OMV in case it was generated in-house
REMARKS		
TOP DEPTH	0	top reading of highest curve
BOTTOM DEPTH	1471.6	bottom reading of the deepest curve
LOGGING DATE	07.03.2017	Standard-Log creation date
BAR CODE	NA	only relevant for digitized Standard-Logs
STORAGE LOCATION	NA	only relevant for digitized Standard-Logs
STORAGE LOCATION INFO	NA	only relevant for digitized Standard-Logs
Temp. Dataset Number*	STBG-22_1	only temp. ID to link data belonging to a dataset in **case of bulk uploads**. WLMS creates an unique ID during upload for each dataset.
Quality Index	HIGH	high Business value dataset Bottom of Form

**Note: The WLMS temporary dataset ID is only used during the bulk uploading process to link data belonging to the Standard-Log dataset. The WLMS is populating a unique dataset ID during the dataset processing step.*

Table 4: WLMS Standard-Log Classification

2.2.5.2. Application environment

All generated Standard-Log digital data (.las) shall be available in the key working databases:

OMV: Petrel and Techlog environment (e.g. Studio), considers also updates.

Note: Global Techlog dictionaries and Petrel global templates are adjusted to Standard-Log standards and with that no implications are expected for the data transfer between the database and applications, assumed that the procedure mentioned above was followed.

OMVP: IP, Petrel, Open Works (Exploration), considers also updates.

2.3. Composite-Log Standards

2.3.1. Curve Standards

The Composite-Log for OMV includes curves as mentioned in table 6, for OMVP as in table 7, provided that relevant measurements are existing in the borehole. Curve naming conventions and unit specifications to be followed exactly as described.

Curve Mnemonic / Output Name	Color	Scale	Line style	Techlog Unit	Petrel Unit	Description
Primary Curves						
BS_CMP	RGB: 0, 0, 0	6 to 26	dash	in	in	COMPOSITE-LOG BIT SIZE
CALI_CMP	RGB: 0, 0, 255	6 to 26	solid	in	in	COMPOSITE-LOG CALIPER
DT_CMP*	RGB: 50, 205, 50	240-40 or 800-130	solid	µs/ft or µs/m*	µs/ft or µs/m*	COMPOSITE-LOG ACOUSTIC SLOWNESS COMPRESSIONAL
GR_CMP	RGB: 0, 190, 0	0 to 150	solid	gAPI	gAPI	COMPOSITE-LOG GAMMA RAY
NEU_CMP	RGB: 0, 0, 255	0.45 to -0.15	dash	m3/m3	m3/m3	COMPOSITE-LOG NEUTRON POROSITY
PEF_CMP	RGB: 165, 42, 42	0 to 10	solid	b/e	dimensionless	COMPOSITE-LOG PHOTOELECTRIC FACTOR
RD_CMP	RGB: 255, 0, 0	0.2 to 2000	solid	ohm.m	ohm.m	COMPOSITE-LOG RESISTIVITY DEEP
RHO_CMP	RGB: 255, 0, 0	1.95 to 2.95	dash	g/cm3	g/cm3	COMPOSITE-LOG FORMATION DENSITY
RM_CMP	RGB: 255, 0, 255	0.2 to 2000	solid	ohm.m	ohm.m	COMPOSITE-LOG RESISTIVITY MEDIUM
RS_CMP	RGB: 0, 0, 255	0.2 to 2000	solid	ohm.m	ohm.m	COMPOSITE-LOG RESITIVITY SHALLOW
RXO_CMP	RGB: 0, 0, 0	0.2 to 2000	solid	ohm.m	ohm.m	COMPOSITE-LOG RESISTIVITY MICRO
SP_CMP	RGB: 255, 0, 0	-160 to 40	solid	mV	mV	COMPOSITE-LOG SPONTANEOUS POTENTIAL
TVD_CMP	RGB: 0, 190, 0			m	m	COMPOSITE-LOG TRUE VERTICAL DEPTH
TVDSS_CMP	RGB: 0, 0, 255			m	m	COMPOSITE-LOG TRUE VERTICAL DEPTH SUBSEA
Secondary Curves						
DRHO_CMP	RGB: 0, 0, 0	-0.75 to 0.25	dot	g/cm3	g/cm3	COMPOSITE-LOG FORMATION DENSITY CORRECTION
DTS_CMP*	RGB: 255, 0, 0	460-60 or 1500-200	solid	µs/ft or µs/m*	µs/ft or µs/m*	COMPOSITE-LOG ACOUSTIC SLOWNESS SHEAR
DTST_CMP*	RGB: 0, 0, 255		solid	µs/ft or µs/m*	µs/ft or µs/m*	COMPOSITE-LOG ACOUSTIC SLOWNESS STONELY
POTA_CMP	RGB: 0, 0, 255	-10 to 10	solid	%	%	COMPOSITE-LOG POTASSIUM
THOR_CMP	RGB: 255, 0, 255	-10 to 30	solid	ppm	ppm	COMPOSITE-LOG THORIUM
URAN_CMP	RGB: 255, 0, 0	-10 to 30	solid	ppm	ppm	COMPOSITE-LOG URANIUM
VELC_CMP	RGB: 255, 0, 255	0 to 8000	solid	m/s	m/s	COMPOSITE-LOG VELOCITY COMPRESSIONAL
VELS_CMP	RGB: 165, 42, 42	0 to 5000	dash	m/s	m/s	COMPOSITE-LOG VELOCITY SHEAR
Secondary Curves Optional						

Curve Mnemonic / Output Name	Color	Scale	Line style	Techlog Unit	Petrel Unit	Description
ROP_CMP	RGB: 255, 0, 0	100 to 0	solid	m/hr or ft/hr	m/hr or ft/hr	COMPOSITE-LOG RATE OF PENETARTION
Vintage Logs (in addition)						
GR_UR/H_CMP GR_CPS_CMP GR_RADT_CMP	RGB: 0, 190, 0	0 to 10 or 0 to 1000 or 0 to 10	dash	uR/h or cps or unitless	dimensionless	COMPOSITE-LOG GAMMA RAY MICRO ROENTGEN PER HOUR or COMPOSITE-LOG GAMMA RAY COUNT RATE PER SECOND or COMPOSITE-LOG GAMMA RAY MIRCOGRAM RADIUM EQUIVALENT PER TON
MINV_CMP	RGB: 165, 42, 42	0.2 to 2000	solid	ohm.m	ohm.m	COMPOSITE-LOG RESISTIVITY MICRO INVERSE
MNOR_CMP	RGB: 128, 0, 128	0.2 to 2000	dash	ohm.m	ohm.m	COMPOSITE-LOG RESISTIVITY MICRO NORMALE
NEU_API_CMP NEU_CPS_CMP	RGB: 0, 0, 255	0 to 5000 or 0 to 1000	long dash	api or cps		COMPOSITE-LOG NEUTRON IN API or COMPOSITE-LOG NEUTRON COUNT RATE PER SECOND

** Austrian wells in µs/m; International wells in µs/ft*

Table 6: OMV Composite-Log curve naming conventions and unit specification

Curve Mnemonic / Output Name	Color	Scale	Line style	IP/ Techlog Unit	Petrel Unit	Description
Primary Curves						
BS_CMP	RGB: 0, 0, 0	6 to 26	dash	in	in	COMPOSITE-LOG BIT SIZE
CALI_CMP	RGB: 0, 0, 255	6 to 26	solid	in	in	COMPOSITE-LOG CALIPER
DT_CMP	RGB: 50, 205, 50	240-40	solid	µs/ft	µs/ft	COMPOSITE-LOG ACOUSTIC SLOWNESS COMPRESSIONAL
GR_CMP	RGB: 0, 190, 0	0 to 150	solid	gAPI	gAPI	COMPOSITE-LOG GAMMA RAY
RES_CMP	RGB: 255, 0, 0	0.2 to 2000	solid	ohm.m	ohm.m	COMPOSITE-LOG RESISTIVITY BEST
RHO_CMP	RGB: 255, 0, 0	1.95 to 2.95	dash	g/cm3	g/cm3	COMPOSITE-LOG FORMATION DENSITY
SP_CMP	RGB: 255, 0, 0	-100 to 0	solid	mV	mV	COMPOSITE-LOG SPONTANEOUS POTENTIAL
TVD_CMP	RGB: 0, 190, 0			m	m	COMPOSITE-LOG TRUE VERTICAL DEPTH
TVDSS_CMP	RGB: 0, 0, 255			m	m	COMPOSITE-LOG TRUE VERTICAL DEPTH SUBSEA

Table 7: OMVP Composite-Log specific curve naming conventions and unit specification

2.3.2. Composite-Log Creation Details

2.3.2.1. Quality

The Composite-Log creation shall be performed following basic petrophysical principles as described in the following chapters. For each primary measurement, the best curve version over a given depth interval is selected. The presented data is depth shifted where deemed necessary and merged (editing degree depends on possibility of automatization!). MWD/LWD data is typically spliced with the wireline data to give full data coverage.

Composite-Logs are to be created for every wellbore including sidetracks (for each borehole a separate Composite-Log to be generated), if a Standard-Log is not available!

2.3.2.2. General

- The dataset must cover the interval from Total Depth (TD) to the surface for each borehole, dependent on data availability and quality.
- Data is cleaned up during the Composite-Log creation process.
- Spliced curve mnemonics to be renamed to meet Company Composite-Log curve naming conventions as explained in chapter 2.3.1.
- Curve output sampling rate: 0.1524m or 0.1m depending on the service company/ data sampling rate. Sampling rate shall be fixed within a well in order not to lose data resolution.
- The best "common" resolution must be used (That means if there is a mix of ft and m logs, 0.05m shall be taken as a resolution, as 1/3 of half a foot is 0.058m)
- Depth units in m or ft, depending on country unit standards normally used.
- Absent (or Null values) values: -999.25.
- All curves are presented with correct/ defined units.
- Composite-Log curves have to be on depth within the absolute depth (Logger depth is the main reference. If missing, the drillers depth shall be used as alternative reference.) tolerances: max. 2m!
- All digitally available data in WLMS to be considered for the Composite-Log generation.
- If additional data becomes available at a later date, the Composite-Log shall be updated based on request.
- Mandatory only if well deviation survey data are available:
  - Final well deviation survey/ well path to be extracted and used from CWDB (OMV) and MDS (OMVP)
  - TVD and TVDSS are calculated with the minimum curvature method, if well deviation data are available. Trend to be continued after the last valid point to borehole TD.
  - Next to the MD depth track, True Vertical Depth (TVD) and True Vertical Depth Sub Sea (TVDSS) are presented

2.3.2.3. Data to be considered

The source of all used data to generate the Composite-Log shall be WLMS, the global leading system for storing Log data!

Raw and processed data as follows to be considered for the Composite-Log generation process, if available. Documentation about the processing steps must be available. Data to be used in following order (decreasing significance):

- Open hole Wireline data (FINAL data deliverables preferred)
- Open hole Wireline data (Field data deliverables)
- RM (Recorded mode) open hole MWD/LWD data (Memory data preferred)
- Cased hole Wireline data (FINAL data deliverables preferred)
- Cased hole Wireline data (Field data deliverables)
- RM cased hole MWD/LWD data (Memory data preferred)
- RT (Realtime) mode open hole MWD/LWD data
- RT mode cased hole MWD/LWD data
- Digitized Data if available or digitization was requested
- Other digitally available data

Note: If data digitization is required the defined digitization process and all related standards need to be followed, see DPR-1380-Log-, Core-/Cutting- and Mudlog Data Archiving.

The usage of data with unknown origin and without documentation about data editing shall be avoided and only considered in case no other source of information or data is available.

2.3.2.4. Data editing/ manipulation details

2.3.2.4.1. General Curve Selection and Data Editing

- General:
  - Artefacts leading to misinterpretations shall be removed or recorded in the Info File, if not possible.
  - All data editing are reported in the Info File.
  - Final deliverables from service providers are the basis for the Composite-Log. Only in case of unavailability, field data or other deliverables are allowed to be used
  - Raw data are preferred to processed or edited data.
  - Wells consisting of multiple boreholes: Data from the main borehole (e.g. UBHI: ATXXXXXXXX00) shall be used until the Kick Off Point (KOP) point. Starting from the KOP (e.g. UBHI: ATXXXXXXXX01, etc.) and below, data from the relevant borehole shall be used to ensure best data coverage for each borehole. Documentation in the Composite-Log Info File has to be adjusted accordingly.
- Data editing:
  - Constant values at the top and bottom on Composite-Log curves to be removed.
  - Invalid curve readings between two logging runs shall be removed before splicing activities take place.
  - Gamma-Ray, neutron and sonic logs in casing correctly responding to the formation (in case environmental parameters are properly set up during the log data acquisition phase by the logging engineer) must be considered for the Composite-Log.
  - Data Gaps > 1m have to be filled with null values (-999.25).
  - Unit conversions to be applied as specified in chapter 2.3.1.
  - Optional automatized data editing:
    - Data before tool ”Pick-up” shall be removed. If the "Pick-up" depth is unknown, data shall be included Care must be taken to ensure the best assessment of valid formation data.
    - Relevant data normalization (e.g. bring cased hole logs to open hole logs level, normalization to open hole key wells) has to be applied to the data and properly documented. Geological aspects (e.g. formation tops, etc.) shall be considered.
    - Curve data recorded in casing shall be removed but valid formation data shall be maintained (e.g. GR or neutron measurements in casing, see above). Valid data in casing shall be kept if it is the best version available.
    - Resistivity data in casing is invalid and therefore to be removed.

2.3.2.4.2. Reference Curves

The first choice for selecting the reference curve for the Composite-Log generation is the Gamma Ray log (GR, in this case GR_CMP), as it is the most common correlation curve. The second choice (especially for older logs) is the Spontaneous Potential log (SP, in this case SP_CMP). The first

run in the hole is normally the reference trace. In case of heavy stick and pull conditions, the curve least affected shall be used as the reference trace.

It must be ensured that in a field/ area of interest one common reference is agreed (Wireline or LWD) for the purpose of consistent data comparison, analysis and well correlation! Generally speaking, in historic wells, wireline is preferred over LWD unless there is a severe stick/slip issue with Wireline data.

2.3.2.4.3. Depth Shifting

Following points must be taken into consideration:

- The first gamma ray run in the hole is used as the reference log. In case of severe stick and pull conditions or missing data, the gamma ray least affected or available has to be selected as reference.
- When several log runs are performed separately in a borehole (e.g. density/neutron, sonic, resistivity) and depth discrepancies occur, it is necessary that the different runs are depth shifted through gamma ray to gamma ray correlations, if available. If not any other reference curve correlations (e.g. SP) are supposed to be used. In some cases, the resistivity curve shall be used to aid correlations.
- Block shifting (linear) and continuous shifting (dynamic) is allowed for the generation of Composite-Logs but must be documented in the Composite-Log Info File.
- Shifts to be made with respect to the reference curve. If a curve requires a shift, all curves recorded on that logging run require the same shift. If the same shift is not sufficient due to borehole environment implications, it is not mandatory for a Composite-Log to perform point to point depth shifting.
- Note: Some software packages perform stretch and squeeze automatically using various forms of cross-correlation between the curves. If computer automated depth shifting is used, the results have to be checked by a Petrophysicist for correctness.
- Automatic software assisted depth shifts have to be reviewed for plausibility and must be marked as automatically processed.
- Tolerance of maximum allowed curve misalignment is equal to, or less than, 0.4 m, along the entire Composite-Log interval.
- East European resistivity data can contain lateral logs with asymmetric, off-depth response to formation changes by design. The Info File here must contain reference as to how depth alignment is achieved, i.e. simple depth matching with SP or normal resistivity curves, quantitative resistivity inversion utilizing SP and normal and lateral logs in the raw data, etc.
- Resistivity Inversion: Automatic depth shifting of the GRD against POT resistivity curve is allowed. More complex processing, such as resistivity inversions, correction to RT is not mandatory.

2.3.2.4.4. Curve Splicing

- Tie in logging runs has to be done by comparing the gamma rays in the overlap sections, if available.
- If necessary, depth shifts must be applied. In case of wireline logs, the complete run shall be shifted (block shifted). LWD logging runs have to be handled carefully as block shifts alone are not necessarily enough.
- **Merging with missing overlap section:** There is no tie-in or depth shifting for logs without an overlap section.
- **Merging with overlap section:** The logs must be spliced at the deepest possible point (from upper run) in an overlap section (valid for WL and MWD/LWD). Merge depths have to be selected at the best point. **Automatic splicing is allowed as**

long as best petrophysical practice is followed! The splice depth shall be selected where two curves (same measurement principle) show approximately the same value to avoid data jumps and future incorrect interpretations (e.g. within shale intervals). It is common to use different merge depths for different curves in the same tool combination since the depth of the first reading is different for each curve.

- **Editing between logging runs:** Merging two open hole logging runs can lead to a gap between two logging runs. In this event both, the first valid reading of the shallower and the last reading of the deeper run shall be identified. The data gap must be replaced with null values (-999.25).
- **Petrom Specific (Best Resistivity Curve):**
  - Composite resistivity is called Best Resistivity in Petrom, recognizing that splicing of laterolog, induction and LWD propagation resistivity leads to a result curve that responds differently to anisotropy, relative formation dip, invasion and rock heterogeneity.
  - Splice points shall be considered in Shales.
  - A 0.5 meter gap shall be kept between 2 spliced resistivity curves, if different measurement types, to avoid that changes are misinterpreted as lithological change.
  - Information about resistivity tool types and log intervals used in generating Best Resistivity must be provided in the Info File.

2.3.2.5. Measurements/ Curve Details

2.3.2.5.1. SP Curves

Following editing procedures must be applied to Spontaneous Potential curves:

- SP logs shall be shifted to eliminate shifts between logging runs when spliced and to remove mechanical shifts.
- The curve have to be plotted and rescaled to a default scale range: -160 to 40mV (OMV), -100 to 0mV (OMVP) to encompass most of the SP log/s. But note, original mV span must be maintained at all times! In case of rescale was performed, it has to be mentioned in the log header.
- The SP drift shift is a controlled rescaling along the well-path which gives a quantitative meaning of the curve. It is not in the scope of Composite-Log processing.

2.3.2.5.2. Acoustic Data

The following editing procedures must be applied to acoustic curves:

- If processed open hole and cased hole acoustic data are available in addition to raw data (e.g. Best DT processed data), those data have to be considered for the Composite-Log.

2.3.2.5.3. Cased Hole Logs

- Resistivity data in casing are invalid and must always be nulled (-999.25) over the interval.
- GR to be presented in casing if there is no open hole GR available. Cased hole processed GR data to be used if available.
- NEU to be presented in casing if there is no open hole NEU available. Cased hole processed neutron data to be used if available.
- Acoustic logs respond, at times, correctly to the formation through casing. Thus, in this case the recording must be left intact.

2.3.2.6. Log Digitization

- If it is necessary to digitize log curves to be able to generate the Composite-Log, it must be ensured that the digitization data quality is high and follows all minimum requirements for digitized data, as defined by the Company (see DPR-1380-Log-, Core-/Cutting- and Mudlog Data Archiving).
- 1:200 scale is the preferred scale for log plot digitization.
- Digitization depth accuracy: 1:200 plots < 20cm, 1:1000 plots < 50cm.
- Preferably raw data or processed data, if the processing steps are known, to be used to ensure that all data manipulation steps done to the data are known and tracked in the COMPOSITE-LOG Info File.
- The source of the digitized log curve used is to be documented in the Info File by including the BARCODE (OMV and OMVP) for the relevant log plot (scanned hardcopy plot).

2.3.2.7. Vintage Logs

- CE-SP curves were historically used as depth reference (“Standard Tiefe”) in Austria. If GR is also available, a decision by the Petrophysicist has to be made about what curve to be used as the depth reference.
- Gamma ray curves acquired in uR/h or counts per second (cps) are included as such.
- Neutron curves acquired in counts per second (cps) or API are included in the Composite-Log as such.
- As most tools were logged as a separate logging run it has to be ensured that data are as good as possible on depth with the defined reference log.
- Neutron measurements, acquired during the lifetime of a field, do not necessarily reflect the initial reservoir conditions (due to fluid level changes during production) and therefore must be used with caution.
- Laterolog resistivity must be used in hydrocarbon bearing zones. CE and other resistivity measurements (e.g. Short Normal, Long Normal and Lateral) shall be used only as last choice due to measurement response.

2.3.3. Composite-Log Deliverables

2.3.3.1. Composite-Log dataset

The Composite-Log dataset shall consist of following components:

- Info file: Word document .DOC or .XLS document
- Data file: .LAS (version LAS 2.0)
- Plot file: .PDF format, scale 1:1000 and 1:200

In the event that one or more components is/are missing, it must be ensured that key information is captured so that end users are informed about most important data implications.

2.3.3.2. File Naming Conventions

Following file naming conventions have to be used:

Info file:

XXXX[BOREHOLE ABBREV.]_COMPOSITE_XXX[WLC; MWD; LWD; MIX]_INF_#.DOC or .XLS

Example: 285-Matca-G-1_COMPOSITE_WLC_INF_1.xlsx or .doc

Data file:

XXXX[BOREHOLE ABBREV.]_COMPOSITE_XXX[WLC;MWDLWDMIX]_#.LAS (version LAS 2.0)

Example: 285-Matca-G-1_COMPOSITE_WLC_1.las

Plot file:

XXXX[BOREHOLE ABBREV.]_COMPOSITE_XXX[WLC;MWD;LWD;MIX]_PLOT_XXX[WL;DD;UNK;TBD]_SCXXX[1000;20]_#.PDF

Example: 285-Matca-G-1_COMPOSITE_WLC_PLOT_WL_SC1000_1.pdf

285-Matca-G-1_COMPOSITE_WLC_PLOT_WL_SC200_1.pdf

Explanations:

[Borehole Name Abbrev.]: Borehole name abbreviation (based on CWDB (OMV), MDS (OMVP), space/s to be replaced with dash! The full borehole name must be used in case a borehole name abbreviation is not available (e.g. OMVP).

[COMPOSITE]: COMPOSITE-LOG is created by an in-house resource or external Service Contractor. Basic verification of the COMPOSITE-LOG by a Company Petrophysicist is mandatory.

[WLC; MWD; LWD; MIX]:

- WLC: Wireline Conveyed
- MWD: Measure While Drilling
- LWD: Logging While Drilling
- MIX: mixture of different services (e.g. Wireline and LWD)

[DD or WL]: The plot is presented in drillers depth (DD) or wireline depth (WL).

[1000; 200]: Scaling of the plot, e.g. 1:1000 or 1:200.

#: Version number

2.3.3.3. Info file

The entire workflow shall be documented in the Composite-Log info file (see Annex A (template): Annex F- COMPOSITE-LOG_INFO-FILE_TEMPLATE.doc and .xls; Annex B (example): Annex G-285 Matca G 1_COMPOSITE_WLC_INF_1.xlsx and .doc)

Relevant details regarding raw data, applied data processing steps, data editing, etc. shall be registered and documented.

The Info file consists of the following sections:

- Basic well information (Header Page): It has to be ensured that all stated borehole header information is aligned with CWDB (OMV) and MDS (OMVP).
- Input Data summary (Logging Summary): Provides an overview of all log data available by the date of the Composite-Log creation.
- Mud info (Mud Info Page): Available mud information is stated for each logging run. optional
- Quality comments (Quality-Editing-Renaming Page): most important comments, essential information for end users, about data quality must be included.
- Editing details: data manipulation, data processing details, etc.
- Renaming: Curve renaming details to be included.
- Depth shifting (Depth Shifting Page): Information about the depth reference and relevant depth shifts including depth shifting method(s). Tie in and merging details are documented.
- Curve Summary (CMP Curves Page): Original curve names, sources of raw/ processed data and splicing depths for the different curves are documented.
- Plot information (File and Plot Information Page): Software used for the plot generation and TVD calculation method is stated (only if survey data are available).
- Completed: Composite-Log creation date, company (in case of external service provider) and name of creator. Composite-Log Procedures version used for the Composite-Log generation.
- Attachments (Attachments Page): relevant screen shots are included in case it is necessary to explain additional details.

2.3.3.4. Plot File

Each Composite-Log dataset shall include at least one Composite-Log plot file, Scale 1:200 or 1:1000. (see Annex H: Annex C-285 Matca G1_COMPOSITE_WLC_PLOT_WL_SC1000_1.pdf and Annex I-285 Matca G1_COMPOSITE_WLC_PLOT_WL_SC200_1.pdf).

The COMPOSITE-LOG plot file consists of following sections:

- Plot Header
- Curve Section
- Footer

2.3.3.4.1. Plot Header

- Main Header: including borehole relevant information based on CWDB (OMV) and MDS (OMVP).
- File name information section: files created for the Composite-Log dataset.
- Details about Composite-Log creation location and name of creator.
- Remarks section: includes the most important information to avoid misinterpretation of the data. (see figure 8 and figure 9 for a header example).

Figure 8: Composite-Log header (example: 285 Matca G1)

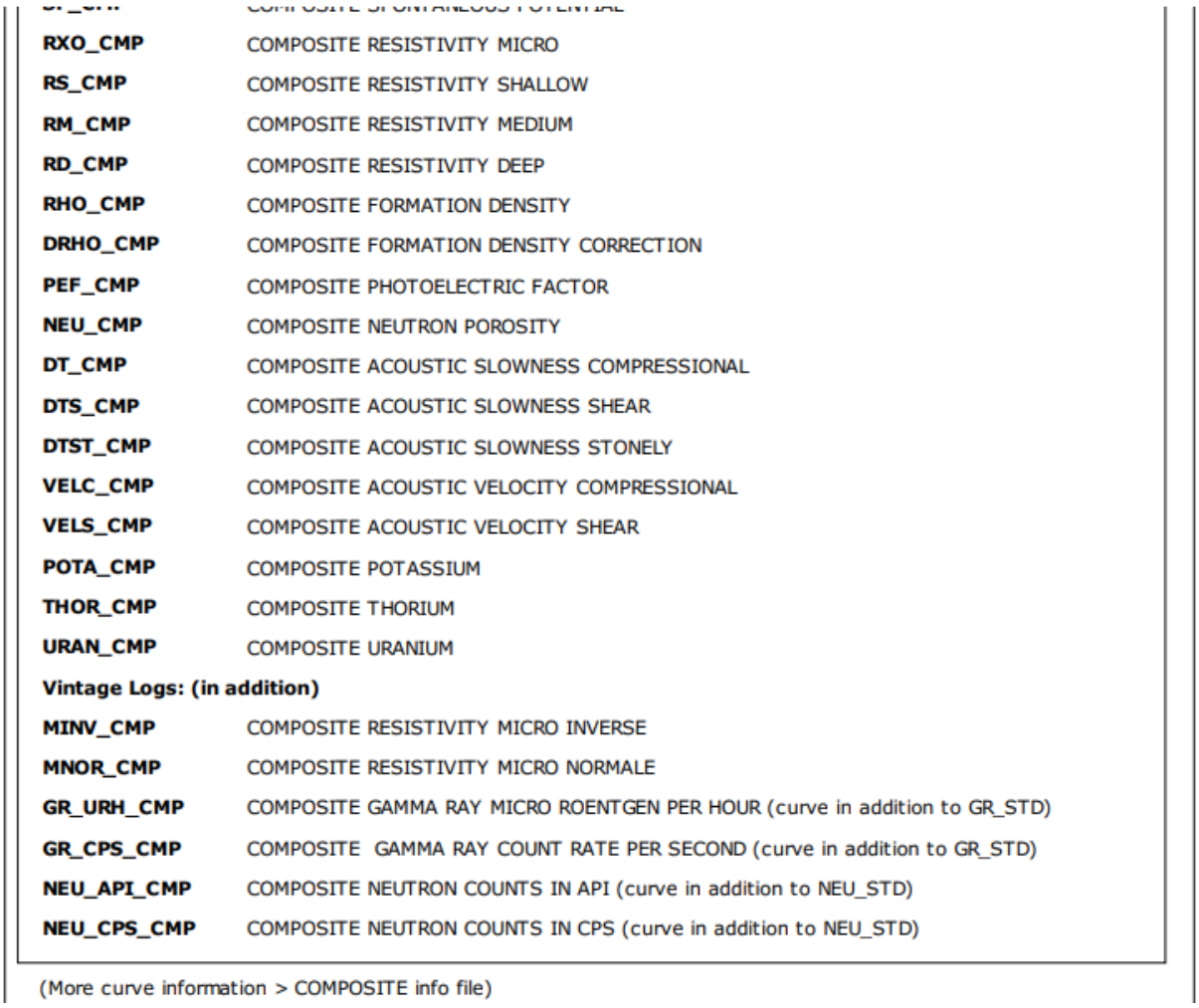

Figure 9: Composite-Log header remark section (example: 285 Matca G1)

2.3.3.4.2. Curve Section

Curve naming conventions, units, color code and line style shall be followed, as explained in chapter 2.3.1. Order of tracks and curves included in tracks shall be followed, as specified in figure 10 and 11.

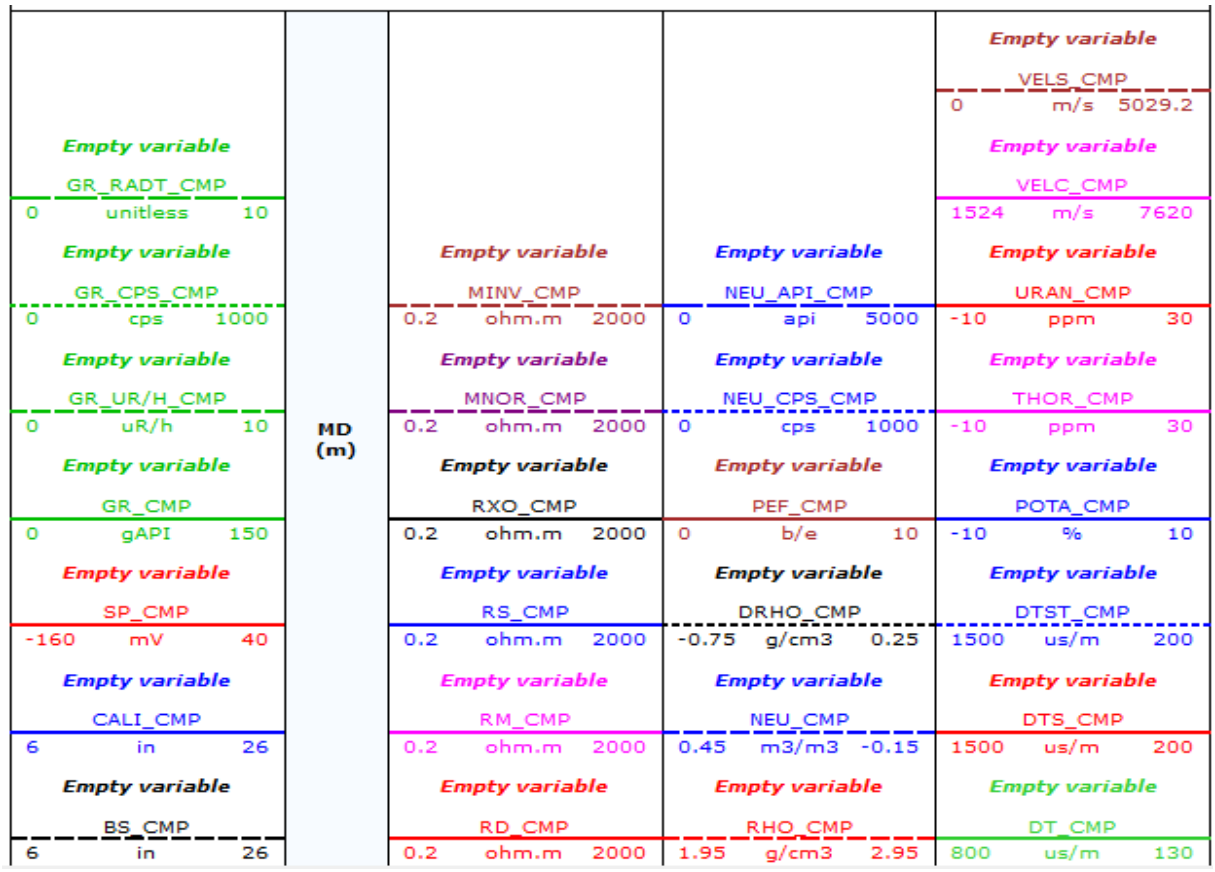

Figure 10: Composite-Log curve section, AT wells

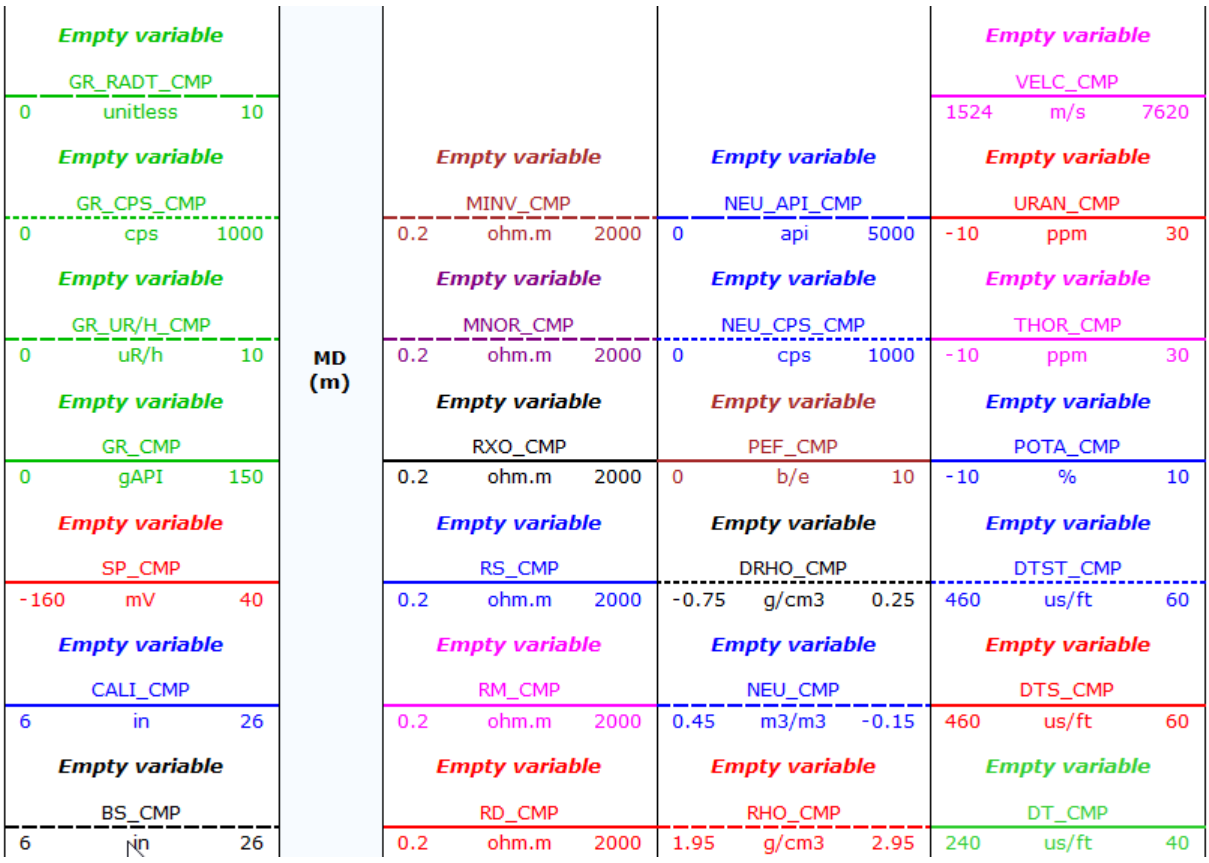

Figure 11: Composite-Log curve section, International wells

2.3.3.4.3. Footer

Composite-Log footer, as shown in figure 12 below is attached at the plot bottom.

COMPANY:	OMV Petrom	
BOREHOLE:	285 MATCA G 1	
BOREHOLE UBHI:	AT0001187500	
BOREHOLE SHORT NAME:	285 Matca	
FIELD:	Matca	
COUNTRY:	Romania	
Well Location:	CRS: Romania_WGS_1984	CRSC:4326
	LAT(DD)/ X(m): 27.55265753	
	LONG(DD/ Y(m): 45.85437347	
Permanent Datum:	MSL Elev.: 0 m	
Log Measured From :	KB 103.47 above Perm.Datum	
Date Processed:	7. June 2021	
Standardlog Interval:	23.5-2182.5m	

Figure 12: Composite-Log Footer (example 285 Matca G1)

2.3.3.4.4. Composite-Log Plot properties

- Plot file format is PDF.
- Plot is on Scale (original size!).
- Plot is continuous (.pdf). No page breaks!

See chapter 2.3.3.6 for Techlog relevant details.

2.3.3.5. Digital Data File

2.3.3.5.1. File Format

The LAS file shall meet the following minimum requirements (see also example Annex J: 285 Matca G 1_COMPOSITE_WLC_1.las):

- LAS 2.0 format is used.
- All Composite-Log curves to be included as defined.
- File and curve naming conventions are followed.
- The LAS header includes all specified attributes as defined under section 2.3.3.5.2 Empty or not defined attributes are not included.
- LAS start and stop depth shall begin and end when at least one curve contains valid data (intervals including only null values for all curves above the first and below the last valid measurement must be removed).
- Lines with no content in the las header start with #.
- LAS follows the international LAS format standard and includes:
  - Version Information Block
  - Well Information Block (includes only borehole relevant attributes and in addition STRT, STOP, STEP and NULL. table 8: grey highlighted attributes (step increment and missing value): standard values.

- Parameter Information Block (covers only log relevant attributes). table 9: Light blue highlighted attributes: Techlog relevant; blue highlighted: WLMS relevant; others are general attributes.
- Curve Information Block (including curve information and relevant remarks)

2.3.3.5.2. File Header Information

Attribute.Unit	Description	Source	CWDB Source Attribute	Remark	Example
STRT.M	FIRST REFERENCE VALUE			Auto	23.5
STOP.M	LAST REFERENCE VALUE			Auto	2182.5
STEP.M	STEP INCREMENT			Standard	0.1
NULL.	MISSING VALUE			Standard	-999.25
WELL.	WELL NAME	CWDB/MDS	Borehole Name		285 Matca G 1
FLD.	GENERAL FIELD NAME	CWDB/MDS	General Field Name		Matca
UBHI.	UNIQUE BOREHOLE IDENTIFIER	CWDB/MDS	UBHI		RO4987020500
UWI.	UNIQUE WELL IDENTIFIER	CWDB/MDS	UWI		RO49870205
CTRY.	COUNTRY	CWDB/MDS	Country		ROMANIA
OPER.	OPERATOR	CWDB/MDS	Operator		PETROM
COMP.	COMPANY	CWDB/MDS	Data Source		PETROM
SRVC.	SERVICE COMPANY (Company who generated the Composite)	Service Provider			HOL
DATE.	DATE OF SERVICE (Date when the Composite was generated)	Service Provider		YYYY-MM-DD	2021-06-10
SHWN.	SHORT WELL NAME	CWDB/MDS	Borehole Abbr		285-Matca-G-1
CRS.	ORIGINAL COORD SYSTEM NAME	CWDB/MDS	Original Coord System Name		Romania_WGS_1984
CRSC.	ORIGINAL COORD SYSTEM CODE	CWDB/MDS	Original CRS		4326
LATI.DD	ORIGINAL LATITUDE	CWDB/MDS	Original Lat North	*	
LONG.DD	ORIGINAL LONGITUDE	CWDB/MDS	Original Long East	*	
X.M	ORIGINAL NORTHING	CWDB/MDS	Original Lat North	*	27.55265753
Y.M	ORIGINAL EASTING	CWDB/MDS	Original Long East	*	45.85437347

**Shall reflect Geodetic Coordinate System Information: To be filled in depending if the Geographic Coordinate system (ORIGINAL LATITUDE and ORIGINAL LONGITUDE) or the Projected System (ORIGINAL NORTHING and ORIGINAL EASTING) is stated in the CWDB.*

Table 8: Composite-Log Well Information section

Attribute.Unit	Description	Source	Remark	Example
HIDE.	LOG SERVICE NAME		Standard	COMPOSITE
RUN.	RUN NUMBER		MIX: in case of multiple runs	MIX
BS.IN	BIT SIZE		MIX: in case of multiple bit sizes	MIX
PDAT.	LOCAL PERMANENT DATUM	Log Info		MSL
LMF.	LOG MEASURED FROM	Log Info		KB
APD.M	ELEVATION OF DEPTH REFERENCE (LMF) ABOVE PERMANENT DATUM	Log Info		103.47
EPD.M	ELEVATION OF PERMANENT DATUM (PDAT) ABOVE MEAN SEA LEVEL	Log Info		0
EKB.M	ELEVATION OF KELLY BUSHING ABOVE PERMANENT DATUM	Log Info		-999.25
EDF.M	ELEVATION OF DRILL FLOOR ABOVE PERMANENT DATUM	Log Info		-999.25
ERT.M	ELEVATION ROTARY TABLE ABOVE PERMANENT DATUM	Log Info		-999.25
EGL.M	ELEVATION OF GROUND LEVEL ABOVE PERMANENT DATUM	Log Info		235.04
SET.	TECHLOG DATASET NAME		Standard	COMPOSITE
group.	TECHLOG GROUP		Standard	COMPOSITE
TYPE.	TYPE		Standard	PROCESSED
SERV.	SERVICE		Standard	MERGED-HOLE
ACTI.	ACTIVITY		Standard	COMPOSITE
CATE.	CATEGORY		Standard	COMPOSITE
CLAS.	CLASSIFICATION		Standard	DIGITAL
AQSO.	ACQUISITION SOFTWARE		Application Name	TECHLOG
RTYP.	RUN TYPE		Standard	FINAL-OUTPUT
PLSC	PLOT SCALE		Standard	NA
DREF.	DEPTH REFERNCE		Standard	WL

Table 9: Composite-Log Las Header Information section

2.3.3.6. Techlog Specifics/ Deliverables

If the Composite-Log is created in Techlog, a cleaned Techlog project is part of the delivery.

In addition to the digital Composite-Log dataset (same content as digital las file), the plot layout and layout header (both are borehole specific) must be available in the Techlog environment (TL Working Reference Project or Studio) to ensure efficient adaption of updates at a later point in time.

Standard Techlog naming conventions are applied as following (see figure 13):

COMPOSITE-LOG Dataset name: COMPOSITE

Grouping: COMPOSITE

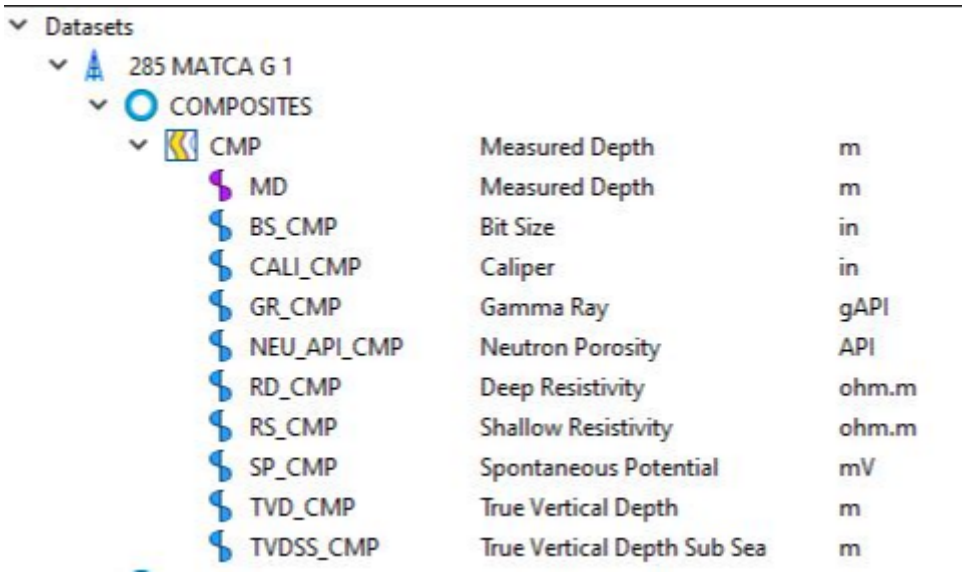

Figure 13: Techlog Grouping and Naming conventions for Composite-Log datasets (example 285 Matca G1).

Templates:

Following Techlog templates are used for the Composite-Log creation (see figure 14):

TL Company folder:

Austrian boreholes:	OMV_COMPOSITE_AT
International boreholes:	OMV_COMPOSITE_INT
Libyan boreholes:	OMV_COMPOSITE_LY

Layout:

For each COMPOSITE-LOG created in Techlog (each borehole), a layout has to be available under:

TL Project folder:

XXXX[Borehole Abbrev]_OMV_COMPOSITE-PLOT

Example: HO O 3_OMV_COMPOSITE-PLOT

The layout has to consist of the COMPOSITE-LOG header, footer and curve section:

XXXX[Borehole Abbrev]_OMV_HEADER_COMPOSITE_9in

XXXX[Borehole Abbrev]_OMV_FOOTER_COMPOSITE_9in

Example: HO O 3_OMV_HEADER_COMPOSITE_9in
HO O 3_OMV_FOOTER_COMPOSITE_9in

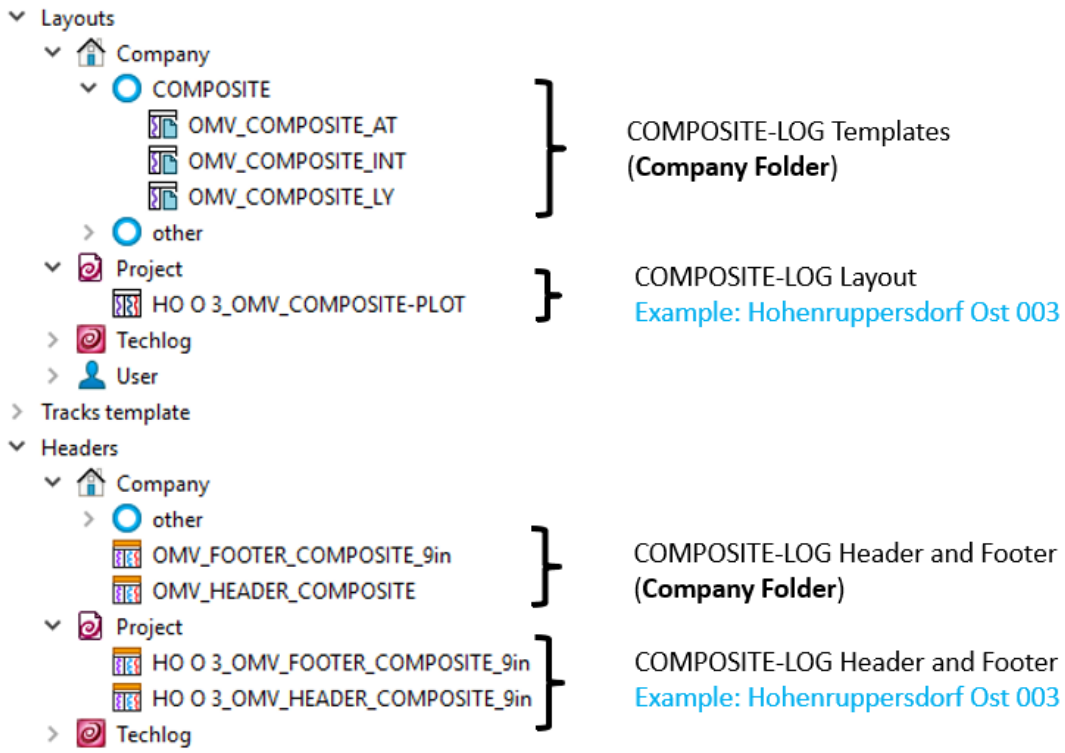

Figure 14: Techlog Template/ Layout naming conventions for Composite-Log datasets (example HOHENRUPPERSDORF OST 003).

2.3.4. Composite-Log Provider (internal, external)

A Composite-Log shall be created by a Company Petrophysicists or externally via Service Providers depending on resource availability.

2.3.4.1. Company Internal

Composite-Logs generated internally shall be verified by a Company Petrophysicist before the final product is archived in WLMS and transferred into the relevant working databases. **No exceptions!** If this is not done, the dataset must be categorized as Composite-General (LOW quality).

2.3.4.2. External Service Provider

The Service Contractor must ensure that the Composite-Log is generated considering basic Petrophysical principles and following all Technical Requirements as described within this document. If the service provider uses Techlog for the Composite-Log creation process the following items shall be considered (Techlog is not mandatory to be used but all mentioned definitions must be followed!).

Pre-requisites:

Items to be provided in advance to the external service providers for their work:

- CWDB (OMV), MDS (OMVP) well header extract as described in Annex K.
- Composite-Log Procedures, templates and examples (latest available version in REAL).
- Well Deviation surveys: final based on CWDB (OMV) and MDS (OMVP)

- Formation tops (corporate if available), not mandatory

If the Composite-Log is created for a historical borehole including data digitization, relevant Company regulations have to be followed as defined in: see DPR-1380-Log-, Core-/Cutting- and Mudlog Data Archiving.

When the service company is using Techlog, following information has to be provided in addition (Techlog project):

- Well header information (based on CWDB)
- Corporate formation tops (based on CWDB*)
- Well deviation survey (based on CWDB*)
- COMPOSITE-LOG template extract from Techlog Company folder:

Header:	OMV_HEADER_COMPOSITE_9in
Footer:	OMV_FOOTER_COMPOSITE_9in
Layout template:	OMV_COMPOSITE_AT (Austrian wells) or
	OMV_COMPOSITE_INT (International wells)
	OMV_COMPOSITE_LY (Libyan boreholes)

*If not available it is not mandatory that the information is provided.

Deliverables:

In addition to the Composite-Log deliverables (chapter 2.3.3), the service provider delivers a clean Techlog project including the final Composite-Log(s) (if the service provider uses Techlog!). Techlog naming conventions shall be followed (chapter 2.3.3.6).

Company QC:

All Composite-Logs created by external Service Providers must be QCd by the Company responsible Expert Petrophysicist or Senior Petrophysicisit! This is to verify that the Composite-Log completeness and quality is in alignment with the Composite-Log procedures. The final, complete, delivery package for each borehole shall be sent to the Company immediately after completion of the work.

2.3.5. Composite-Log Archiving

All Composite-Logs (created internally and externally) are archived in the relevant corporate system: **WLMS**. In addition the latest version of Composite-Log must be available in the main working database environments:

OMV: Petrel and Techlog environment (e.g. relevant Studio environments).

OMVP: IP, Petrel, Open Works (Exploration).

Note: If a Composite-Log is reworked and all Standardlog-Log standards are followed (“Upgrade of Composite-Log to Standard-Log”), the Composite-Log shall be replaced in the working environments with the Standard-Log! In WLMS the Standard-Log shall be loaded as additional dataset and the Composite-Log must be kept.

2.3.5.1. WLMS

WLMS is the corporate storage archive for Composite-Logs. When a Composite-Log is uploaded to WLMS (via WLMS data drop site), after selecting the correct well/borehole (based on CWDB/ MDS), following mandatory attributes have to be populated (valid for all Composite-Logs):

ATTRIBUTE	COMPOSITE-LOG: PLOTS/ DIGITAL FILE/ INFO FILE (EXAMPLE)	General INFO/ Description
UBHI	AT0001997900	UBHI based on CWDB (correct borehole selected during the uploading process)
BOREHOLE NAME	HOHENRUPPERSDORF OST 003	Borehole name based on the CWDB
TYPE	PROCESSED	spliced, merged, edited data
SERVICE	MERGED-HOLE	open hole/ cased hole/ multiple borehole intervals
ACTIVITY	COMPOSITE	
CATEGORY	COMPOSITE	
NAME	COMPOSITE-PLOT COMPOSITE-REPORT COMPOSITE	Name for Composite-Log plots Name for Composite -Log Info files Name for Composite -Log digital las file
RUN NUMBER	MIX	combination of several runs
CLASSIFICATION	PLOT DIGITAL REPORT	Composite-Log Plot files Composite-Log digital las file Composite-Log Iinfo files
PLOT SCALE	1:1000 or 1:200	only valid for plot files; reports and digital file: NA
DEPTH REFERENCE	WL	To be filled depending on what was used as depth reference (e.g. DD, WL, …)
BIT SIZE	MIX	In case of several bit sizes
APPLICATION NAME	TECHLOG	Techlog for OMV w/o OMVP; for external CMP it depends on Software package used for the CMP generation.
RUN TYPE	FINAL-OUTPUT	Final Product at the time of generation
SOURCE	OMV	Data source/ Operator during STD generation
SERVICE CONTRACTOR	OMV	OMV in case it was generated in-house
REMARKS		
TOP DEPTH	537.8	top reading of highest curve

ATTRIBUTE	COMPOSITE-LOG: PLOTS/ DIGITAL FILE/ INFO FILE (EXAMPLE)	General INFO/ Description
BOTTOM DEPTH	1745.9	bottom reading of the deepest curve
LOGGING DATE	2015-05-07	COMPOSITE-LOG creation date
BAR CODE	NA	only relevant for digitized COMPOSITE-LOGs
STORAGE LOCATION	NA	only relevant for digitized COMPOSITE-LOGs
STORAGE LOCATION INFO	NA	only relevant for digitized COMPOSITE-LOGs
Temp. Dataset Number*	HO-O-3_1	only temp. ID to link data belonging to a dataset in **case of bulk uploads**. WLMS creates an unique ID during upload for each dataset.
Quality Index	MEDIUM or LOW	

**Note: The WLMS temporary dataset ID is only used during the uploading process to link data belonging to the Composite-Log dataset. The WLMS is populating a unique dataset ID during the dataset processing step.*

Table 10: WLMS Composite-Log Classification

2.3.5.2. Application environment

All generated Composite-Log digital data (.las) shall be available in the key working databases:

OMV: Petrel and Techlog environment (e.g. Studio), considers also updates.

Note: Global Techlog dictionaries and Petrel global templates are adjusted to Composite-Log standards and with that no implications are expected for the data transfer between the database and applications, assumed that the procedure mentioned above was followed.

OMVP: IP, Petrel, Open Works (Exploration), considers also updates

3. Terms & Abbreviations

API	AMERICAN PETROLEUM INSTITUDE
AT	AUSTRIA
CMP	COMPOSITE
Company	OMV Exploration & Production and OMV Petrom Exploration & Production and all their affiliates, excluding SapuraOMV
CPI	COMPUTERIZED PETROPHYSICAL INTERPRETATION (e.g. TL Quanti ELAN, TL Quanti, etc.)
CPS	COUNTS PER SECOND
CT	Coiled tubing
CWDB	CENTRAL WELL DATABASE
GR	GAMMA RAY
INT	INTERNATIONAL
KOP	KICK OFF POINT
LWD	LOGGING WHILE DRILLING
m MD	METER MEASURED DEPTH

MDS	MASTER DATA STORE
ML	MUDLOG
MWD	MEASURE WHILE DRILLING
NEU	NEUTRON
OMV	OMV Classic, excluding SapuraOMV
OMVP	OMV Petrom and all its affiliates
PETRO	PETROPHYSICS
QC	QUALITY CONTROL
RM	RECORDED MODE
RT	REALTIME
SC	SCALE
SP	SPONTANEOUS POTENTIAL
TD	TOTAL DEPTH
TL	TECHLOG
TVD	TRUE VERTICAL DEPTH
TVDSS	TRUE VERTICAL DEPTH SUBSEA
UBHI	UNIQUE BOREHOLE IDENTIFIER
uR/h	MICROSIEVERT/ HOUR
WL	WIRELINE
WLC	WIRELINE CONVEYED
WLMS	WELL LOG MANAGEMENT SYSTEM

4. Transitory Provisions

- Not applicable

5. Annexes

Title of Annex	Obligatory or illustrative
Annex A: STANDARD-LOG INFO FILE TEMPLATE	Obligatory
Annex B: STBG-22_PETRO-STD_WLC_INFO	Illustrative
Annex C: STBG-22_PETRO-STD_WLC_PLOT_STD_SC200_1	Illustrative
Annex D: STBG-22_PETRO-STD_WLC_PLOT_STD_SC1000_1	Illustrative
Annex E: STBG-22_PETRO-STD_WLC	Illustrative
Annex F: COMPOSITE-LOG_INFO-FILE_TEMPLATE	Obligatory
Annex G: 285-Matca-G-1_COMPOSITE_WLC_INF_1	Illustrative
Annex H: 285-Matca-G-1_COMPOSITE_WLC_PLOT_WL_SC200_1	Illustrative
Annex I: 285-Matca-G-1_COMPOSITE_WLC_PLOT_WL_SC1000_1	Illustrative
Annex J: 285-Matca-G-1_COMPOSITE_WLC_1	Illustrative
Annex K: WELL HEADER EXTRACT CWDB	Illustrative

6. Signatures

- Electronic workflow: This regulation is approved via electronic workflow.

REAL Metadata Card

DTR-0604-Generation and Archiving of Standard-Logs and Composite-Logs - ENG

References to external Regulations and other Platforms:	WLMS CoP: https://omv.sharepoint.com/sites/CoPPetroleumEngineering/Petrophysics/WLMS/SitePages/ProjectHome.aspx
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Replaced Regulations:	old code: U.C.02-HQ-TRE-001
References to other OMV Internal Regulations:	DPR-1380-Log-, Core-/Cuttings- and Mudlog Data Archiving
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Country:	Global
Topic:	Petrophysics (Discipline) fully exempted SapuraOMV

Organizational Scope: E Energy
P-E Exploration & Production