

PGT

2023

Componente geologica, idrogeologica e sismica

F11

ALLEGATO A

Settembre 2024

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PGT | Piano di Governo del Territorio

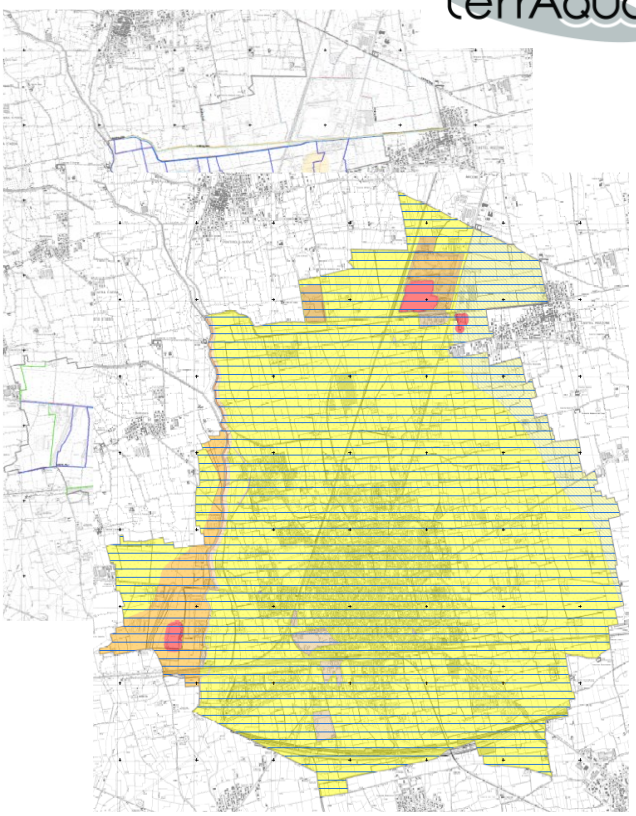
COMUNE DI **TREVIGLIO**
PROVINCIA DI BERGAMO

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COMUNE DI TREVIGLIO

Provincia di Bergamo

data:	agg.to:	archivio:
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PIANO DI GOVERNO DEL TERRITORIO

AGGIORNAMENTO DELLO STUDIO GEOLOGICO, IDROGEOLOGICO E SISMICO DEL TERRITORIO COMUNALE DI TREVIGLIO

ALLEGATO A
INDAGINI SISMICHE

TREVIGLIO2, VIA DEI CAPPUCCINI 1

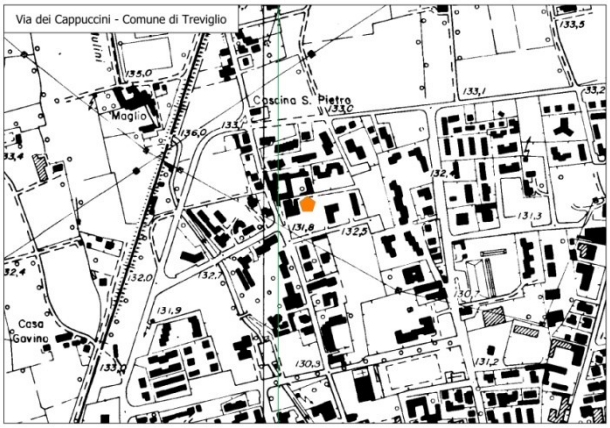
Start recording: 20/02/20 09:31:37 End recording: 20/02/20 09:51:38
Trace length: 0h20'00". Analyzed 75% trace (manual window selection)
Sampling rate: 128 Hz

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Array geometry (x): 0.0 3.0 6.0 9.0 12.0 15.0 18.0 21.0 24.0 27.0 30.0 33.0 36.0 39.0 42.0 45.0 48.0 m.

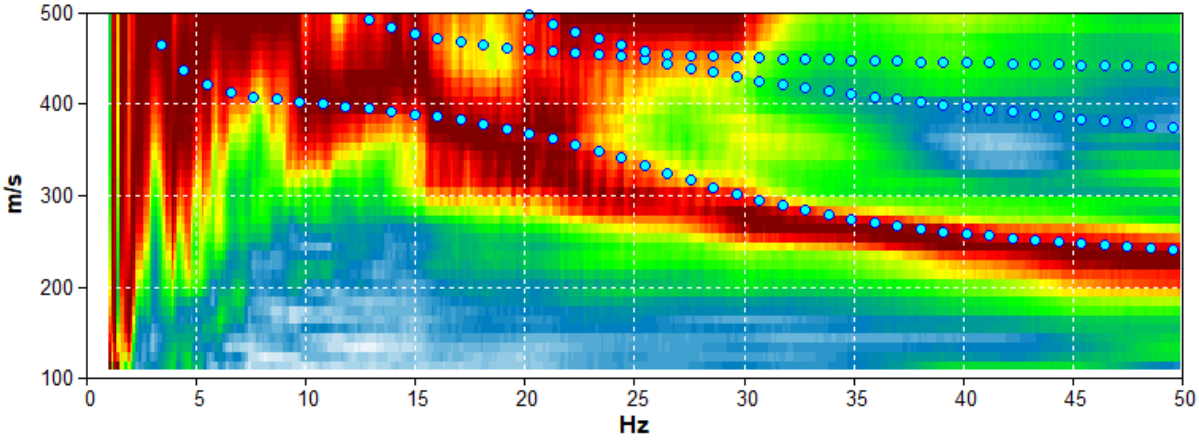


Foto



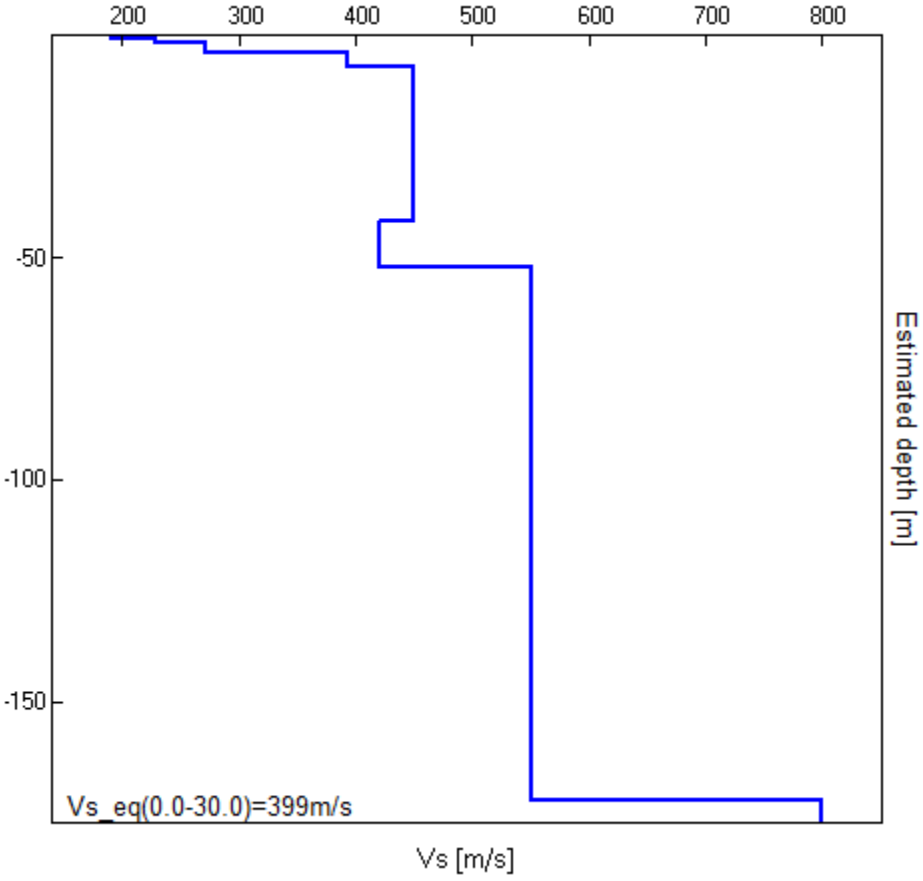
Estratto mappa

MODELLED RAYLEIGH WAVE PHASE VELOCITY DISPERSION CURVE



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.80	0.80	190	0.45
1.50	0.70	228	0.42
4.00	2.50	272	0.42
7.00	3.00	393	0.42
42.00	35.00	450	0.45
52.00	10.00	420	0.46
172.00	120.00	550	0.45
inf.	inf.	800	0.45

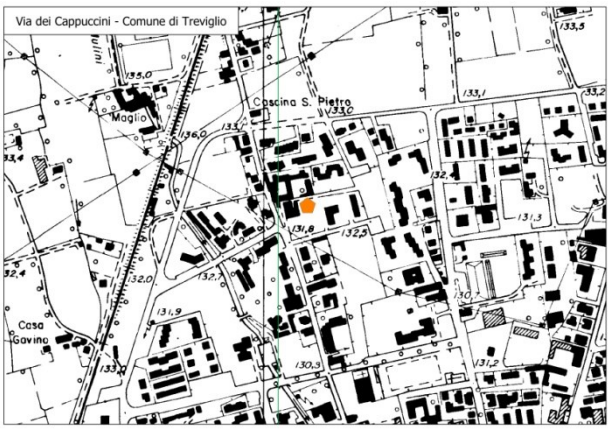
Vs_eq(0.0-30.0)=399m/s


200
300
400
500
600
700
800
-50
-100
-150
Vs_eq(0.0-30.0)=399m/s
Vs [m/s]
Estimated depth [m]

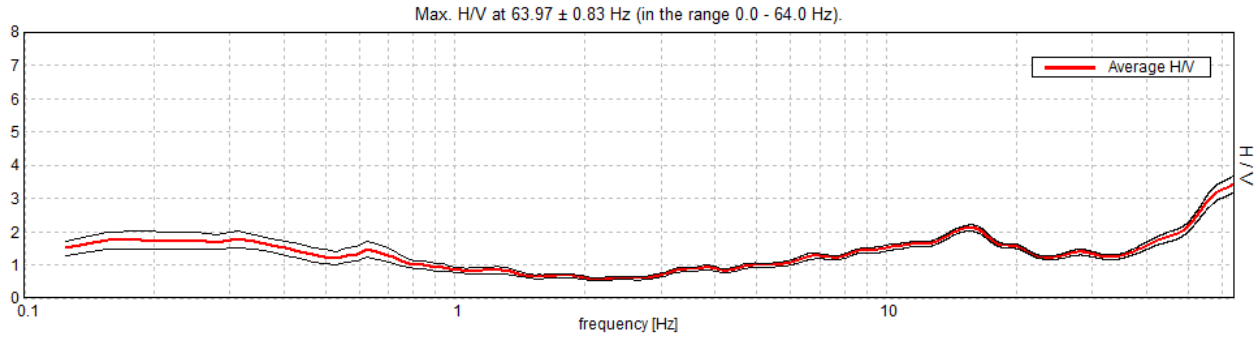
TREVIGLIO2, VIA DEI CAPPUCCINI 1

Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 20/02/20 09:31:37 End recording: 20/02/20 09:51:38
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

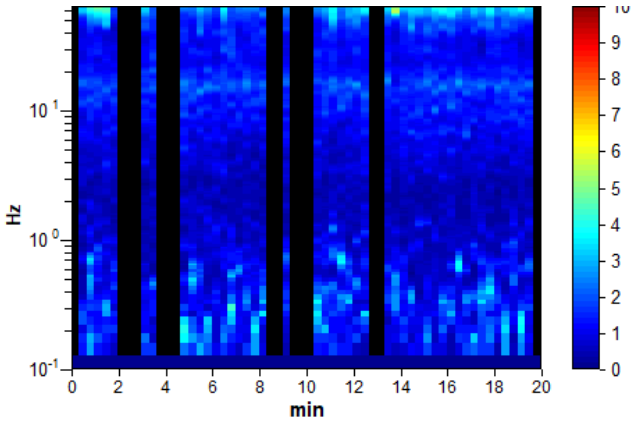
Trace length: 0h20'00". Analyzed 75% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

	
Foto	Estratto mappa

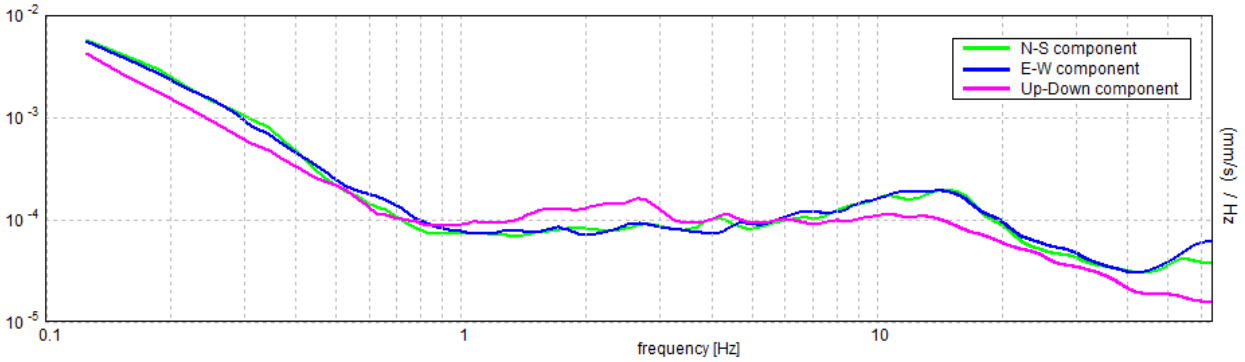
HORIZONTAL TO VERTICAL SPECTRAL RATIO



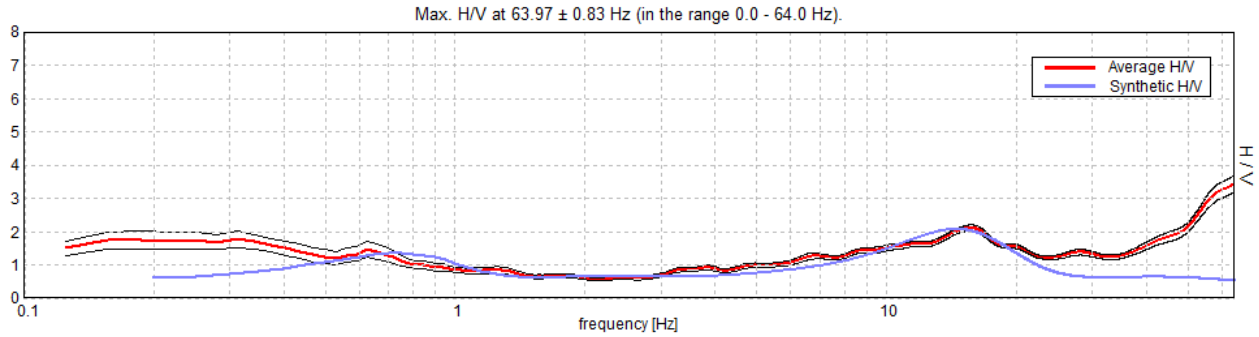
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

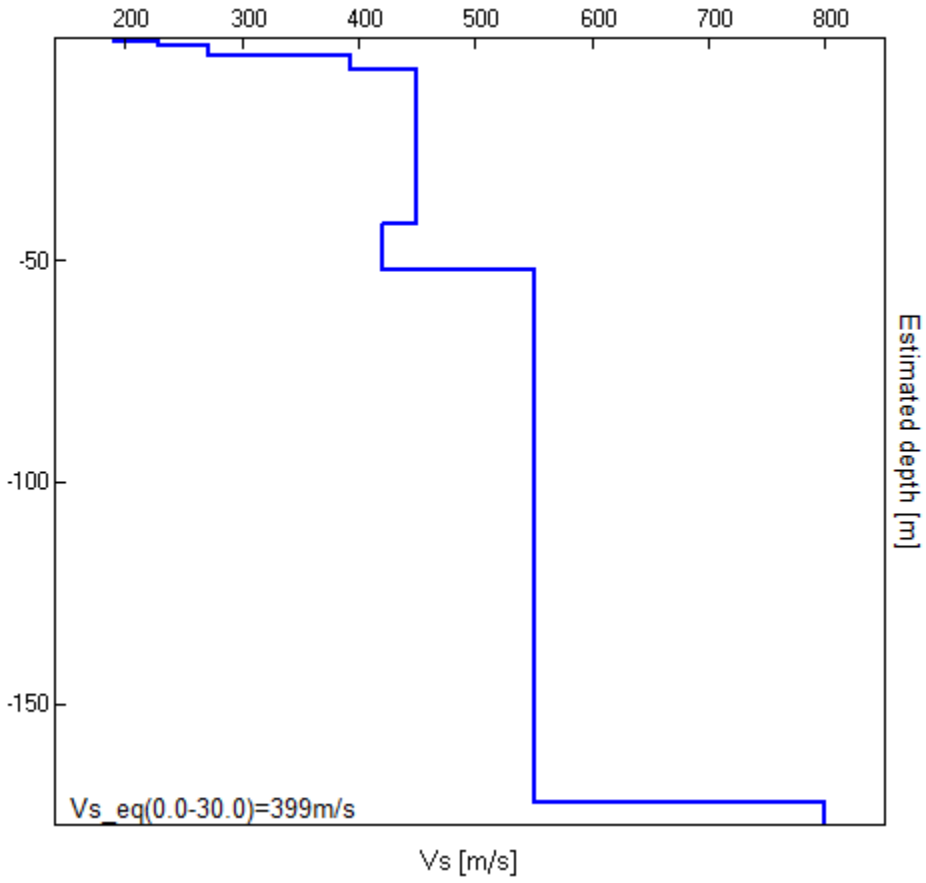


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.80	0.80	190	0.45
1.50	0.70	228	0.42
4.00	2.50	272	0.42
7.00	3.00	393	0.42
42.00	35.00	450	0.45
52.00	10.00	420	0.46
172.00	120.00	550	0.45
inf.	inf.	800	0.45

Vs_eq(0.0-30.0)=399m/s



[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 63.97 ± 0.83 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	63.97 > 0.50	OK	
$n_c(f_0) > 200$	57571.9 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 1026 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	42.281 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	3.44 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.01301| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.83255 < 3.19844	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.2595 < 1.58	OK	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

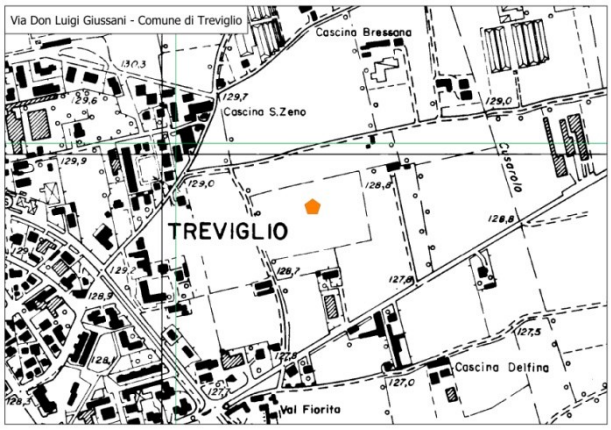
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

TREVIGLIO2, VIA GIUSSANI 1

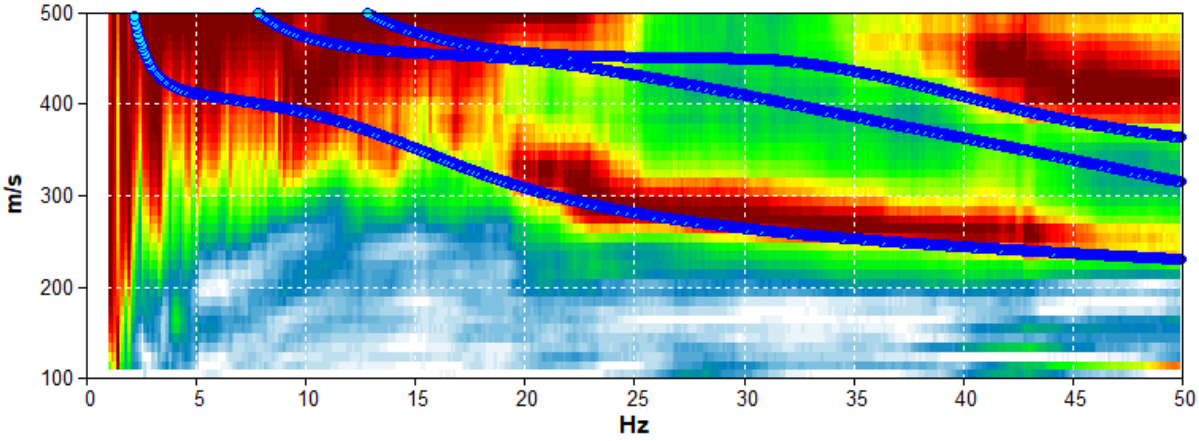
Start recording: 20/02/20 10:23:36 End recording: 20/02/20 10:43:37
Trace length: 0h20'00". Analyzed 85% trace (manual window selection)
Sampling rate: 128 Hz

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Array geometry (x): 0.0 3.0 6.0 9.0 12.0 15.0 18.0 21.0 24.0 27.0 30.0 33.0 36.0 39.0 42.0 45.0 48.0 m.

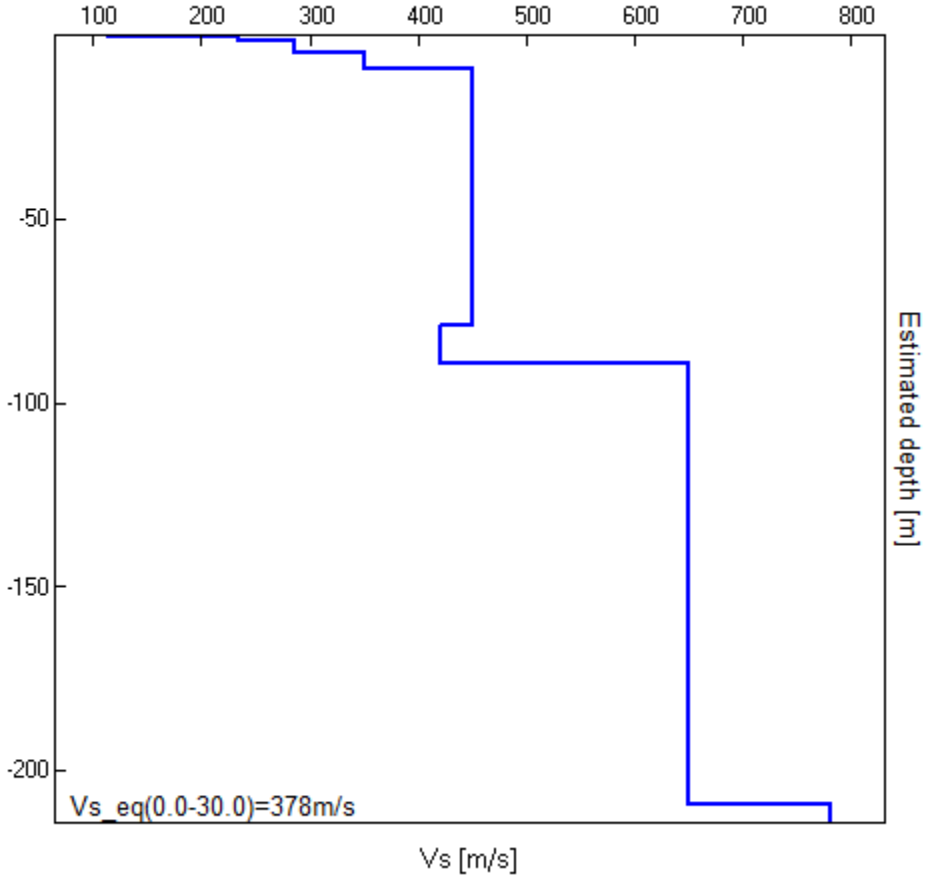
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<tr><td>Foto</td><td>Estratto mappa</td></tr>
</table>

MODELLED RAYLEIGH WAVE PHASE VELOCITY DISPERSION CURVE



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.60	0.60	115	0.42
1.60	1.00	235	0.42
4.60	3.00	286	0.42
9.10	4.50	350	0.45
19.10	10.00	450	0.45
79.10	60.00	450	0.45
89.10	10.00	420	0.45
209.10	120.00	650	0.42
inf.	inf.	780	0.42

Vs_eq(0.0-30.0)=378m/s


100
200
300
400
500
600
700
800
-50
-100
-150
-200
Vs_eq(0.0-30.0)=378m/s
Vs [m/s]
Estimated depth [m]

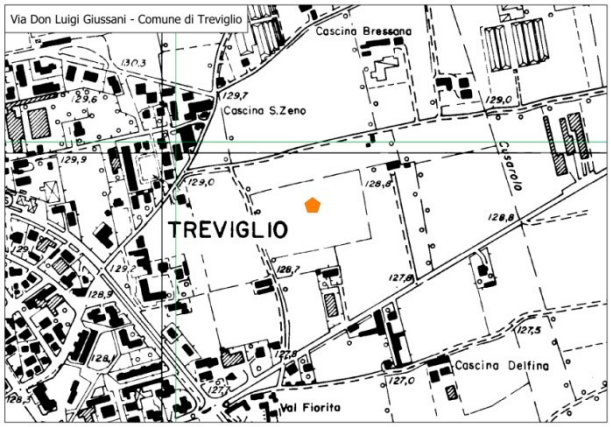
TREVIGLIO2, VIA GIUSSANI 1

Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 20/02/20 10:23:36 End recording: 20/02/20 10:43:37
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 85% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

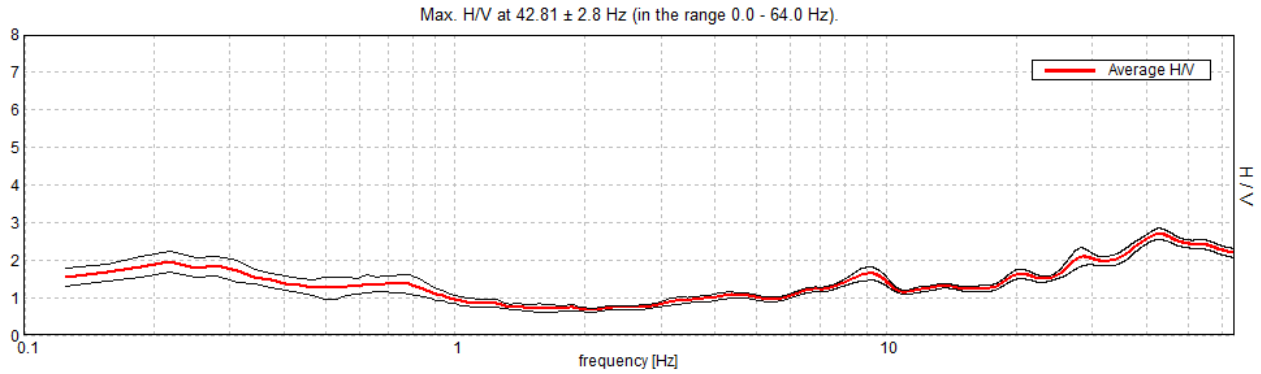


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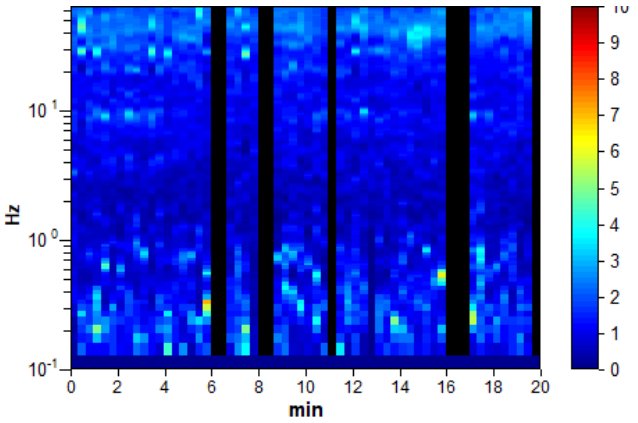


Estratto mappa

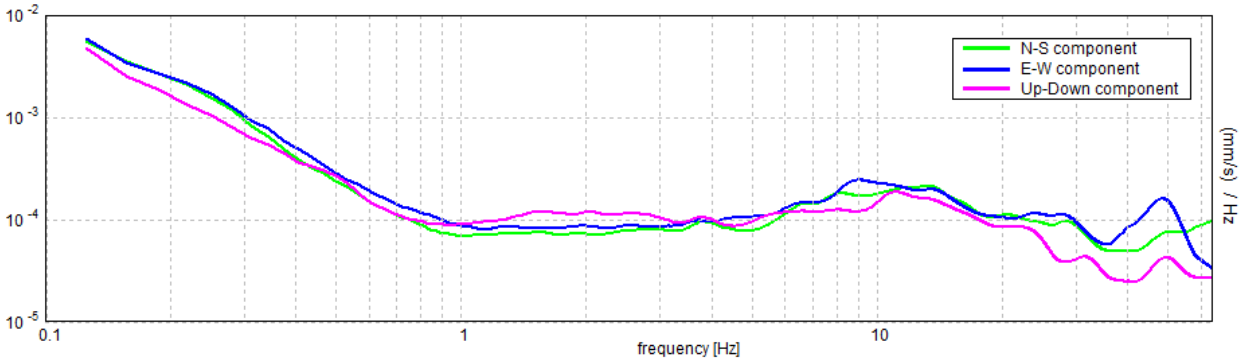
HORIZONTAL TO VERTICAL SPECTRAL RATIO



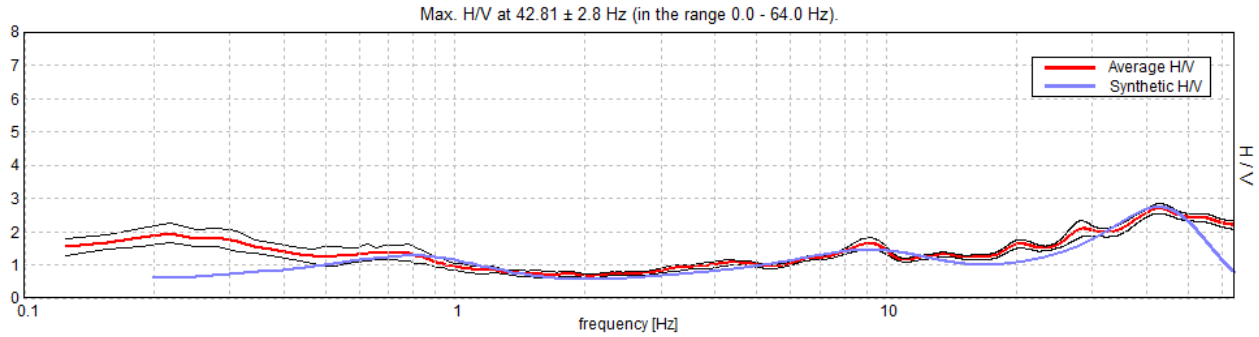
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

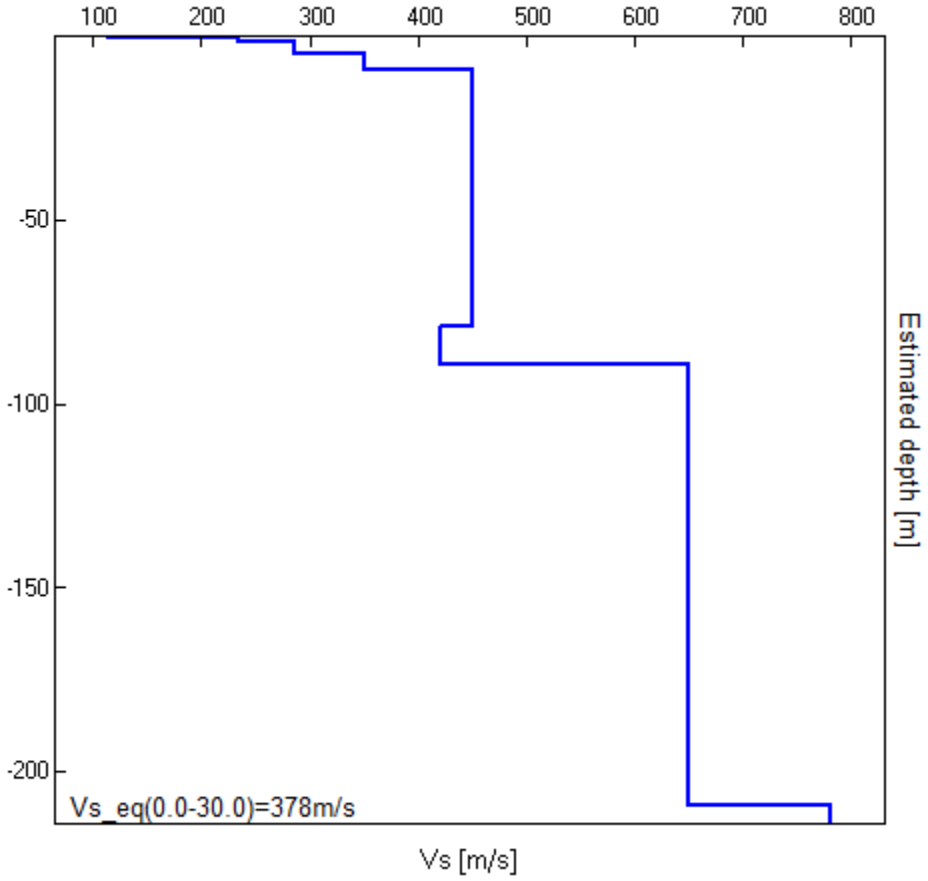


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.60	0.60	115	0.42
1.60	1.00	235	0.42
4.60	3.00	286	0.42
9.10	4.50	350	0.45
19.10	10.00	450	0.45
79.10	60.00	450	0.45
89.10	10.00	420	0.45
209.10	120.00	650	0.42
inf.	inf.	780	0.42

Vs_eq(0.0-30.0)=378m/s



[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 42.81 ± 2.8 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	42.81 > 0.50	OK	
$n_c(f_0) > 200$	43668.8 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 1364 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	18.313 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.70 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.0653| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	2.79553 < 2.14063		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1516 < 1.58	OK	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

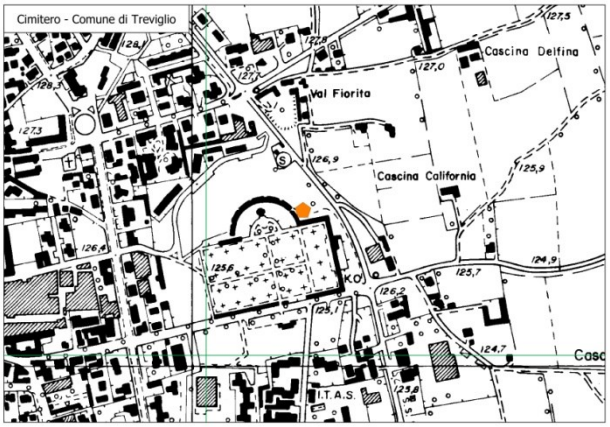
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

TREVIGLIO2, CIMITERO 1

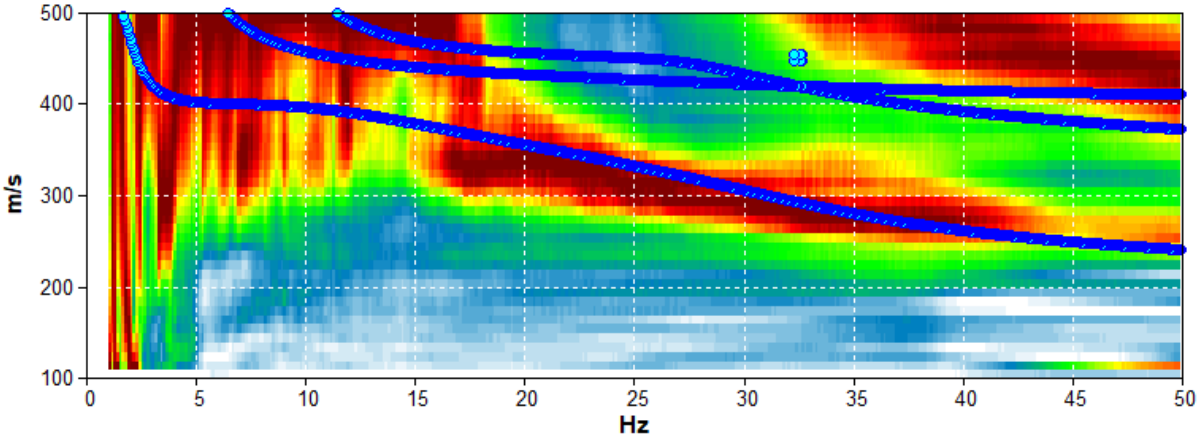
Start recording: 20/02/20 11:08:37 End recording: 20/02/20 11:28:37
Trace length: 0h20'00". Analysis performed on the entire trace.
Sampling rate: 128 Hz

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Array geometry (x): 0.0 3.0 6.0 9.0 12.0 15.0 18.0 21.0 24.0 27.0 30.0 33.0 36.0 39.0 42.0 45.0 48.0 m.

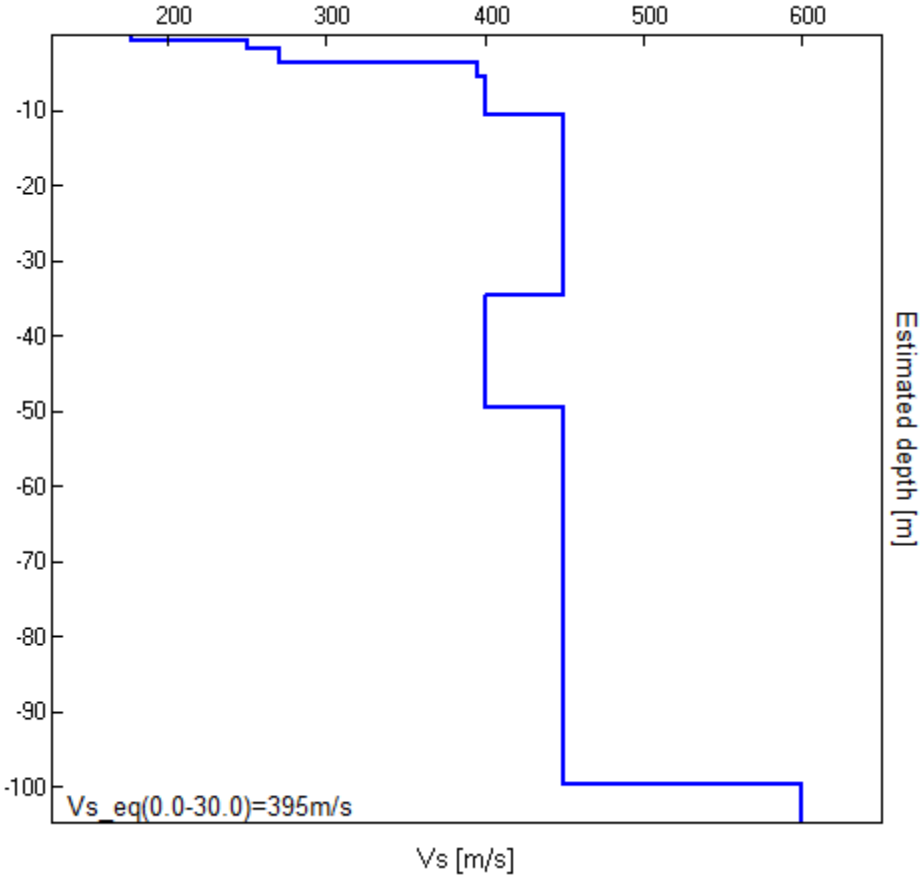
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</table>

MODELLED RAYLEIGH WAVE PHASE VELOCITY DISPERSION CURVE



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.80	0.80	177	0.42
1.80	1.00	250	0.42
3.60	1.80	270	0.42
5.60	2.00	395	0.45
10.60	5.00	400	0.44
34.60	24.00	450	0.46
49.60	15.00	400	0.46
99.60	50.00	450	0.46
inf.	inf.	600	0.42

Vs_eq(0.0-30.0)=395m/s


200
300
400
500
600
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Vs_eq(0.0-30.0)=395m/s
Estimated depth [m]
Vs [m/s]

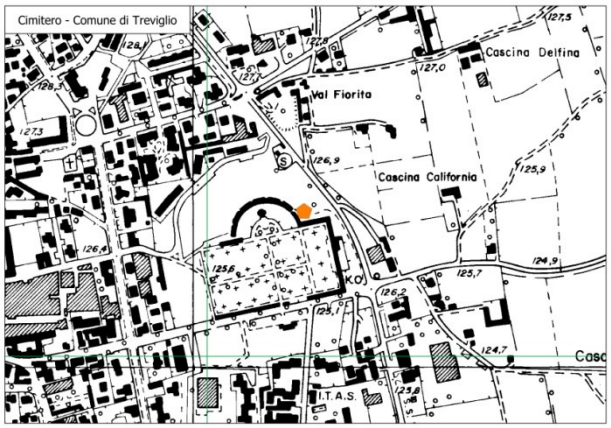
TREVIGLIO2, CIMITERO 1

Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 20/02/20 11:08:37 End recording: 20/02/20 11:28:37
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analysis performed on the entire trace.
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

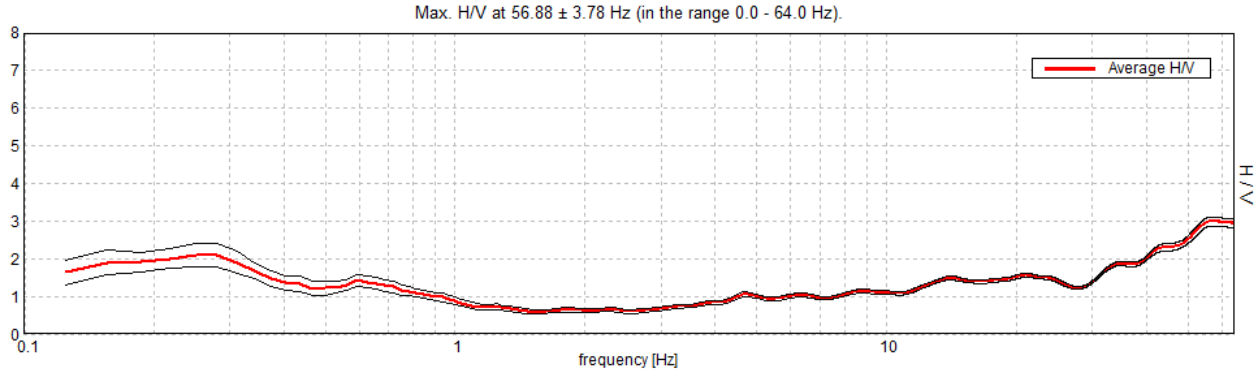


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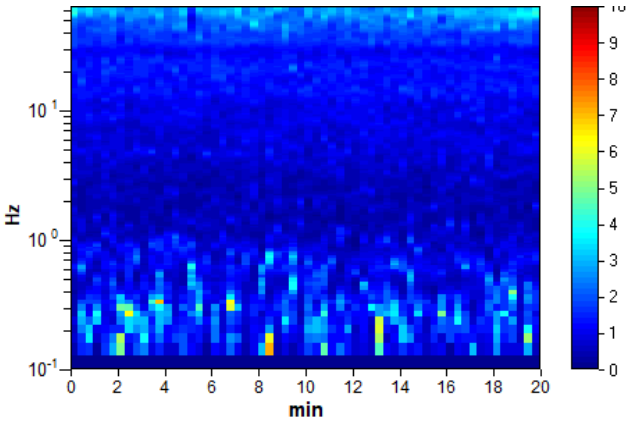


Estratto mappa

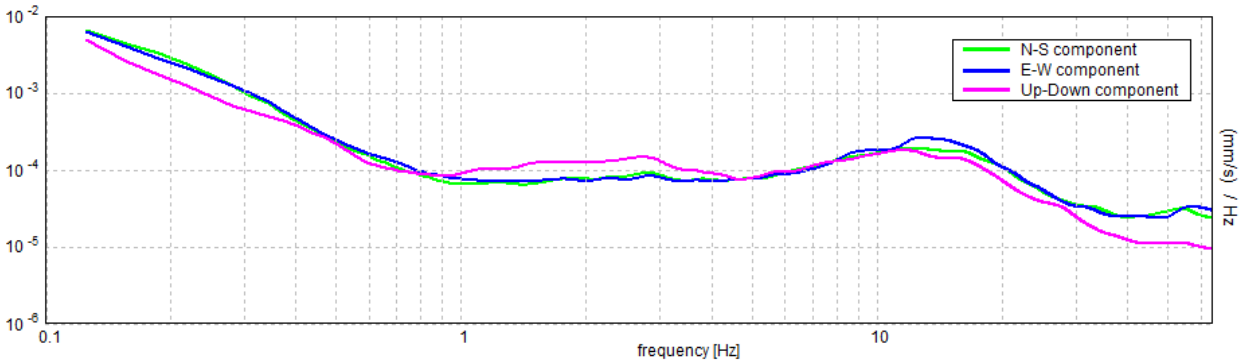
HORIZONTAL TO VERTICAL SPECTRAL RATIO



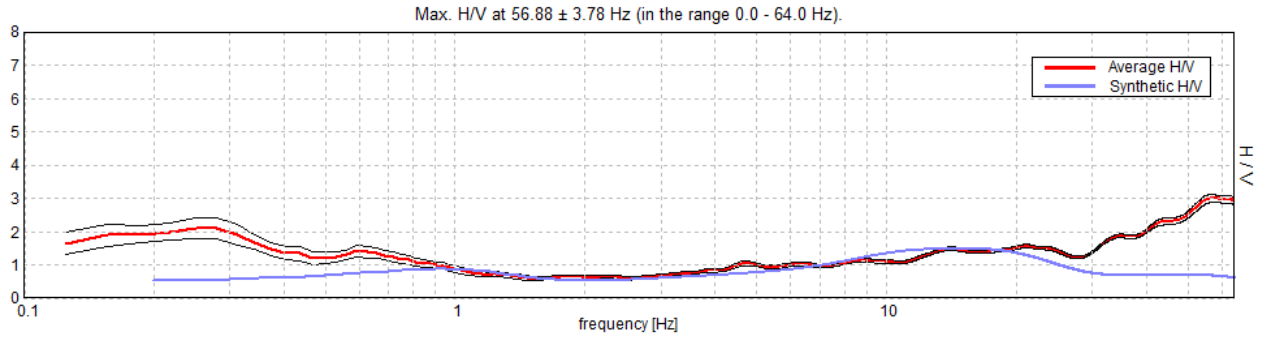
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

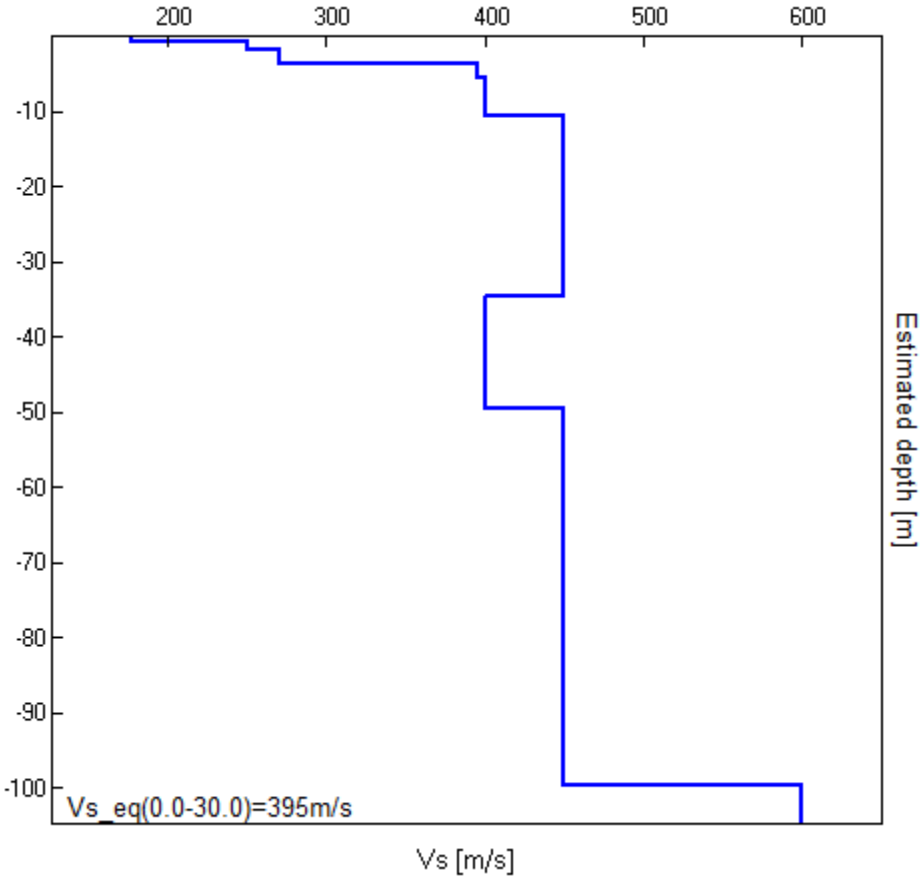


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.80	0.80	177	0.42
1.80	1.00	250	0.42
3.60	1.80	270	0.42
5.60	2.00	395	0.45
10.60	5.00	400	0.44
34.60	24.00	450	0.46
49.60	15.00	400	0.46
99.60	50.00	450	0.46
inf.	inf.	600	0.42

Vs_eq(0.0-30.0)=395m/s



[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 56.88 ± 3.78 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	56.88 > 0.50	OK	
$n_c(f_0) > 200$	68250.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 1139 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	30.75 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.99 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.06649| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	3.78171 < 2.84375		NO
$\sigma_A(f_0) < \theta(f_0)$	0.1184 < 1.58	OK	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

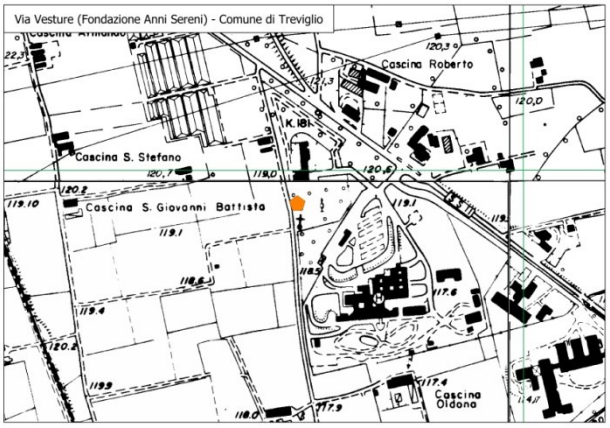
Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

TREVIGLIO, T04 – Via Vesture (Fondazione Anni Sereni)

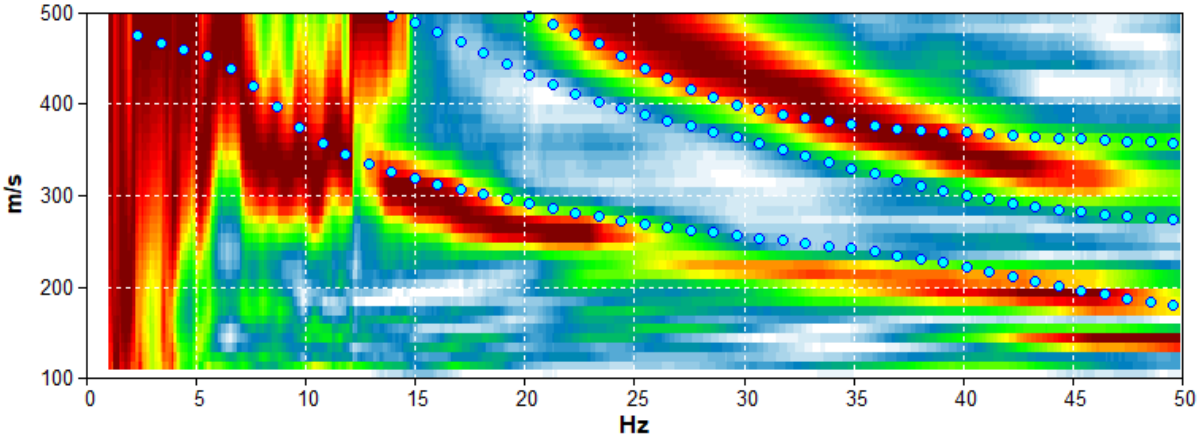
Start recording: 20/02/2012:23:06 End recording: 20/02/20 12:43:06
Trace length: 0h20'00". Analyzed 83% trace (manual window selection)
Sampling rate: 128 Hz

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Array geometry (x): 0.0 3.0 6.0 9.0 12.0 15.0 18.0 21.0 24.0 27.0 30.0 33.0 36.0 39.0 42.0 45.0 48.0 m.

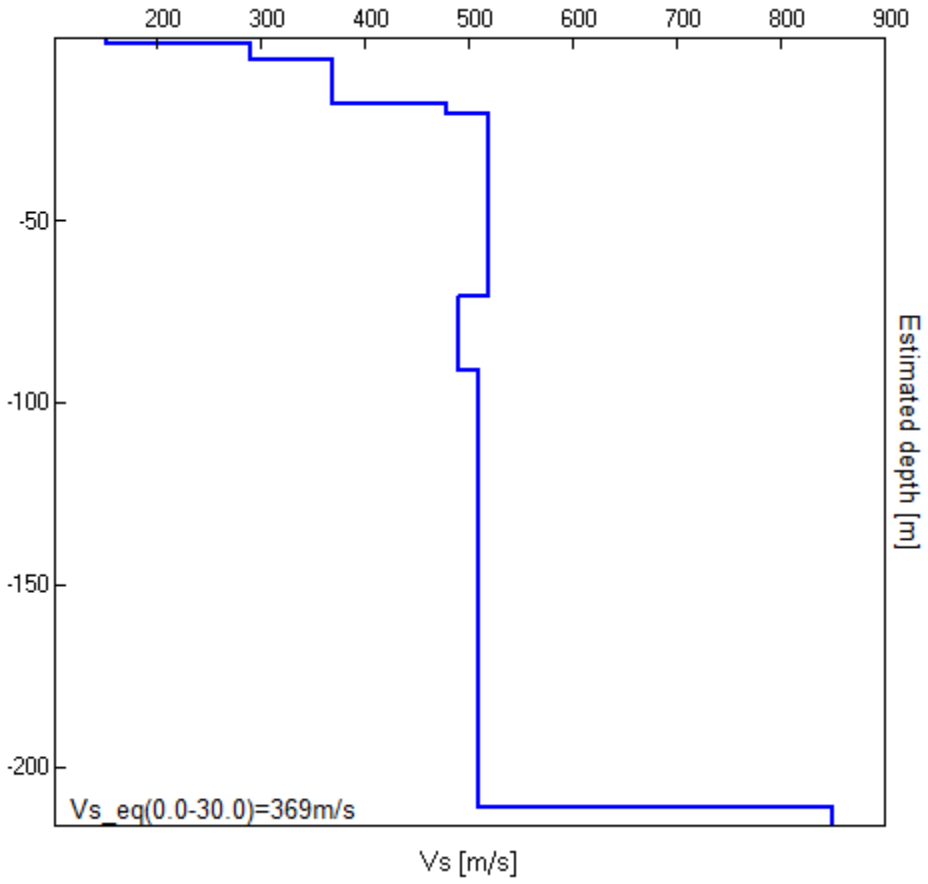
<table>
<tr><td></td><td>
</td></tr>
<tr><td>Foto</td><td>Estratto mappa</td></tr>
</table>

MODELLED RAYLEIGH WAVE PHASE VELOCITY DISPERSION CURVE



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
1.50	1.50	153	0.42
6.00	4.50	290	0.42
18.00	12.00	370	0.46
21.00	3.00	479	0.44
71.00	50.00	520	0.44
91.00	20.00	490	0.44
211.00	120.00	510	0.42
inf.	inf.	850	0.42

Vs_eq(0.0-30.0)=369m/s


200
300
400
500
600
700
800
900
-50
-100
-150
-200
Vs_eq(0.0-30.0)=369m/s
Vs [m/s]
Estimated depth [m]

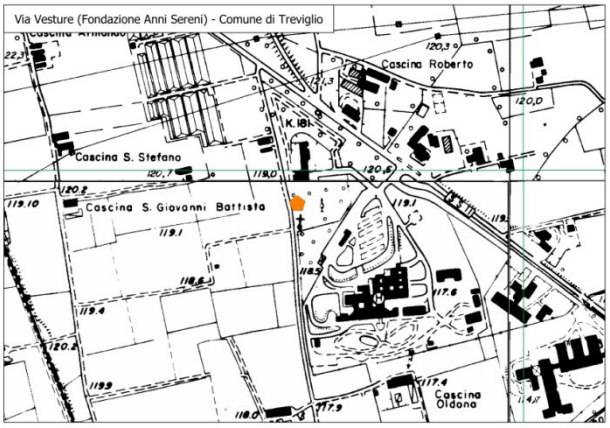
TREVIGLIO, T04 - Via Vesture (Fondazione Anni Sereni)

Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 20/02/2012:03:06 End recording: 20/02/20 12:23:06
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 83% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothingtype: Triangularwindow
Smoothing: 10%

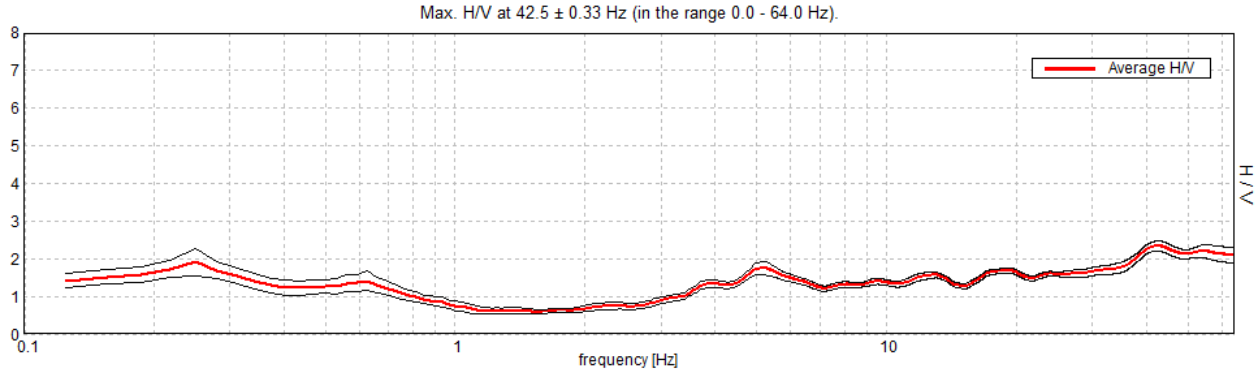


Foto

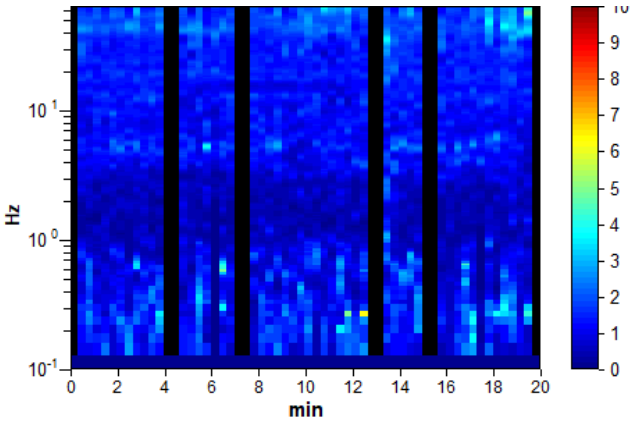


Estratto mappa

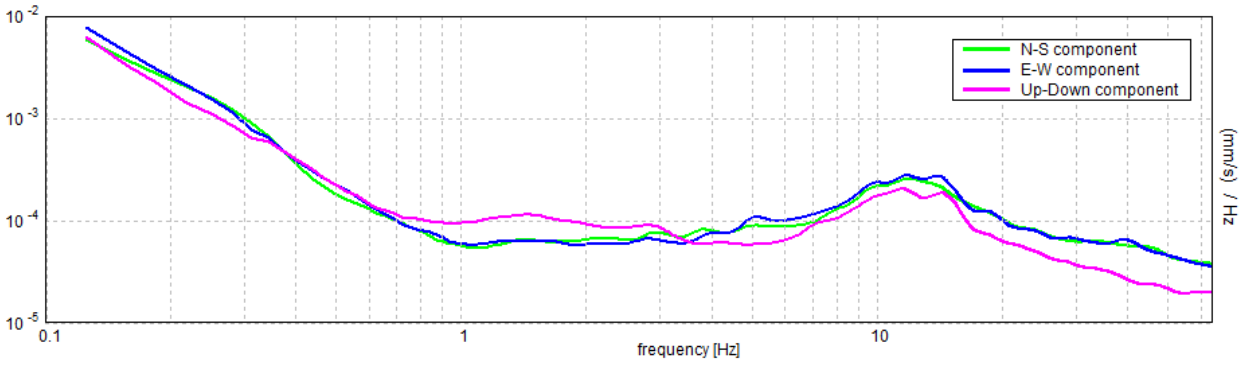
HORIZONTAL TO VERTICAL SPECTRAL RATIO



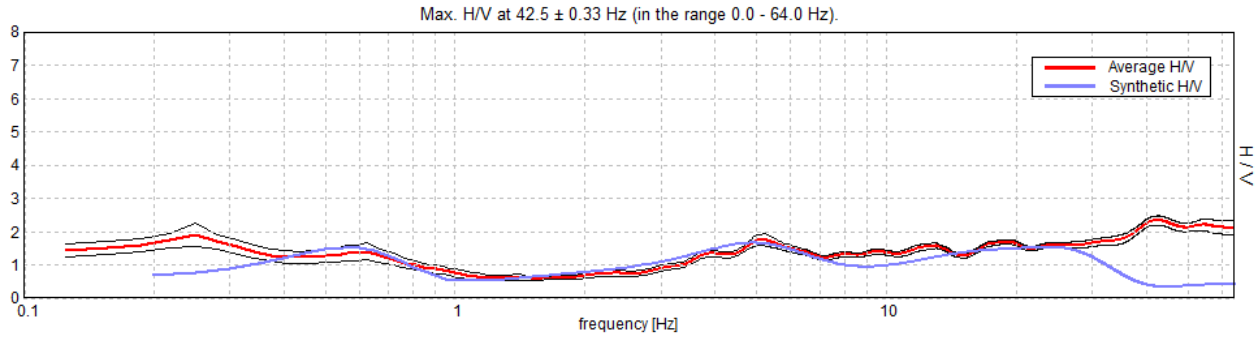
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

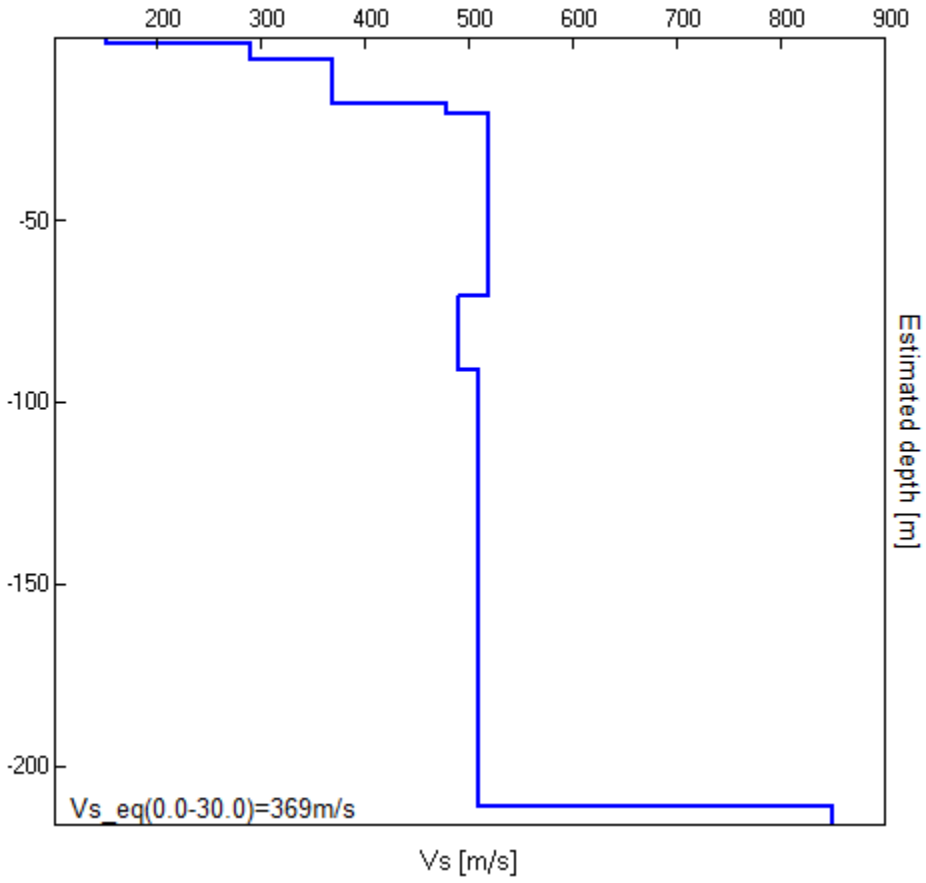


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
1.50	1.50	153	0.42
6.00	4.50	290	0.42
18.00	12.00	370	0.46
21.00	3.00	479	0.44
71.00	50.00	520	0.44
91.00	20.00	490	0.44
211.00	120.00	510	0.42
inf.	inf.	850	0.42

Vs_eq(0.0-30.0)=369m/s



[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 42.5 ± 0.33 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	42.50 > 0.50	OK	
$n_c(f_0) > 200$	42500.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 1369 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$			NO
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.33 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.00772| < 0.05	OK	
$\sigma_f < \varepsilon(f_0)$	0.32802 < 2.125	OK	
$\sigma_A(f_0) < \theta(f_0)$	0.1378 < 1.58	OK	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{logH/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{logH/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

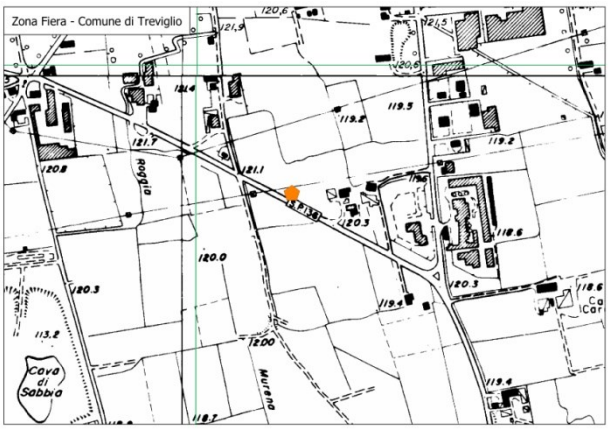
TREVIGLIO, T05_FIERA

Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 20/02/20 14:13:51 End recording: 20/02/20 14:33:51
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analyzed 93% trace (manual window selection)
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

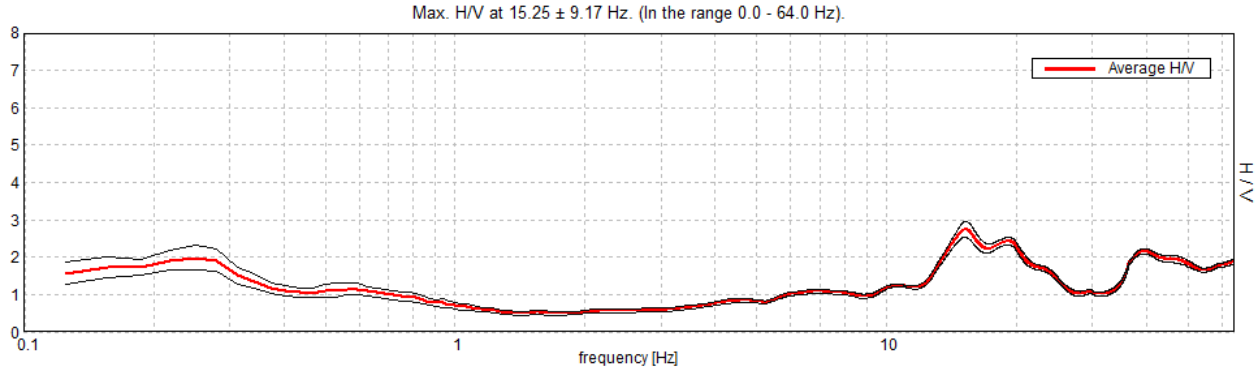


Foto

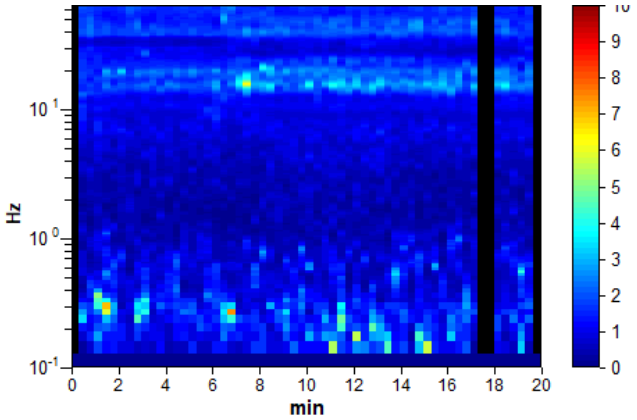


Estratto mappa

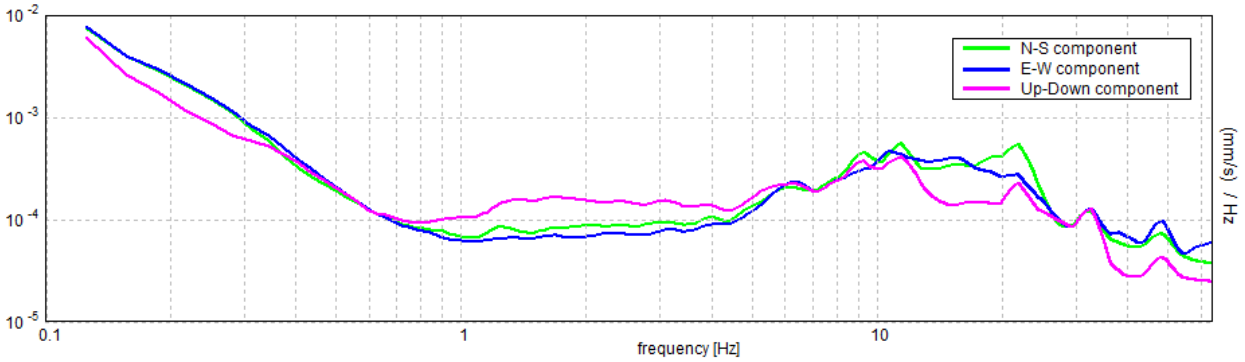
HORIZONTAL TO VERTICAL SPECTRAL RATIO



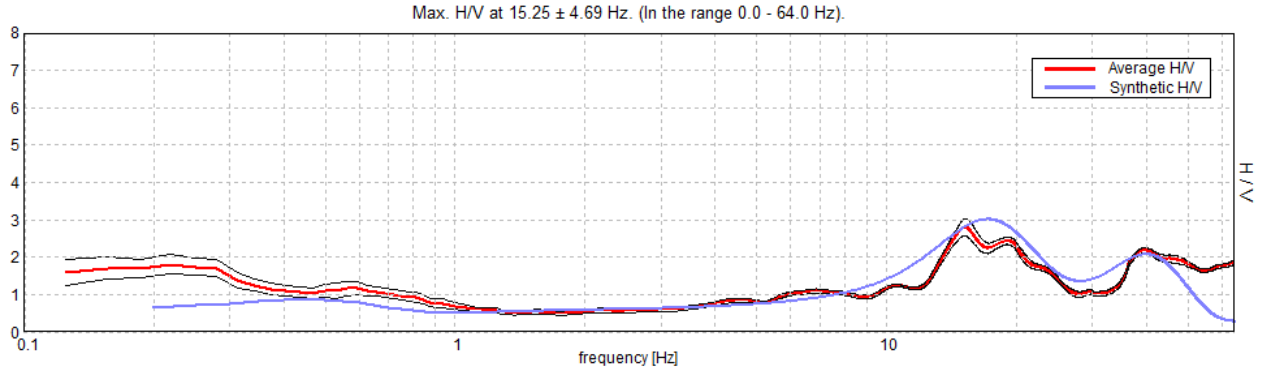
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

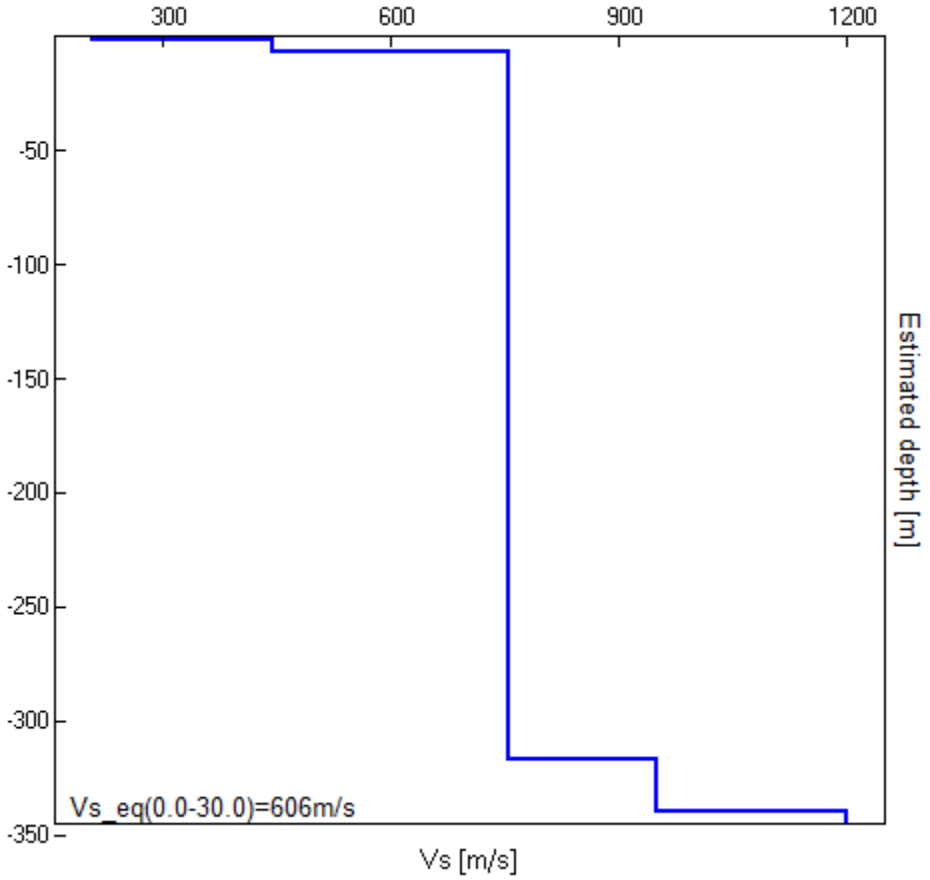


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
1.40	1.40	210	0.42
6.80	5.40	446	0.42
316.80	310.00	755	0.30
339.80	23.00	950	0.10
inf.	inf.	1200	0.40

Vs_eq(0.0-30.0)=606m/s



[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 15.25 ± 9.17 Hz (in the range 0.0 - 64.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	15.25 > 0.50	OK	
$n_c(f_0) > 200$	17080.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 733 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	12.469 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$	25.094 Hz	OK	
$A_0 > 2$	2.75 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.60144| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	9.17195 < 0.7625		NO
$\sigma_A(f_0) < \theta(f_0)$	0.2107 < 1.58	OK	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20

TREVIGLIO, T06 - PALAFACCHETTI

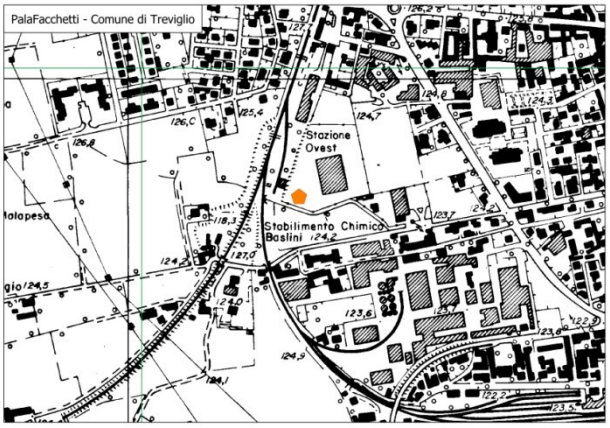
Start recording: 20/02/20 14:20:50 End recording: 20/02/2014:40:50
Trace length: 0h20'00". Analysis performed on the entire trace.
Sampling rate: 128 Hz

Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN

Array geometry (x): 0.0 3.0 6.0 9.0 12.0 15.0 18.0 21.0 24.0 27.0 30.0 33.0 36.0 39.0 42.0 45.0 48.0 m.

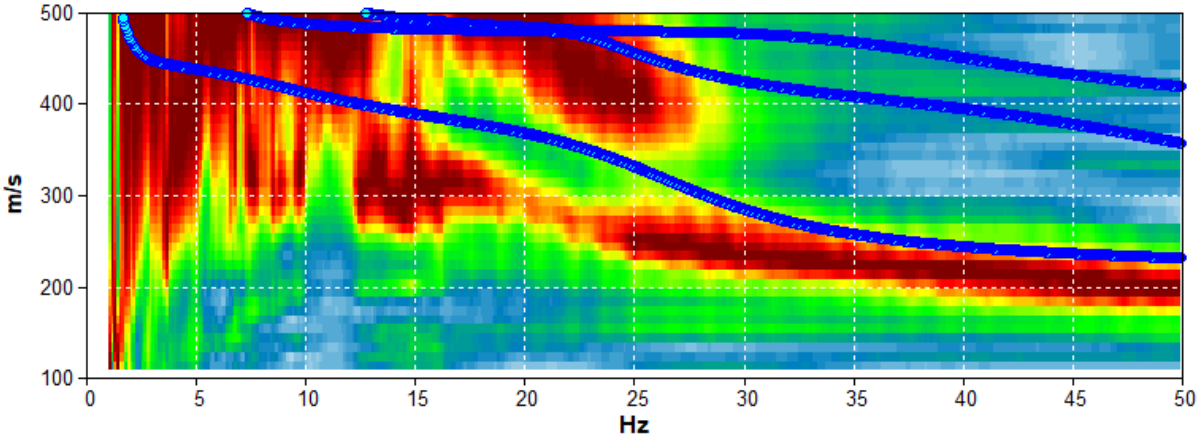


Foto



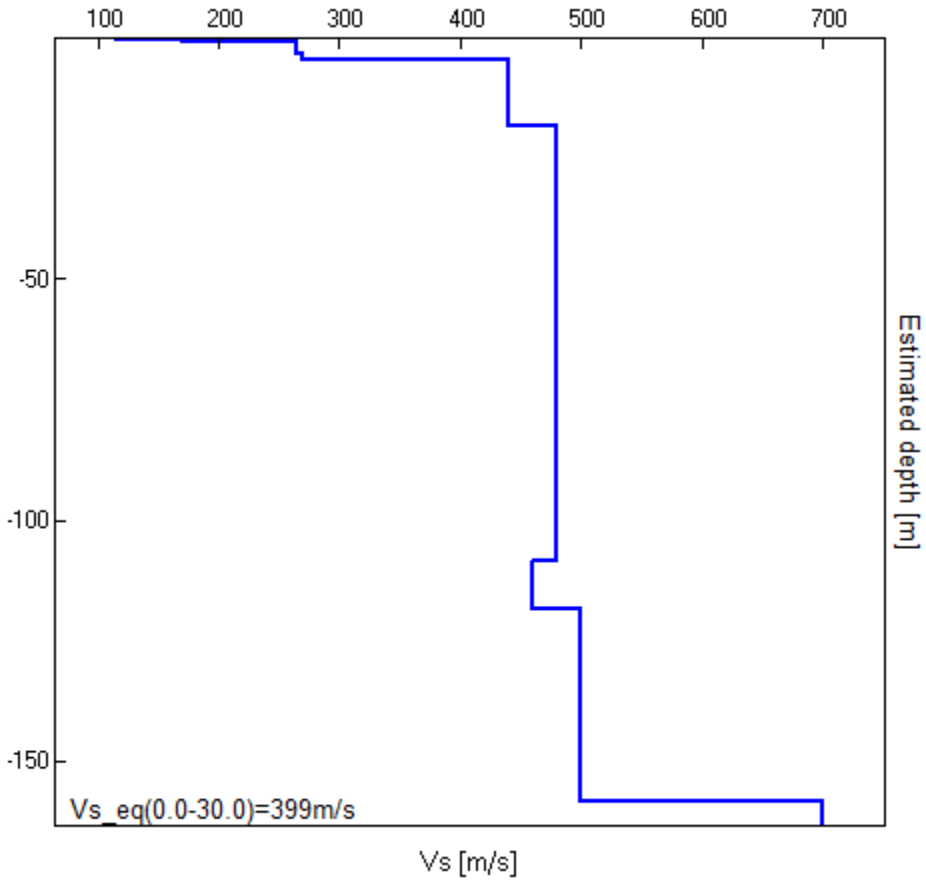
Estratto mappa

MODELLED RAYLEIGH WAVE PHASE VELOCITY DISPERSION CURVE



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.40	0.40	115	0.42
0.80	0.40	170	0.42
3.30	2.50	265	0.42
4.30	1.00	270	0.45
18.30	14.00	440	0.45
108.30	90.00	480	0.45
118.30	10.00	460	0.45
158.30	40.00	500	0.44
inf.	inf.	700	0.43

Vs_eq(0.0-30.0)=399m/s


100
200
300
400
500
600
700
-50
-100
-150
Vs_eq(0.0-30.0)=399m/s
Vs [m/s]
Estimated depth [m]

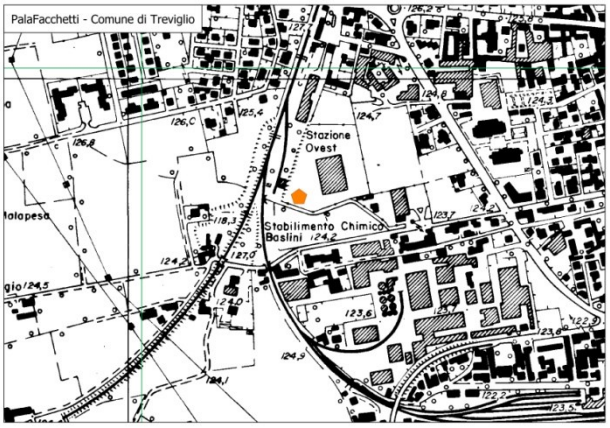
TREVIGLIO, T06 - PALAFACCHETTI

Instrument: TEN-0031/01-07
Data format: 16 byte
Full scale [mV]: n.a.
Start recording: 20/02/2014:55:50 End recording: 20/02/20 15:15:50
Channel labels: NORTH SOUTH; EAST WEST ; UP DOWN
GPS data not available

Trace length: 0h20'00". Analysis performed on the entire trace.
Sampling rate: 128 Hz
Window size: 20 s
Smoothing type: Triangular window
Smoothing: 10%

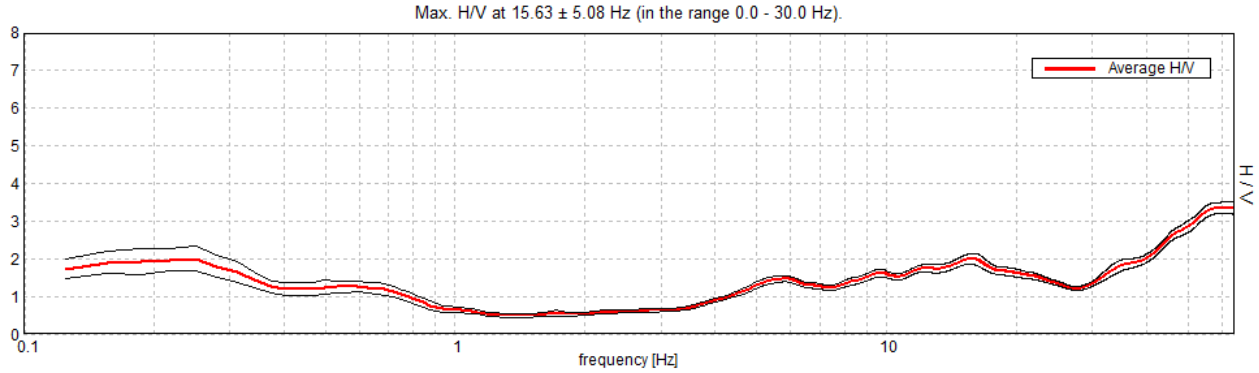


Foto

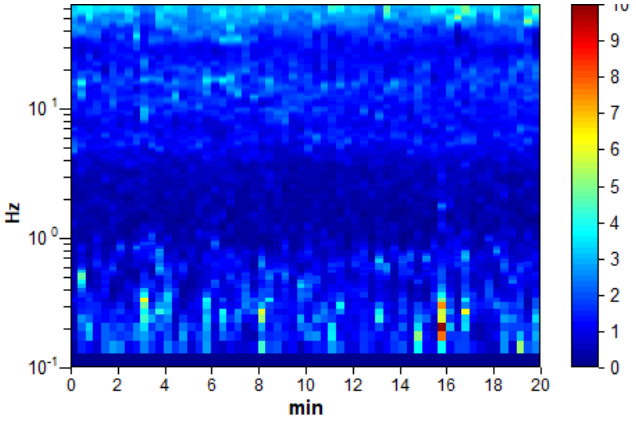


Estratto mappa

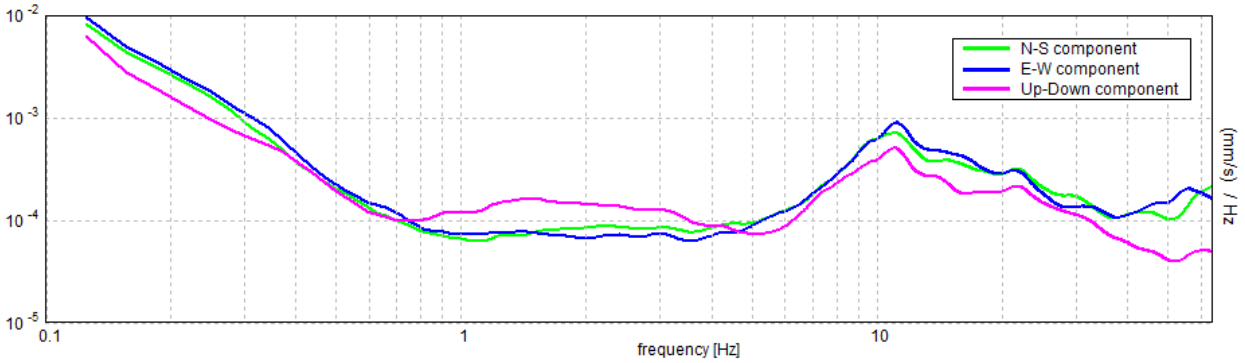
HORIZONTAL TO VERTICAL SPECTRAL RATIO



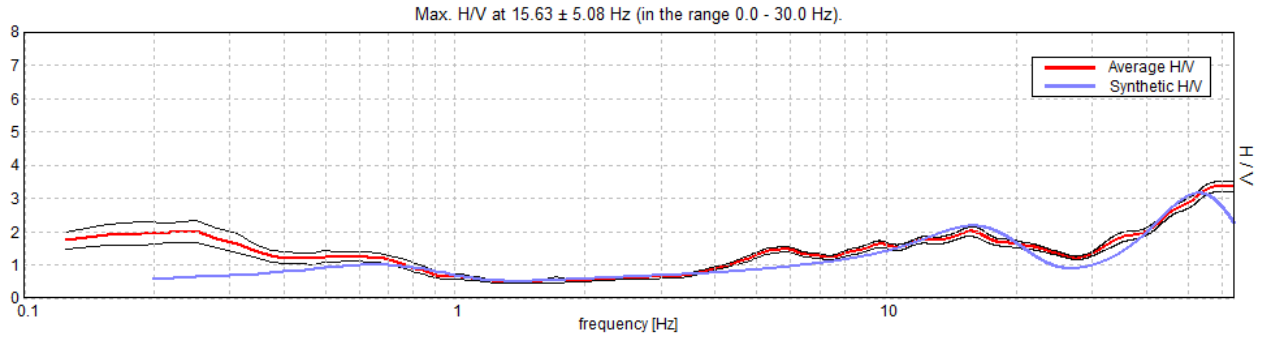
H/V TIME HISTORY



SINGLE COMPONENT SPECTRA

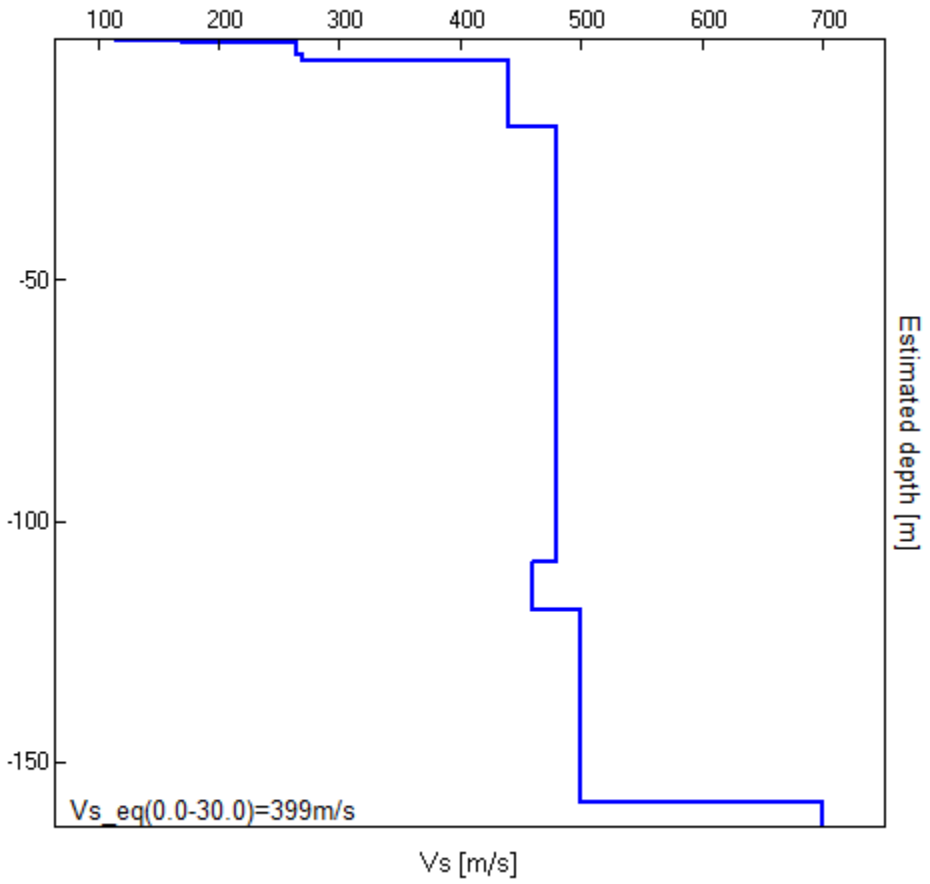


EXPERIMENTAL vs. SYNTHETIC H/V



Depth at the bottom of the layer [m]	Thickness [m]	Vs [m/s]	Poisson ratio
0.40	0.40	115	0.42
0.80	0.40	170	0.42
3.30	2.50	265	0.42
4.30	1.00	270	0.45
18.30	14.00	440	0.45
108.30	90.00	480	0.45
118.30	10.00	460	0.45
158.30	40.00	500	0.44
inf.	inf.	700	0.43

Vs_eq(0.0-30.0)=399m/s



[According to the SESAME, 2005 guidelines. **Please read carefully the *Grilla* manual before interpreting the following tables**.]

Max. H/V at 15.63 ± 5.08 Hz (in the range 0.0 - 30.0 Hz).

Criteria for a reliable H/V curve [All 3 should be fulfilled]			
$f_0 > 10 / L_w$	15.63 > 0.50	OK	
$n_c(f_0) > 200$	18750.0 > 200	OK	
$\sigma_A(f) < 2$ for $0.5f_0 < f < 2f_0$ if $f_0 > 0.5$Hz **$\sigma_A(f) < 3$ for $0.5f_0 < f < 2f_0$ if $f_0 < 0.5$Hz**	Exceeded 0 out of 751 times	OK	
Criteria for a clear H/V peak [At least 5 out of 6 should be fulfilled]			
Exists f^- in $[f_0/4, f_0]$ | $A_{H/V}(f^-) < A_0 / 2$	4.313 Hz	OK	
Exists f^+ in $[f_0, 4f_0]$ | $A_{H/V}(f^+) < A_0 / 2$			NO
$A_0 > 2$	2.00 > 2	OK	
$f_{peak}[A_{H/V}(f) \pm \sigma_A(f)] = f_0 \pm 5\%$	|0.3249| < 0.05		NO
$\sigma_f < \varepsilon(f_0)$	5.07651 < 0.78125		NO
$\sigma_A(f_0) < \theta(f_0)$	0.137 < 1.58	OK	

L_w	window length
n_w	number of windows used in the analysis
$n_c = L_w n_w f_0$	number of significant cycles
f	current frequency
f_0	H/V peak frequency
σ_f	standard deviation of H/V peak frequency
$\varepsilon(f_0)$	threshold value for the stability condition $\sigma_f < \varepsilon(f_0)$
A_0	H/V peak amplitude at frequency f_0
$A_{H/V}(f)$	H/V curve amplitude at frequency f
f^-	frequency between $f_0/4$ and f_0 for which $A_{H/V}(f^-) < A_0/2$
f^+	frequency between f_0 and $4f_0$ for which $A_{H/V}(f^+) < A_0/2$
$\sigma_A(f)$	standard deviation of $A_{H/V}(f)$, $\sigma_A(f)$ is the factor by which the mean $A_{H/V}(f)$ curve should be multiplied or divided
$\sigma_{\log H/V}(f)$	standard deviation of log $A_{H/V}(f)$ curve
$\theta(f_0)$	threshold value for the stability condition $\sigma_A(f) < \theta(f_0)$

Threshold values for σ_f and $\sigma_A(f_0)$					
Freq. range [Hz]	< 0.2	0.2 – 0.5	0.5 – 1.0	1.0 – 2.0	> 2.0
$\varepsilon(f_0)$ [Hz]	0.25 f_0	0.2 f_0	0.15 f_0	0.10 f_0	0.05 f_0
$\theta(f_0)$ for $\sigma_A(f_0)$	3.0	2.5	2.0	1.78	1.58
log $\theta(f_0)$ for $\sigma_{\log H/V}(f_0)$	0.48	0.40	0.30	0.25	0.20