

Monthly report

Railway Field Laboratory

April 2026

Client: Swiss confederation; Federal Offices for the Environment (FOEN) and Transport (FOT), CH-3003 Bern
The FOEN and the FOT are offices of the Federal Department of the Environment, Transport, Energy and Communications (DETEC).

Consultant: Müller-BBM Rail Technologies GmbH
Helmut-A.-Müller-Straße 1 - 5
82152 Planegg
www.MuellerBBM-Rail.com

Author: Markus Naumann, Nathan Isert, Stefan Lutzenberger

Supervision FOEN / FOT: Philipp Huber, Fredy Fischer
Franz Kuster, Christoph Dürig

Remarks: This report was published on behalf the Swiss Federal Office for the Environment (FOEN) and Transport (FOT). The consultant is responsible for the content and all data displayed.

Version: V1

Date: 6.5.2026

1. Status railway field laboratory

Construction work on the tracks:

- none

Downtimes of the measurement systems:

- none

Downtimes of the sensors:

- MQ 21: a-mq21-5-lx/y/z and a-mq21-5-ux/y/z (as of 11.9.2024 cable probably cut during mowing work)

Maintenance and sensor exchange:

- Verification of the calibration of all acceleration sensors on 28.4.2026 and 29.4.2026
- Replacement of a defective measuring card at measuring cross-section MQ 21 on 28.4.2026

Modifications to the data, database, or analysis:

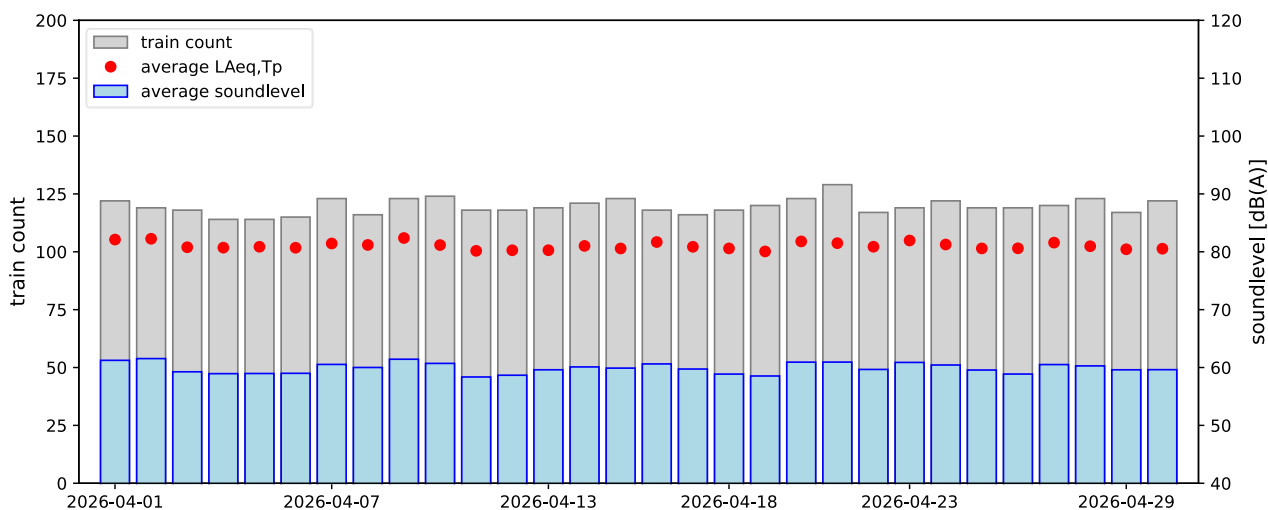
- none

Monthly data volume collected:

- 596 GB

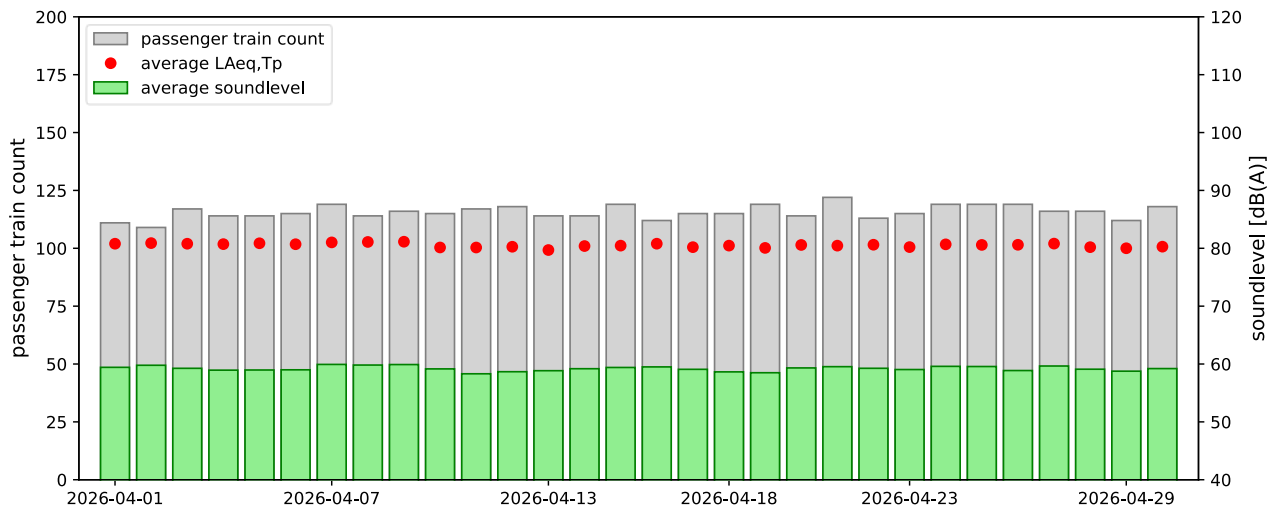
2. Measurement data

Daytime averages (24h) for all train passages at reference section (REF)



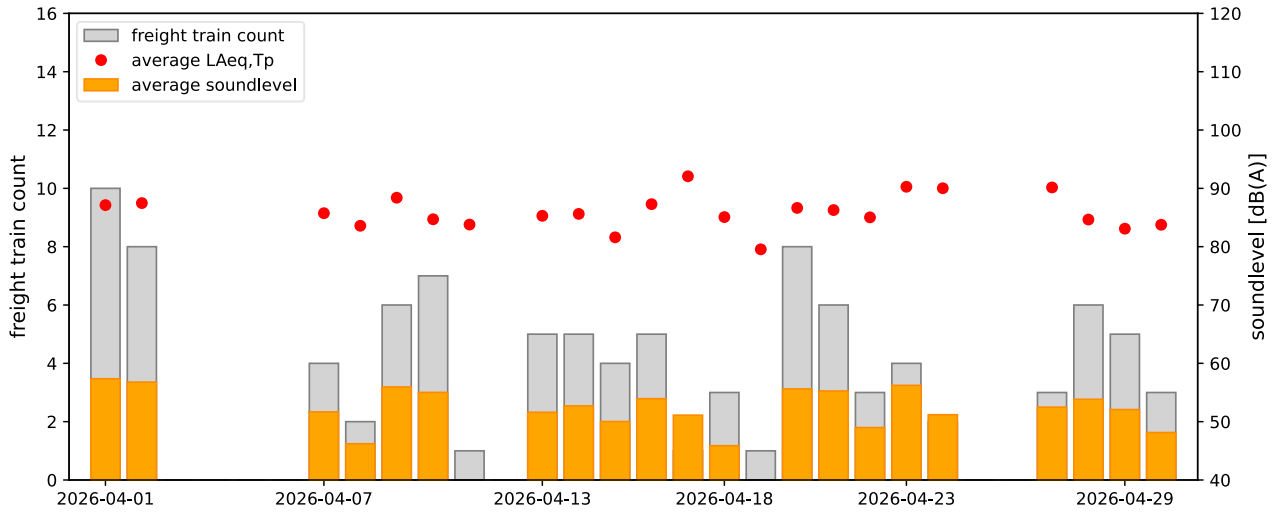
date	location	train count	passenger train count	freight train count	service train count	average LAeqTp	average soundlevel
01.04.2026	REF	122	111	10	1	82,1	61,2
02.04.2026	REF	119	109	8	2	82,3	61,5
03.04.2026	REF	118	117	0	1	80,8	59,3
04.04.2026	REF	114	114	0	0	80,7	58,9
05.04.2026	REF	114	114	0	0	80,9	59,0
06.04.2026	REF	115	115	0	0	80,7	59,0
07.04.2026	REF	123	119	4	0	81,4	60,5
08.04.2026	REF	116	114	2	0	81,2	60,0
09.04.2026	REF	123	116	6	1	82,4	61,4
10.04.2026	REF	124	115	7	2	81,2	60,7
11.04.2026	REF	118	117	1	0	80,2	58,4
12.04.2026	REF	118	118	0	0	80,3	58,7
13.04.2026	REF	119	114	5	0	80,3	59,6
14.04.2026	REF	121	114	5	2	81,0	60,1
15.04.2026	REF	123	119	4	0	80,6	59,9
16.04.2026	REF	118	112	5	1	81,7	60,6
17.04.2026	REF	116	115	1	0	80,9	59,7
18.04.2026	REF	118	115	3	0	80,6	58,9
19.04.2026	REF	120	119	1	0	80,1	58,5
20.04.2026	REF	123	114	8	1	81,8	60,9
21.04.2026	REF	129	122	6	1	81,5	60,9
22.04.2026	REF	117	113	3	1	80,9	59,7
23.04.2026	REF	119	115	4	0	82,0	60,9
24.04.2026	REF	122	119	2	1	81,3	60,4
25.04.2026	REF	119	119	0	0	80,6	59,6
26.04.2026	REF	119	119	0	0	80,6	58,9
27.04.2026	REF	120	116	3	1	81,6	60,5
28.04.2026	REF	123	116	6	1	81,0	60,3
29.04.2026	REF	117	112	5	0	80,4	59,6
30.04.2026	REF	122	118	3	1	80,5	59,6
month	REF	3589	3470	102	17	81,1	60,0

Daytime averages (24h) for all passenger train passages at reference section (REF)



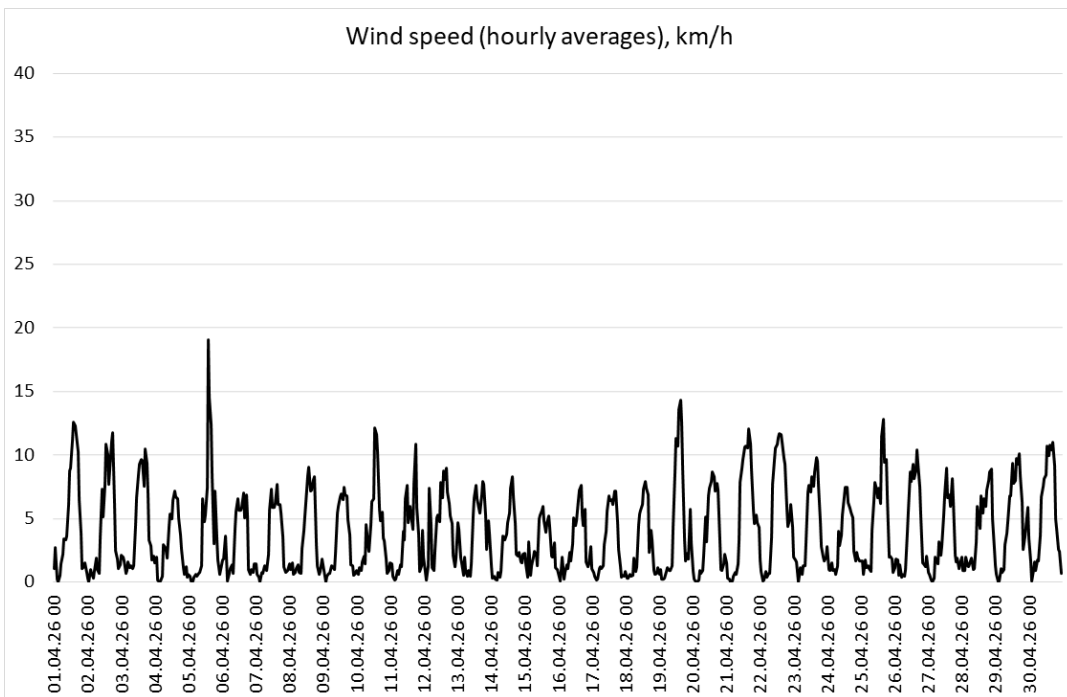
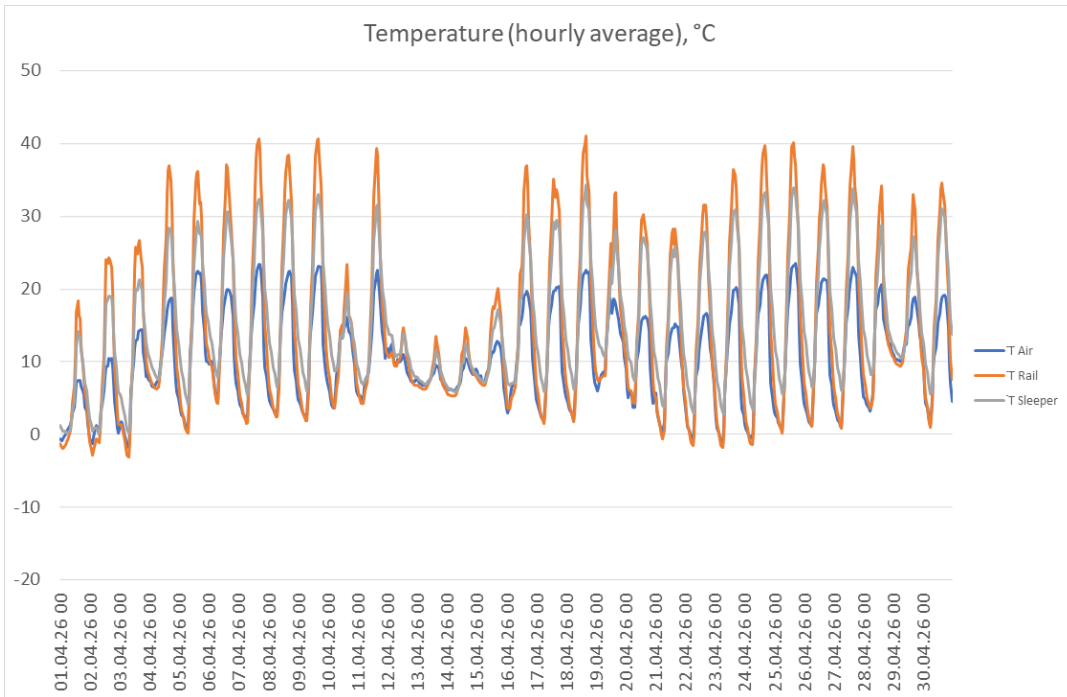
date	location	passenger train count	average speed	average length	average axlecount	average LAeqTp	average soundlevel
01.04.2026	REF	111	112,0	162,8	24,0	80,8	59,4
02.04.2026	REF	109	113,3	182,8	27,0	80,9	59,8
03.04.2026	REF	117	112,3	147,6	21,8	80,8	59,3
04.04.2026	REF	114	112,8	143,6	21,0	80,7	58,9
05.04.2026	REF	114	113,8	143,5	21,2	80,9	59,0
06.04.2026	REF	115	112,7	147,2	21,5	80,7	59,0
07.04.2026	REF	119	111,8	162,5	23,9	81,0	59,9
08.04.2026	REF	114	114,1	165,4	24,2	81,1	59,8
09.04.2026	REF	116	111,4	163,0	24,0	81,1	59,9
10.04.2026	REF	115	112,3	171,3	25,2	80,1	59,2
11.04.2026	REF	117	111,4	135,1	19,9	80,1	58,3
12.04.2026	REF	118	112,0	146,6	21,8	80,3	58,7
13.04.2026	REF	114	110,0	168,4	24,8	79,7	58,8
14.04.2026	REF	114	111,5	163,9	24,1	80,4	59,2
15.04.2026	REF	119	112,2	164,7	24,3	80,5	59,4
16.04.2026	REF	112	113,9	169,1	24,8	80,8	59,5
17.04.2026	REF	115	112,5	169,2	24,8	80,2	59,1
18.04.2026	REF	115	113,0	141,6	20,8	80,5	58,6
19.04.2026	REF	119	111,1	142,3	21,0	80,1	58,5
20.04.2026	REF	114	113,9	167,4	24,6	80,6	59,3
21.04.2026	REF	122	111,3	162,9	23,8	80,5	59,5
22.04.2026	REF	113	113,5	166,3	24,4	80,6	59,3
23.04.2026	REF	115	110,9	164,3	24,1	80,2	59,0
24.04.2026	REF	119	112,7	165,4	24,3	80,7	59,6
25.04.2026	REF	119	112,0	165,7	24,4	80,6	59,6
26.04.2026	REF	119	111,1	140,0	20,6	80,6	58,9
27.04.2026	REF	116	111,5	164,4	24,2	80,8	59,7
28.04.2026	REF	116	111,6	163,7	24,0	80,2	59,1
29.04.2026	REF	112	112,1	166,5	24,4	80,0	58,8
30.04.2026	REF	118	111,6	163,3	24,0	80,3	59,2
month	REF	3470	112,2	159,2	23,4	80,5	59,2

Daytime averages (24h) for all freight train passages at reference section (REF)



date	location	freight train count	average speed	average length	average axle count	average LAeqTp	average soundlevel
01.04.2026	REF	10	88,6	213,1	47,4	87,1	57,4
02.04.2026	REF	8	91,2	223,6	46,3	87,5	56,8
03.04.2026	REF						
04.04.2026	REF						
05.04.2026	REF						
06.04.2026	REF						
07.04.2026	REF	4	96,4	221,4	43,0	85,7	51,7
08.04.2026	REF	2	67,1	142,7	21,0	83,6	46,2
09.04.2026	REF	6	93,1	186,0	37,3	88,4	56,0
10.04.2026	REF	7	80,6	261,8	62,6	84,7	55,0
11.04.2026	REF	1	95,6	71,4	12,0	83,8	39,1
12.04.2026	REF						
13.04.2026	REF	5	86,8	172,9	39,0	85,3	51,6
14.04.2026	REF	5	91,7	207,7	48,4	85,6	52,7
15.04.2026	REF	4	72,6	286,0	60,0	81,6	50,0
16.04.2026	REF	5	79,8	168,5	30,0	87,3	53,9
17.04.2026	REF	1	88,9	172,6	26,0	92,1	51,1
18.04.2026	REF	3	78,5	49,9	11,3	85,1	45,9
19.04.2026	REF	1	55,5	85,7	18,0	79,5	38,5
20.04.2026	REF	8	84,3	191,9	42,8	86,6	55,6
21.04.2026	REF	6	82,8	261,0	50,3	86,3	55,3
22.04.2026	REF	3	83,6	168,2	38,0	85,0	49,0
23.04.2026	REF	4	92,2	213,4	43,5	90,3	56,2
24.04.2026	REF	2	86,6	138,8	19,0	90,0	51,2
25.04.2026	REF						
26.04.2026	REF						
27.04.2026	REF	3	99,5	137,4	20,7	90,2	52,5
28.04.2026	REF	6	82,6	240,2	55,3	84,7	53,8
29.04.2026	REF	5	88,2	286,3	66,4	83,1	52,1
30.04.2026	REF	3	72,4	150,2	21,3	83,8	48,1
month	REF	102	85,4	204,3	42,9	86,4	52,0

3. Weather data



Appendix: measurement quantities

Transit Exposure Level *TEL*

A-weighted sound pressure level of a single train pass-by as energetic average over the entire exposure duration T and averaged over the pass-by duration T_p .

$$TEL = 10 \log \left(\frac{1}{T_p} \int_0^T \frac{p_A^2(t)}{p_0^2} dt \right) \quad (1)$$

Where

$p_A(t)$ = the A-weighted sound pressure, [Pa]

$p_0 = 20 \mu\text{Pa}$ (reference pressure), [Pa]

$T_p = T_2 - T_1$ = pass-by duration of the train, time interval during which a train is within the measurement cross-section and which starts with the entry time T_1 into the measurement cross-section and ends with the exit time T_2 , [s]

T = time interval which starts when the smoothed sound pressure level (sound pressure level smoothed as a function of time with the frequency weighting A and a time weighting F („fast“) or averaging over a duration period of time, e.g. 100 ms) is for the last time 10 dB below that prevailing at the time of entering the measurement cross-section and which ends when the smoothed sound pressure level is for the first time 10 dB below the one at the time of leaving the measurement cross-section. [s]

A-weighted equivalent sound pressure level of the train pass-by $L_{Aeq,Tp}$

The A-weighted equivalent sound pressure level equals the (energetic) average of the sound pressure level over the train pass-by time T_p according to the following equation:

$$L_{Aeq,Tp} = 10 \log \left(\frac{1}{T_p} \int_{T_1}^{T_2} \frac{p_A^2(t)}{p_0^2} dt \right) \quad (2)$$

where

$p_A(t)$ = the A-weighted sound pressure, [Pa]

$p_0 = 20 \mu\text{Pa}$ (reference sound pressure), [Pa]

$T_p = T_2 - T_1$ = pass-by duration of the train, [s]

Sound Exposure Level *SEL*

The sound exposure level *SEL* references the acoustic energy of the entire pass-by event to one second. The *SEL* is used in calculating average sound level contributions from trains over longer periods of time (i.e. days/months/year). The *SEL* is related to the transit exposure level *TEL* through:

$$SEL = TEL - 10 \log (T_0 / T_p) \quad (3)$$

where

$$T_0 = 1 \text{ [s]}$$

T_p = pass-by duration of the train, [s]

Average sound level (period)

Average (energetic) A-weighted sound pressure level measured over a given period of time.

For the average sound level contributions from train pass-byes this equals the sum (energetic) of all sound exposure levels during the period for a given measurement position:

$$\text{average soundlevel} = 10 \cdot \log_{10} \left(\sum 10^{\frac{SEL}{10}} \right) - A1 \quad (4)$$

where

$$A1 = 10 \cdot \log_{10}(n \cdot 24 \cdot 3600) \text{ for a 24-hour period}$$

SEL (see equation 3) taken from measurement data

n = number of days being averaged over

Average $L_{Aeq,Tp}$

Average (energetic) sound level of all the A-weighted sound pressure levels from the individual equivalent sound level of all train pass-byes in a given period of time (day/month/year).

Calculated per train category and per period day/night, month, year, etc. and per measurement location:

$$\text{average } L_{Aeq,Tp} = 10 \cdot \log_{10} \left(\sum T_p \cdot 10^{\frac{L_{Aeq,Tp}}{10}} \right) + 10 \cdot \log_{10} \left(\frac{1}{\sum T_p} \right) \quad (5)$$

where

T_p = pass-by duration of the train [s]

$L_{Aeq,Tp}$ (see equation 2) is calculated directly from the measurement data