



COMUNE DI CASCINA  
(PROVINCIA DI PISA)

SCHEDE DEI DATI DI BASE

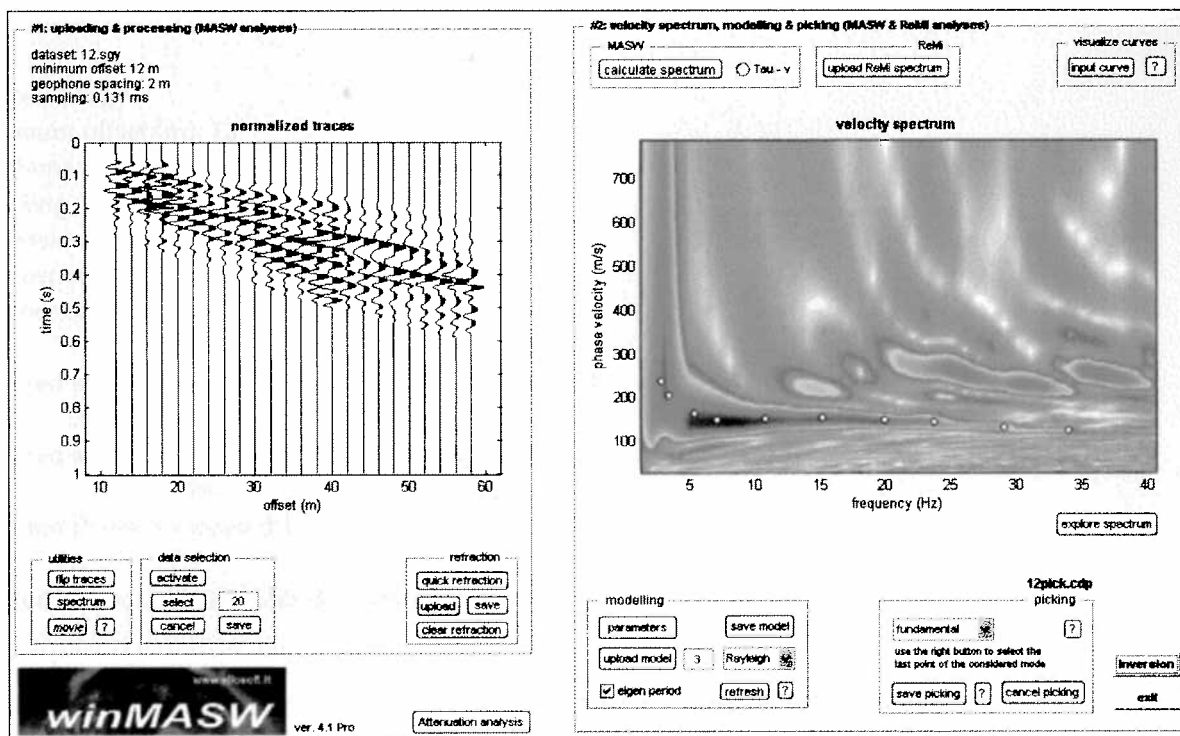
Numero: 68+M68

Località: Badia, via Vecchia fiorentina

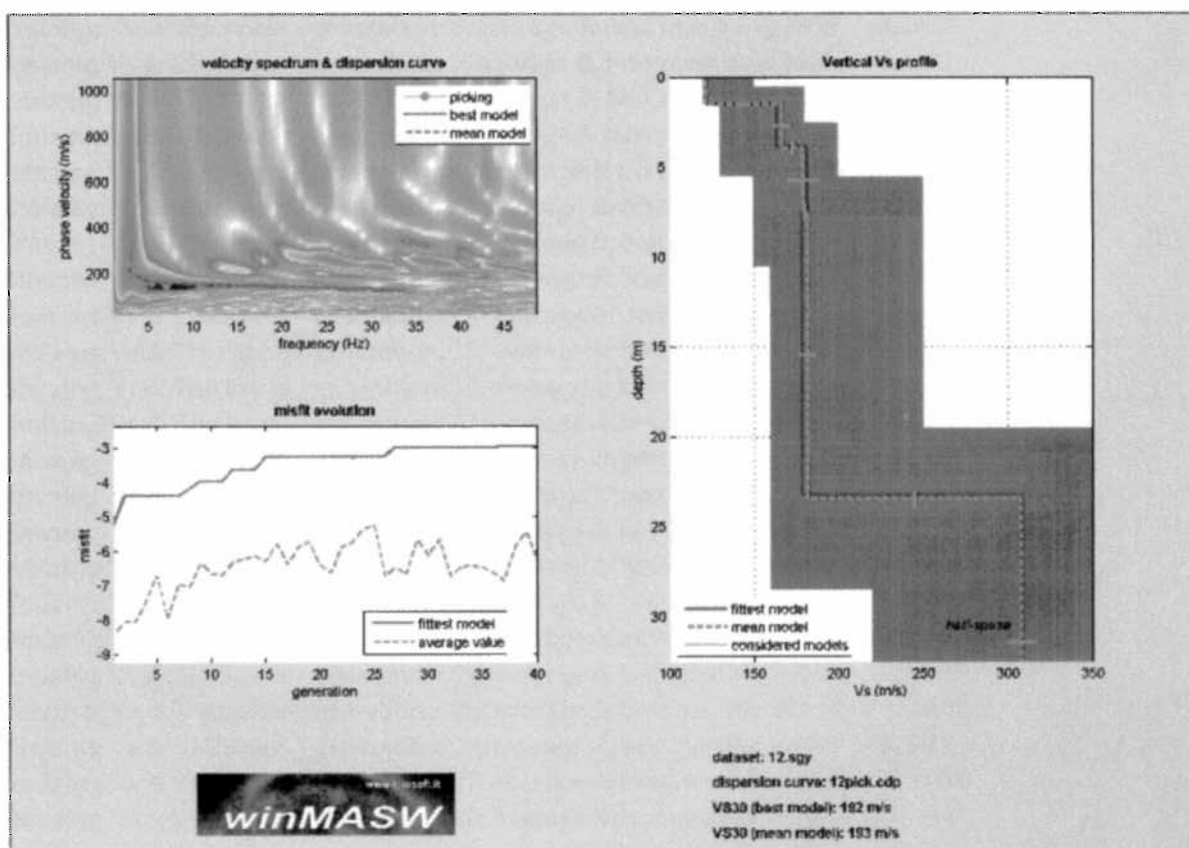
Tipo e numero: n. 1 prova penetrometrica statica CPT  
n. 1 indagine sismica MASW

Fonte: Comune di Cascina

## GRAFICI INDAGINE SISMICA MASW



Common-shot gather e spettro di velocità



Risultato inversione

# RISULTATI ELABORAZIONE MASW – loc. Badia di Cascina – via Vecchia Fiorentina

Dispersion curve: number of frequency-velocity points=10

dataset: 12.sgy

minimum offset (m): 12

geophone spacing (m): 2

sampling (ms): 0.131

Dispersion curve: 12pick.cdp

Number of individuals: 20

Number of generations: 31

Adopted search space (minimum Vs & thickness): 120	0.5	130	2	150	3	160
14 220						
Adopted search space (maximum Vs & thickness): 150	1.5	180	4	200	5	
250 18 350						
Adopted Poisson values: 0.3	0.3	0.3	0.3	0.3	0.3	

Output folder: C:\WINMAS-2\output

Rayleigh wave analysis

Optimizing Vs & Thickness - generation: 1; average & best misfits: -8.3912	-5.2302
Optimizing Vs & Thickness - generation: 2; average & best misfits: -8.0532	-4.3952
Optimizing Vs & Thickness - generation: 3; average & best misfits: -8.0368	-4.3952
Optimizing Vs & Thickness - generation: 4; average & best misfits: -7.4436	-4.3952
Optimizing Vs & Thickness - generation: 5; average & best misfits: -6.7047	-4.3952
Optimizing Vs & Thickness - generation: 6; average & best misfits: -7.9555	-4.3952
Optimizing Vs & Thickness - generation: 7; average & best misfits: -6.9583	-4.3952
Optimizing Vs & Thickness - generation: 8; average & best misfits: -7.0478	-4.1933
Optimizing Vs & Thickness - generation: 9; average & best misfits: -6.3326	-3.9522
Optimizing Vs & Thickness - generation: 10; average & best misfits: -6.6487	-3.9522
Optimizing Vs & Thickness - generation: 11; average & best misfits: -6.6995	-3.9522
Optimizing Vs & Thickness - generation: 12; average & best misfits: -6.3128	-3.6307
Optimizing Vs & Thickness - generation: 13; average & best misfits: -6.2273	-3.6307
Optimizing Vs & Thickness - generation: 14; average & best misfits: -6.1386	-3.6307
Optimizing Vs & Thickness - generation: 15; average & best misfits: -6.2866	-3.2691
Optimizing Vs & Thickness - generation: 16; average & best misfits: -5.7934	-3.2691
Optimizing Vs & Thickness - generation: 17; average & best misfits: -6.3827	-3.2691
Optimizing Vs & Thickness - generation: 18; average & best misfits: -5.8839	-3.2691
Optimizing Vs & Thickness - generation: 19; average & best misfits: -5.7362	-3.2691
Optimizing Vs & Thickness - generation: 20; average & best misfits: -6.3951	-3.2691
Optimizing Vs & Thickness - generation: 21; average & best misfits: -6.6435	-3.2691
Optimizing Vs & Thickness - generation: 22; average & best misfits: -5.8823	-3.2691
Optimizing Vs & Thickness - generation: 23; average & best misfits: -5.7466	-3.2691
Optimizing Vs & Thickness - generation: 24; average & best misfits: -5.3652	-3.2447
Optimizing Vs & Thickness - generation: 25; average & best misfits: -5.2497	-3.2447
Optimizing Vs & Thickness - generation: 26; average & best misfits: -6.726	-3.2447
Optimizing Vs & Thickness - generation: 27; average & best misfits: -6.4873	-2.9804
Optimizing Vs & Thickness - generation: 28; average & best misfits: -6.6849	-2.9804
Optimizing Vs & Thickness - generation: 29; average & best misfits: -5.6667	-2.9804
Optimizing Vs & Thickness - generation: 30; average & best misfits: -6.1363	-2.9804

Optimizing Vs & Thickness - generation: 31; average & best misfits: -5.6675 -2.9804

Checking the new search space (for the finer search)

Now a finer search around the most promising search space area

Rayleigh wave analysis

Optimizing Vs & Thickness - generation: 1; average & best misfits: -6.7348	-2.9804
Optimizing Vs & Thickness - generation: 2; average & best misfits: -6.4518	-2.9804
Optimizing Vs & Thickness - generation: 3; average & best misfits: -6.4418	-2.9804
Optimizing Vs & Thickness - generation: 4; average & best misfits: -6.4727	-2.9804
Optimizing Vs & Thickness - generation: 5; average & best misfits: -6.6361	-2.9804
Optimizing Vs & Thickness - generation: 6; average & best misfits: -6.8731	-2.9513
Optimizing Vs & Thickness - generation: 7; average & best misfits: -5.8784	-2.9513
Optimizing Vs & Thickness - generation: 8; average & best misfits: -5.4498	-2.9513
Optimizing Vs & Thickness - generation: 9; average & best misfits: -6.2475	-2.9513

Model after the Vs & Thickness optimization (fixed Poisson values):

Vs (m/s): 122 165 183 179 308  
Poisson: 0.3 0.3 0.3 0.3 0.3  
Thickness (m): 1.5 2.4 3.5 16

Number of models considered to calculate the average model: 26

#####  
RESULTS winMASW Pro  
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Dataset: 12.sgy  
Analyzed curve: 12pick.cdp

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#### MEAN MODEL

VS (m/s): 122 167 180 182 308  
Standard deviations (m/s): 2 5 9 5 9

Thickness (m): 1.4 2.5 3.5 16.0  
Standard deviations (m): 0.1 0.4 0.4 0.5

Approximate values for Vp, density & elastic moduli

Vp (m/s): 228 312 337 340 576  
Density (gr/cm3): 1.70 1.77 1.79 1.79 1.92  
Vp/Vs ratio: 1.87 1.87 1.87 1.87 1.87  
Poisson: 0.30 0.30 0.30 0.30 0.30  
Young modulus (MPa): 66 128 151 154 474  
Sjear modulus (MPa): 25 49 58 59 182  
Lamé (MPa): 38 74 87 89 273  
Bulk modulus (MPa): 55 107 126 128 394

Fundamental mode

Mean model

f(Hz)	VR(m/s)
2.78729	225.5712
3.36269	200.5288
5.3355	167.2738
7.06171	161.714
10.7607	156.8342
15.1174	151.8829
19.885	146.3786
23.6662	141.9433
29.0093	135.5202
33.9413	129.8006

BEST MODEL

Vs (m/s):	121.9071	164.5659	182.5067	179.0789	308.1563
thickness (m):	1.5	2.35334	3.50629	15.7937	

Approximate values for Vp, density & elastic moduli

Vp (m/s):	228	308	341	335	577
Density (gr/cm3):	1.70	1.77	1.79	1.79	1.92
Vp/Vs ratio:	1.87	1.87	1.86	1.87	1.87
Poisson:	0.30	0.30	0.30	0.30	0.30
Young modulus (MPa):	66	125	156	149	474
Shear modulus (MPa):	25	48	60	57	182
Lamé (MPa):	38	72	88	86	275
Bulk modulus (MPa):	55	104	129	124	396

dispersion curve (frequency - Rayleigh phase velocity)

Fundamental mode)

best model

F(Hz)	VR(m/s)
2.78729	224.5373
3.36269	198.4527
5.3355	165.3855
7.06171	160.3564
10.7607	156.3561
15.1174	151.4984
19.885	145.1781
23.6662	140.0719
29.0093	133.1973
33.9413	127.617

Maximum penetration depth according to the "Steady State Rayleigh Method": 34 m

Inversion quality: very good

VS5 (mean model): 153 m/s  
VS5 (best model): 152 m/s

VS20 (mean model): 174 m/s  
VS20 (best model): 172 m/s

VS30 (mean model): 193 m/s  
VS30 (best model): 192 m/s

Possible Soil Type: C  
(based on the mean model)

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winMASW 4.2 Pro  
Surface Wave Analysis  
via MASW - Multichannel Analysis of Surface Waves

[www.eliosoft.it](http://www.eliosoft.it)