Acquisition Parameters for 1-D MASW Survey

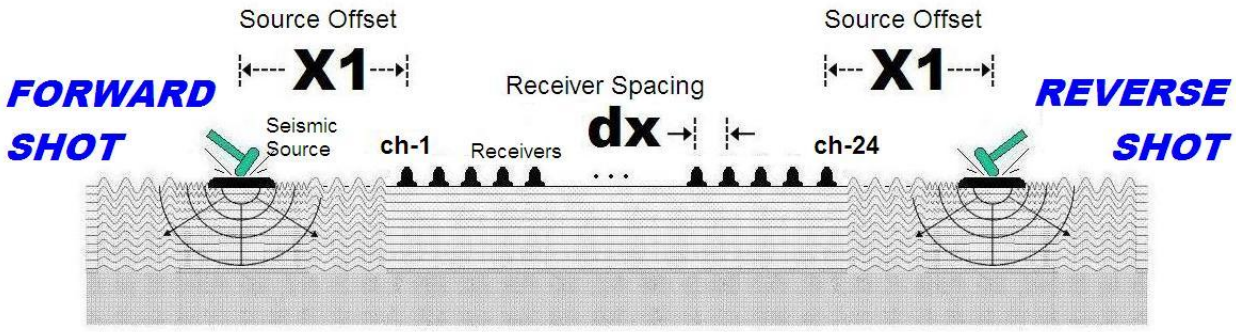
Field layout: At each site, both forward and reverse shots (see diagram below) are collected with three (3) different source offsets (X1's): X11 = 6dx, X12 = 12dx, and X13 = 24dx with dx (receiver spacing) = 4 ft. The table below is an example field note that shows multiple files (records) collected and saved at each source offset. One record is a data set from an N-channel field recording that is treated as the most fundamental data unit in MASW data processing.

Site Name: Test Site #1	X11 (=6dx)	X12 (=12dx)	X13 (=24dx)
FORWARD (FWR)	1001.dat–1003.dat	1004.dat–1006.dat	1007.dat–1009.dat
REVERSE (REV)	1010.dat–1012.dat	1013.dat–1015.dat	1016.dat–1018.dat

Recording parameters: sampling interval (dt) = 0.5 millisecond (ms), recording time (T) = 1000 ms, low-cut analog filter = out (never use it), vertical stacking** = 1–3 times, seismic source = a 20-lb sledgehammer as minimum (a weight-drop source is also preferred), file type to save = SEG-2.

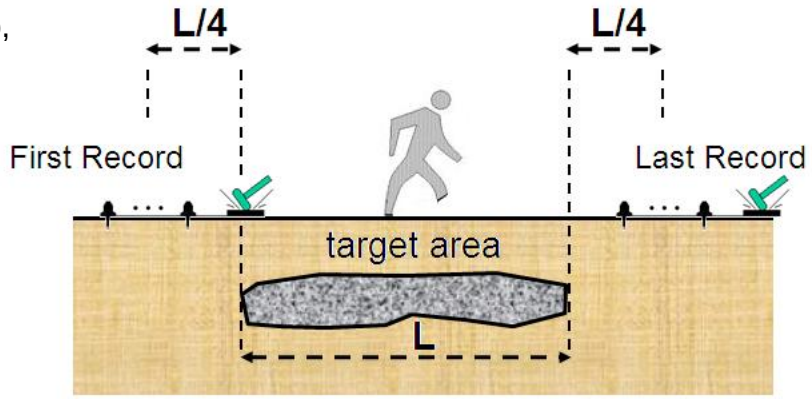
***Vertical stacking of 1 means a record is saved at each impact, whereas vertical stacking of, say, 3 means three (3) records from three impacts are stacked (superimposed) in seismograph memory and then this stacked record is saved as a file. The vertical stacking can increase signal-to-noise ratio (S/N) during acquisition and can be useful especially for roadside surveys.*

FIELD LAYOUT FOR 1-D MASW SURVEY



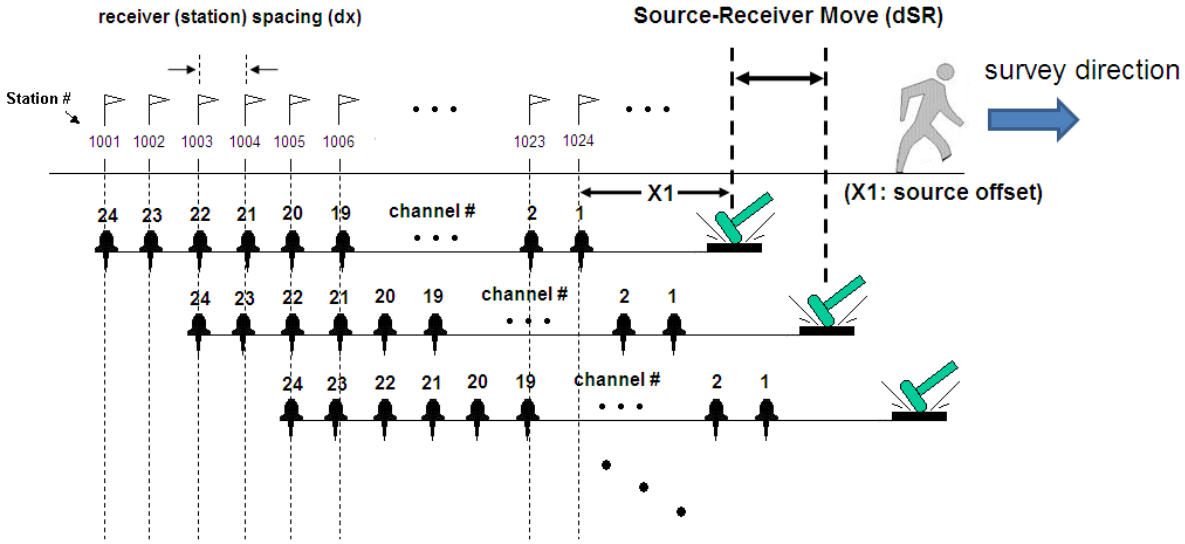
2-D MASW Survey

A 2-D survey is accomplished by repeating 1-D surveys at consecutive points along a preset linear survey line as illustrated in the diagram below. The source offset (X1) is set usually to (N/4)dx (N=total number of channels). So, with 24-channel acquisition, X1 = 6dx is optimum. The same X1 is used for all consecutive 1-D surveys.



Start and end points of the survey should be determined in such a way that the final 2-D shear-velocity map can cover certain portions of the normal area on both sides of the target (anomaly) zone to maximize the mapping effectiveness. A rule of thumb is that center of the receiver spread (or array) starts and ends at a quarter length (L/4) before and after the target zone of length L, respectively, as illustrated in the diagram on right. It is critically important to accurately mark, at a minimum, the start and end points on the ground. It is also important to keep accurate field notes, a sample of which are shown on the next page.

The increment of the receiver array and shot point is called source-receiver move (dSR) (see diagram below) and influences lateral resolution of the survey: the smaller, the higher resolution. However, the higher resolution results in a higher overall cost as the survey will take more time and end up with more data. The following criteria can be used: **dSR = 1dx (highest) , (2-4)dx (good), (4-8)dx (fair), (8-12)dx (minimum resolution).**



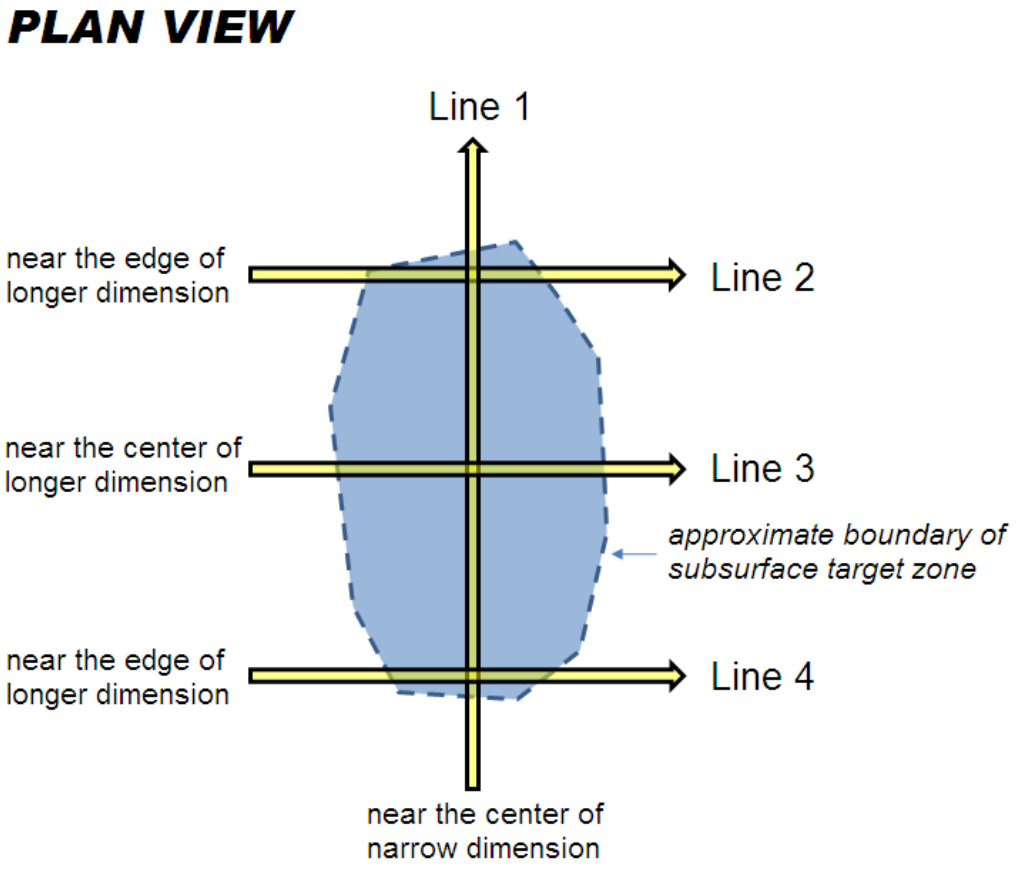
Sample Field Notes for a 2-D MASW Survey

Date:
Location:
Survey type: 1-D, 2-D, or 3-D
Sampling interval (ms): 0.5
Recording time (ms): 1000
Number of channel: 24
Receivers: 4.5-Hz phones
Source: 20-lb sledge hammer
Comments:

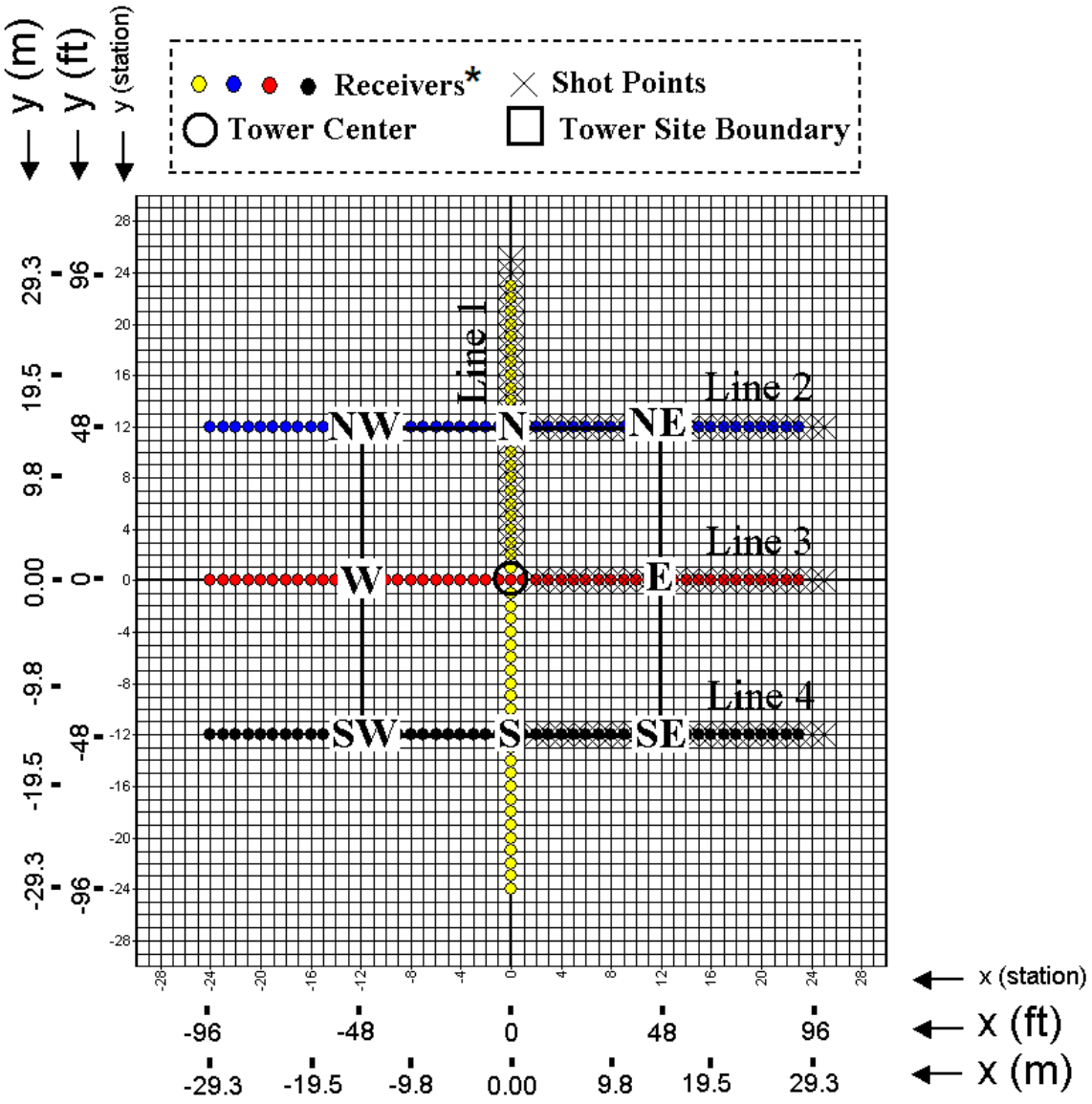
File Name	Station for Ch-1	Station for Ch-24	Station for Shot	Comments
1.dat	1001	1024	1030	3 vertical stacking
2.Dat	1003	1026	1032	3 vertical stacking, etc.
3.Dat	1005	1028	1034	Same as before
4.Dat	1007	1030	1036	Same…

3-D MASW Survey

A 3-D survey is accomplished by repeating 2-D surveys at different locations and also with different orientations, as illustrated below. More 2-D lines are usually needed along the direction perpendicular to the elongated dimension. The exact location of each 2-D line should be marked on the ground and faithfully recorded in the field notes. The sample field layout plan shown has been commonly used for wind-turbine site characterization.



FIELD LAYOUT FOR MULTIPLE 2-D (3-D) MASW SURVEYS (Proposed Wind Turbine Site)



*48-channel fixed receiver array (only shot points move)