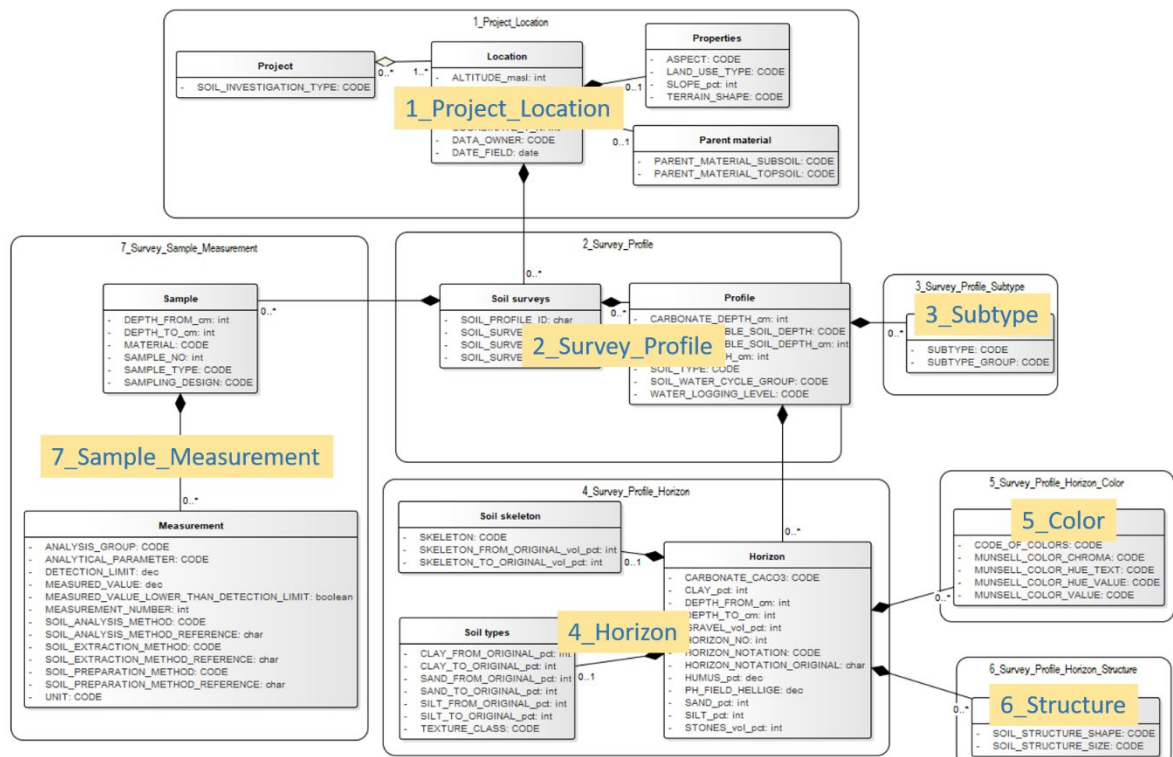


Swiss Soil Information System NABODAT

Swiss Soil Dataset

Documentation Version 6 (April 2022)



Acknowledgements

The Service Center NABODAT thanks the cantonal soil protection offices (FABO) for the data, their cooperation and the valuable input they have provided in the preparation of the Swiss Soil Dataset.

Special thanks goes to the Soil Science Society of Switzerland (BGS), which has launched the processing of soil profile data from the archive of today's Agroscope (a large part of the available soil data) and has developed the necessary concepts, foundations and tools.

For the financial support in processing the data we thank the Federal Offices FOEN (Federal Office for the Environment), FOAG (Federal Office for Agriculture) and ARE (Federal Office for Spatial Development).

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Content

The present technical documentation describes the contents of the " Swiss Soil Dataset – Documentation Version 6 (april 2022)". This document provides information on the scope and content of the national dataset and is integral to the documents provided to the user by the NABODAT Service Center.

The main tables, the hierarchical relationships between the tables and the attributes of the data set are described. For further details on pedological content, we refer the reader to the reference literature.

This dataset was generated with the consensus of the cantonal soil protection offices. It contains **point data** such as soil information gathered at soil profiles or from soil quality surveys. Spatial soil data such as soil maps or raster data are not part of this dataset. The data set contains the various measurements and soil parameters, soil pollutant data are excluded from the dataset. The majority of the data has been collected and measured decades ago. The data are not representative for the entire area of Switzerland.

Swiss Soil Information System NABODAT and Service Center NABODAT

The Federal Office for the Environment (FOEN) launched in 2012 the Swiss Soil Information System NABODAT for the compilation and harmonisation of Swiss soil data aiming on the availability of such cantonal soil datasets. First and foremost, the information system serves for the national and cantonal soil protection agencies for their daily work and cantonal implementation of soil protection measures.

The Service Center NABODAT is responsible for the harmonisation and maintenance of the Swiss Soil Dataset. It is affiliated to the Swiss Competence Center for Soils at the school of Agricultural, Forest and Food Sciences (HAFL). The project management is by the FOEN. It supports users with processing, data import and data management and organises, specifies and tests the further development of the application together with the NABODAT task force and external IT developers.

For the interested public, the website www.nabodat.ch informs about the soil information system and offers documents about NABODAT for download.

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Dataset – Basics

The majority of the soil information in this point dataset dates from 1953-1996. During this period, at the former Swiss Federal Research Station for Agricultural Crops (FAP) or Agroecology and Agriculture (FAL) (now Agroscope) a national soil mapping service was located and carried out about 330 mapping projects (Grob et al., 2015). On the initiative of the Soil Science Society of Switzerland (BGS), the analogue soil profile data stored in the archive of today's Agroscope were digitally secured in the "Bodeninformation Schweiz" (BI-CH) project from 2001 onwards. In a second step, they were translated by soil experts into the currently valid Swiss mapping key (FAL, 1997) and finally transferred from the Service Center NABODAT to the National Soil Information System NABODAT.

In addition to this soil profile data from the former national mapping service, the dataset offers further soil data from cantonal and national soil investigations, which are stored in NABODAT.

Quantity structure – version 6 (april 2022)

The present version 6 of the Swiss Soil Dataset is the fourth edition of the dataset. This version contains soil information for around **33'000 sites**, whose spatial distribution is shown in figure 1.

Since the soil data were mainly collected within individual soil mapping surveys, they are neither representative for most cantons nor for Switzerland (<http://www.nabodat.ch> > Service > Bodenkartierungskatalog). For more detailed soil data (e.g. soil pollutant data) not included in the national data set, the respective cantonal soil protection offices should be contacted directly (<http://www.nabodat.ch> > Verbund NABODAT > Mandanten).

The Dataset is updated regularly to include new and recently integrated soil data from national and cantonal projects are available in a harmonised format to the public.

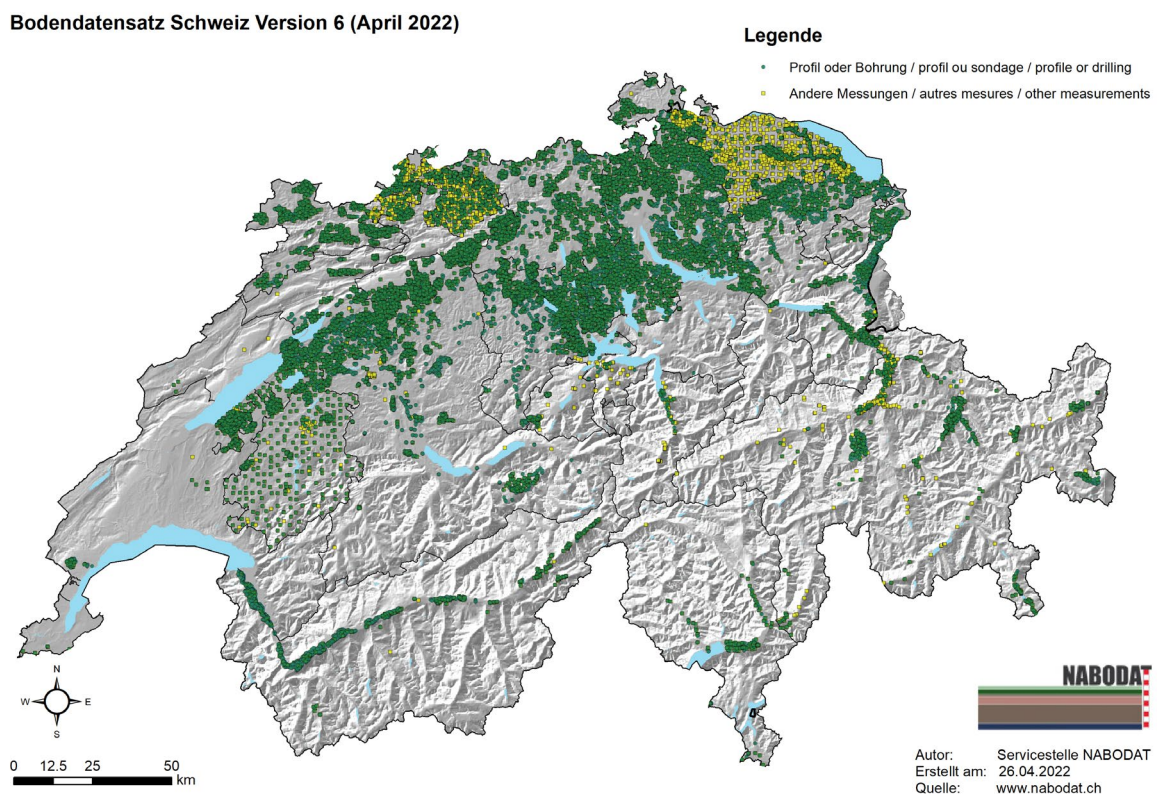


Figure 1: Spatial distribution of the data in the Swiss Soil Dataset Version 6.

Data model

The data model of the Swiss soil data set is based on the data model NABODAT 1.5 (Rehbein et al., 2017). For reasons of clarity, the (relational) data set was divided into 7 tables according to the hierarchy of the data model. Figure 2 gives an overview of the 7 tables, the attributes and the relations between the tables.

The required key attributes are filled redundantly into the corresponding table sheets. A list and explanation of the codes used can be found separately in the last spreadsheet.

Each table of the Swiss soil dataset consists of several classes and their attributes. The relationship between the classes is symbolized by a diamond:



If the diamond is filled, class B can only exist if class A also exists.
 Example: Information on the source material can only exist if a site has been created.



If diamond is not filled, class B can also exist if class A does not exist.
 Example: A location can exist without being assigned to a project.

In addition, the multiplicity (usually "0..1" or "0..*") is used to define how many instances an assigned class can consist of.

0..1 The assigned class cannot occur at all or only once.
 Example: A site can be assigned to none or one aspect information (class properties).

0..* The assigned class cannot occur or can occur any number of times.
 Example: No subtypes or any number of subtypes can be assigned to a profile.
 For a better readability of the data, all 0..* relationships have been stored in separate table sheets (subtype, soil color, soil structure). The soil survey type was not stored separately. Here, locations can be listed twice in the table if a location is assigned to several projects and thus possibly to different soil survey types.

For a better readability of the data, all 0..* relationships have been stored in separate table sheets (subtype, soil color, soil structure). The soil survey type was not stored separately, because locations can be listed twice in the table if a location is assigned to several projects and thus possibly to different soil survey types.

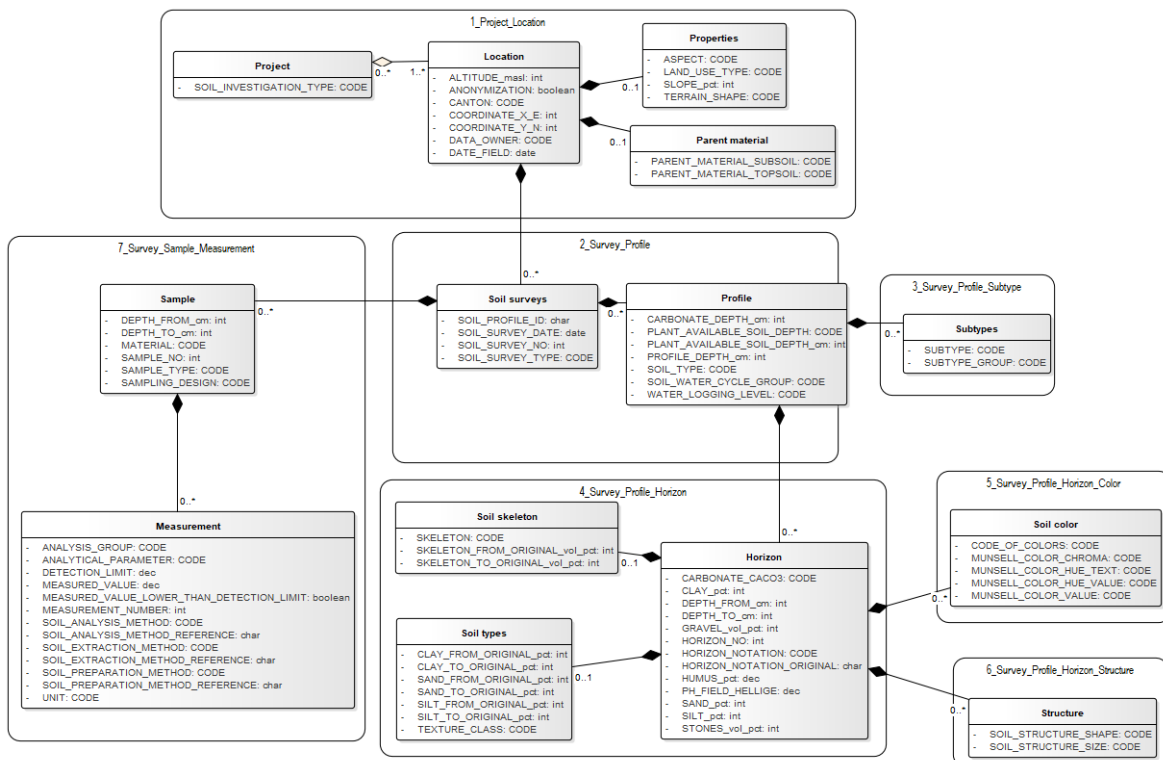


Figure 2: Structure of the data set in 7 tables. The links between the tables indicate the relationship between the tables.

Further literature on the interpretation of soil information in terms of content:

- FAL (1997): Kartieren und Beurteilen von Landwirtschaftsböden. Autoren: Brunner J., Jäggi F., Nievergelt J., Peyer K.. Schriftenreihe Nr. 24. Eidg. Forschungsanstalt für Agrarökologie und Landbau, Reckenholz, Zürich. (heute Agroscope)
- BGS Bodenkundliche Gesellschaft der Schweiz (2010): Klassifikation der Böden der Schweiz. Bearbeitet von der Arbeitsgruppe Klassifikation und Nomenklatur. Dritte, korrigierte Auflage 2008, Luzern.
- Grob U., Ruef A., Zihlmann U., Klauser L. und Keller A. (2015): Agroscope Bodendatenarchiv – Bodendaten aus Bodenkartierungen 1953 – 1996. Agroscope Science 14 / 2015.
- Rehbein K., Grob U., Klauser L. und Keller A. (2017): Nationales Bodeninformationssystem NABODAT – Datenmodell Version 1.5. Agroscope, Service Center NABODAT, Zürich. (verfügbar auf www.nabodat.ch)
- Eisenhut C. (2004): Datenmodell BI-CH 03. Projekt Bodeninformation Schweiz BI-CH / Teilprojekt 5.
- Borer F. und Knecht M. (2014): Bodenkartierung Schweiz – Entwicklung und Ausblick. Arbeitsgruppe Bodenkartierung der BGS (Bodenkundliche Gesellschaft der Schweiz).
- GeoIV (2008): Verordnung über Geoinformation (Geoinformationsgesetz) vom 21. Mai 2008 (Stand 8. August 2012). SR 510.620.

Dataset – Description of tables and attributes

The following description of all classes according to the data model with the corresponding attributes is sorted alphabetically. In addition to the name of the attribute, the data type (character, integer, code, etc.) is documented and a short description of the contents. For attributes with codes, the corresponding data source is referred to for further information on the code list.

Class Horizon

Package: Swiss Soil Dataset
Modified: 16.11.2018
Description: Characterization of the soil horizons

Attribute

Name	Data type	Description
CARBONATE_CACO3	CODE	Field determination of calcium carbonate (CaCO ₃) content in horizon Source of code list: Profilblatt Nr. 44 (FAL, 1997)
CLAY_pct	int	Estimated clay content in horizon [%]
DEPTH_FROM_cm	int	Upper limit of horizon [cm]
DEPTH_TO_cm	int	Lower limit of horizon [cm]
GRAVEL_vol_pct	int	Estimated gravel content in horizon [Vol.%]
HORIZON_NOTATION_ORIGINAL	char	Original information of horizon notation
HORIZON_NOTATION	CODE	Notation of horizon Source of code list: Profilblatt Nr. 29/30 (FAL, 1997)
HORIZON_NO	int	Number of the soil horizon
HUMUS_pct	dec	Estimated content of humus in horizon [%]
PH_FIELD_HELLIGE	dec	Field determination of pH-level (pH Hellige)
SAND_pct	int	Estimated sand content in horizon [%]
SILT_pct	int	Estimated silt content in horizon [%]
STONES_vol_pct	int	Estimated stone content in horizon [Vol.%]

Class Location

Package: Swiss Soil Dataset
Modified: 16.11.2018
Description: Unique description of the location (name, spatial location etc.).

Attribute

Name	Data type	Description
ALTITUDE_masl	int	Altitude of location in m.a.s.l. [m]

Name	Data type	Description
ANONYMIZATION	boolean	Anonymization of location information : Name of locality, address, property number and GIS address are blanked out. The coordinates are moved to a 1000m grid (2643059/1221782 becomes 2643000/1221000).
CANTON	CODE	Name of the canton, where the location is found Source of code list: Bundesamt für Statistik (BFS)
COORDINATE_X_E	int	Swiss national coordinates CH1903+ (LV95)
COORDINATE_Y_N	int	Swiss national coordinates CH1903+ (LV95)
DATA_OWNER	CODE	Assignment of location to a data owner (client of the NABODAT network)
DATE_FIELD	date	Date of the locations survey

Class Measurement

Package: Swiss Soil Dataset

Modified: 16.11.2018

Description: Analysis results of the samples taken from a location survey.

Attribute

Name	Data type	Description
ANALYSIS_GROUP	CODE	Assignment of the measurement to an analysis group Source of code list: NABODAT
ANALYTICAL_PARAMETER	CODE	Assignment of the measurement to an analytical parameter Source of code list: NABODAT
DETECTION_LIMIT	dec	Detection limit of measurement
MEASUREMENT_NUMBER	int	Number of measurement in case of multiple measurements of the same sample
MEASURED_VALUE	dec	Measured value
MEASURED_VALUE_LOWER_THAN_DETECTION_LIMIT	boolean	Measured Value is lower than the detection limit
SOIL_ANALYSIS_METHOD	CODE	Soil analysis method of measurement Source of code list: NABODAT
SOIL_ANALYSIS_METHOD_REFERENCE	char	Reference method for the soil analysis method of measurement
SOIL_EXTRACTION_METHOD	CODE	Soil extraction method of measurement Source of code list: NABODAT
SOIL_EXTRACTION_METHOD_REFERENCE	char	Reference method for the soil extraction method of measurement
SOIL_PREPARATION_METHOD	CODE	Soil preparation method of measurement Source of code list: NABODAT
SOIL_PREPARATION_METHOD_REFERENCE	char	Reference method for the soil preparation method of measurement

Name	Data type	Description
UNIT	CODE	Unit of measured value Source of code list: NABODAT

Class Parent material

Package: Swiss Soil Dataset
 Modified: 16.11.2018
 Description: Parent material of soil formation in sub- and topsoil

Attribute

Name	Data type	Description
PARENT_MATERIAL_TOP-SOIL	CODE	Parent material in topsoil at the location Source of code list: Profilblatt Nr. 62 (FAL, 1997)
PARENT_MATERIAL_SUB-SOIL	CODE	Parent material in subsoil at the location Source of code list: Profilblatt Nr. 62 (FAL, 1997)

Class Profile

Package: Swiss Soil Dataset
 Modified: 16.11.2018
 Description: Profile data and profile properties

Attribute

Name	Data type	Description
CARBONATE_DEPTH_cm	int	Limit of present carbonate [cm]
PLANT_AVAILABLE_SOIL_DEPTH	CODE	Classification of the plant available soil depth in profile Source of code list: Profilblatt Nr. 24b (FAL, 1997)
PLANT_AVAILABLE_SOIL_DEPTH_cm	int	Plant available soil depth in profile [cm]
PROFILE_DEPTH_cm	int	Depth of the assessed profile [cm]
SOIL_TYPE	CODE	Soil type at profile location Source of code list: Profilblatt Nr. 16 (FAL, 1997)
SOIL_WATER_CYCLE_GROUP	CODE	Class of soil water cycle defined by the soil mapping guideline Source of code list: Profilblatt Nr. 23 (FAL, 1997)
WATER_LOGGING_LEVEL	CODE	Degree of water logging level according to the levels of the soil water cycle groups Source of code list: Datenmodell BI-CH 03 (Eisenhut, 2004)

Class Project

Package: Swiss Soil Dataset
Modified: 16.11.2018
Description: Information on the project in the context of which the site was examined.

Attribute

Name	Data type	Description
SOIL_INVESTIGATION_TYPE	CODE	Type of the soil survey Source of code list: NABODAT

Class Properties

Package: Swiss Soil Dataset
Modified: 16.11.2018
Description: Characterization of the location (topography, land use type, etc.).

Attribute

Name	Data type	Description
ASPECT	CODE	Direction of the location Source of code list: Profilblatt Nr. 59 (FAL, 1997)
LAND_USE_TYPE	CODE	Land use type at the location Source of code list: Profilblatt Nr. 61 (FAL, 1997)
SLOPE_pct	int	Slope in [%]
TERRAIN_SHAPE	CODE	Terrain shape at the location Source of code list: Profilblatt Nr. 26 (FAL, 1997)

Class Sample

Package: Swiss Soil Dataset
Modified: 16.11.2018
Description: Samples taken as part of a site survey

Attribute

Name	Data type	Description
DEPTH_FROM_cm	int	Upper limit of sample depth [cm]
DEPTH_TO_cm	int	Lower limit of sample depth [cm]
MATERIAL	CODE	Specification of the sampled soil material (litter, mineral soil, etc.) Source of code list: BODAT 4.2
SAMPLING_DESIGN	CODE	Sampling design of the sample material (e.g. profile, area etc.) Source of code list: BODAT 4.2
SAMPLE_NO	int	Number of sample; unique within a survey
SAMPLE_TYPE	CODE	Type of the sample taken Source of code list: BODAT 4.2

Class Soil color

Package: Swiss Soil Dataset
Modified: 16.11.2018
Description: Soil color according to Munsell-Standard Soil Color Charts (1967)

Attribute

Name	Data type	Description
CODE_OF_COLORS	CODE	Code of colors (patches and matrix) according to Munsell-Standard Soil Color Charts Source of code list: Profilblatt Nr. 48-55 (FAL, 1997)
MUNSELL_COLOR_CHROMA	CODE	Chroma according to Munsell-Standard Soil Color Charts Source of code list: Profilblatt Nr. 48-55 (FAL, 1997)
MUNSELL_COLOR_HUE_TEXT	CODE	Color text of Hue according to Munsell-Standard Soil Color Charts Source of code list: Profilblatt Nr. 48-55 (FAL, 1997)
MUNSELL_COLOR_HUE_VALUE	CODE	Color value of Hue according to Munsell-Standard Soil Color Charts Source of code list: Profilblatt Nr. 48-55 (FAL, 1997)
MUNSELL_COLOR_VALUE	CODE	Value according to Munsell-Standard Soil Color Charts Source of code list: Profilblatt Nr. 48-55 (FAL, 1997)

Class Soil skeleton

Package: Swiss Soil Dataset
Modified: 16.11.2018
Description: Estimated skeleton content in horizon

Attribute

Name	Data type	Description
SKELETON	CODE	Estimated skeleton content in top/subsoil of the profile or in the horizon Source of code list: Profilblatt Nr. 19/20 (FAL, 1997)
SKELETON_TO_ORIGINAL_vol_pct	int	Estimated maximum volume of existent skeleton in top/subsoil of the profile or original information of the horizon [%]
SKELETON_FROM_ORIGINAL_vol_pct	int	Estimated minimum volume of existent skeleton in top/subsoil of the profile or original information of the horizon [%]

Class Soil surveys

Package: Swiss Soil Dataset
Modified: 16.11.2018
Description: Central Class, to which both the profile data and the analysis data are linked.
The key is uniquely composed of the soil survey number and the profile ID.

Attribute

Name	Data type	Description
SOIL_SURVEY_DATE	date	Date of soil survey

Name	Data type	Description
SOIL_SURVEY_NO	int	Number of soil survey; per survey, n-profiles (with the same type of survey) and 1 sampling can be created
SOIL_SURVEY_TYPE	CODE	Type of soil survey (profile type or sampling) Source of code list: Profilblatt Nr. 3 (FAL, 1997, erweitert)
SOIL_PROFILE_ID	char	Unique identification of the profile respectively the sampling per survey Profile = 1..n; Sampling = 0

Class Soil types

Package: Swiss Soil Dataset

Modified: 16.11.2018

Description: Classification of estimated texture class in horizon. Categorisation of clay, silt
and sand contents in ranges.

Attribute

Name	Data type	Description
CLAY_FROM_ORIGI- NAL_pct	int	estimated minimum clay content in top/subsoil of the pro- file or original information of the horizon [%]
CLAY_TO_ORIGINAL_pct	int	estimated maximum clay content in top/subsoil of the pro- file or original information of the horizon [%]
SAND_FROM_ORIGI- NAL_pct	int	estimated minimum sand content in top/subsoil of the pro- file or original information of the horizon [%]
SAND_TO_ORIGINAL_pct	int	estimated maximum sand content in in top/subsoil of the profile or original information of the horizon [%]
SILT_FROM_ORIGI- NAL_pct	int	estimated minimum silt content in top/subsoil of the profile or original information of the horizon [%]
SILT_TO_ORIGINAL_pct	int	estimated maximum silt content in top/subsoil of the profile or original information of the horizon [%]
TEXTURE_CLASS	CODE	estimated texture class in top/subsoil of the profile or in the horizon Source of code list: Profilblatt Nr. 21/22 (FAL, 1997)

Class Structure

Package: Swiss Soil Dataset

Modified: 16.11.2018

Description: Assesement of the soil structure

Attribute

Name	Data type	Description
SOIL_STRUCTURE_SHAPE	CODE	Shape of the soil structure Source of code list: Profilblatt Nr. 31 (FAL, 1997)
SOIL_STRUCTURE_SIZE	CODE	Size of the soil structure Source of code list: Profilblatt Nr. 32 (FAL, 1997)

Class Subtypes

Package: Swiss Soil Dataset
Modified: 16.11.2018
Description: Subtypes of soil profile

Attribute

Name	Data type	Description
SUBTYPE	CODE	Subtype of soil profile Source of code list: Profilblatt Nr. 18 (FAL, 1997)
SUBTYPE_GROUP	CODE	Categorization of subtype into a subtype group Source of code list: Profilblatt Nr. 18 (FAL, 1997)

Appendix: Data model of the Swiss Soil Dataset Version 6 (april 2022)

