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A summary on the Surfbar-2 Test

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Day 1 – Square Grid

The Surfbar-2 test was conducted at UNLV-EGTS on the 15th and 16th of Jan 2010. The participants for the first day were Barbara Luke, Chris Cothrun, Prajwol Tamrakar, Suchan Lamichhane, Nihad Rajabdeen, Pinthep Kittipongdaja, Karina Tam, James Cordova and Stephanie Ross.

Layout

Chris located the wooden peg marked over the buried steel and plastic barrel on the 14th Jan 2010. Those two points were located 10m apart in north and south direction. From UNLV-EGTS map (figure 1), the coordinates of the steel and plastic barrels are (32 m, 29 m) and (32 m, 19 m) respectively using the spike at the sidewalk intersections as the origin of the EGTS coordinate system, which is at +036.1088° / -115.1417° (WGS 84). The grid for the surfbar-2 test was planned in such a way that the centre point of the line joining the steel and plastic barrels coincide with the centre point of the grid. The grid consists of 144 sensors (geophones) with spacing of 2 m in both the x and y direction.

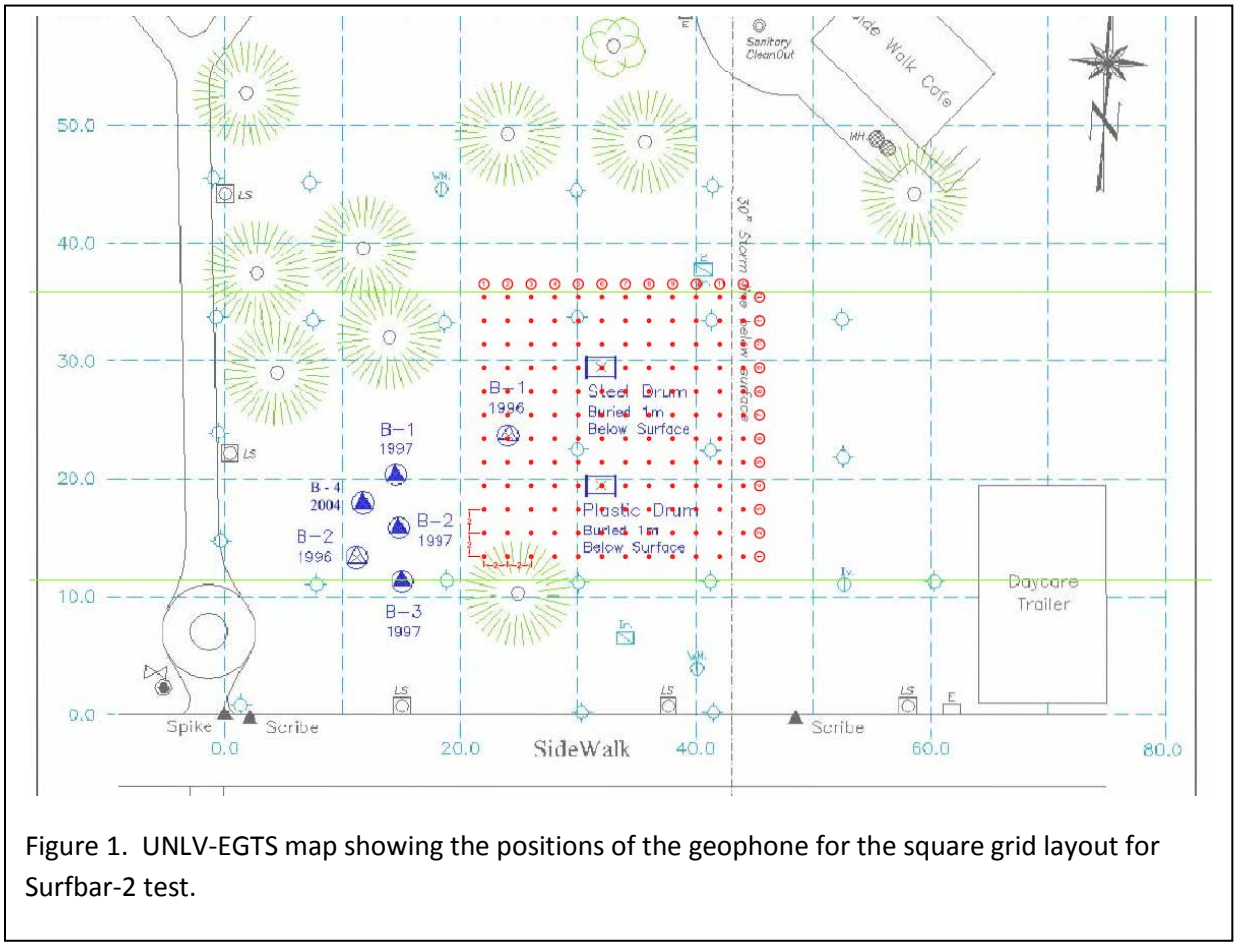


Figure 1. UNLV-EGTS map showing the positions of the geophone for the square grid layout for Surfbar-2 test.

The line joining the centre points of barrels which run through the north-south direction is assumed to be the y-direction and the perpendicular to this line is the x-direction. Figure 1 shows 144 geophones

arranged in 12 lines showing line 6 over the barrels. As per UNLV-EGTS map, the coordinate of the first geophone (at south west corner) is (22 m,13 m). The cable connecting the geophones ran through north-south direction. The connection

Figure 2. Layout of cable and geophones for Surfbar-2 test on 15 Jan (View to the north).

number 1 was assigned to the geophone at south end of line 1 and the last connector i.e. number 24 was assigned to the geophone at south end of line 2. Each seismic cable has 12 channels, so we used 6 pairs of cables to connect the geophones.

Equipment

6 Geometrics Geode Seismograph (24 channels each)
144 40 Hz Geophones (on loan from PASSCAL)
8 lb sledgehammer
16 lb sledgehammer
APS Dynamics APS 400 ELECTRO-SEIS shaker

6 geodes were used to collect the data from the geophones and transfer the data to the computer. Geodes were placed south of the grid and the computer was placed near the first geophone i.e. the geophone at south end of line 1. Previously, we planned to acquire the data from the shaker and 8 lb

Sledgehammer but the acquisition time for the shaker with a multiple number of stacks was excessively long so data was acquired by hammer hit with a single hit followed by three stacked hits saved into a single shot file. The hammer hit (source) is located at the offset distance of 1 m in the x and y direction from the geophone as shown in Surfbar-2 test square grid layout, skipping one geophone between two in each row and column. The layout of the source has 7 rows and 7 columns with spacing of 4 m in each direction. The data were recorded in Seg-2 file format instead of Seg-y format because the software could not record the data of full length of time in Seg-y format. The multichannel record had the sampling interval 20.833 µsec, record length 0.75 sec and delay -0.01 sec. The source located to the

Figure 3. Geodes connecting geophones

south west direction of the first geophone was assumed to be the origin of the layout. The location of source is named as the coordinate of the source from that origin. For example, the source at origin was named as station 0000 and the source at the extreme north east corner was named as station 2424. Here, the first two digits is the x-coordinate and last two is the y-coordinate. Data was collected with a single hammer impact and a 3 stacked hammer hits for each location. In addition to this, the shaker was also used at station 0000 and data of 5 and 15 stacks were collected. The shaker signal was a 250ms 30

HZ to 180 Hz 'chirp' (represented by the sample values in the file chirp_30_180_50.txt) Similarly, the sledgehammer of 16 lb was also used to collect data at station 0000 with 1 and 3 stacks.

Table 1. Field data collection for Surfbar-2 Test (Square grid layout system)
*see page 12 for coordinate system

File name	X Coordinate	Y Coordinate	No. of Stacks	Source type	Remarks
1.dat	0	24	1	H	H is 8 lb Sledgehammer
2.dat	0	24	3	H	
3.dat	0	24	1	H	
4.dat	0	20	1	H	
5.dat	0	20	3	H	
6.dat	0	16	1	H	
7.dat	0	16	3	H	
8.dat	0	12	1	H	
9.dat	0	12	3	H	
10.dat	0	8	1	H	
11.dat	0	8	3	H	
12.dat	0	4	1	H	
13.dat	0	4	3	H	
14.dat	0	0	1	H	
15.dat	0	0	3	H	
16.dat	4	0	1	H	
17.dat	4	0	3	H	
18.dat	4	4	1	H	
19.dat	4	4	3	H	
20.dat	4	8	1	H	

21.dat	4	8	3	H	
22.dat	4	12	1	H	
23.dat	4	12	3	H	
24.dat	4	16	1	H	
25.dat	4	16	3	H	
26.dat	4	20	1	H	
27.dat	4	20	3	H	
28.dat	4	24	1	H	
29.dat	4	24	3	H	
30.dat	8	24	1	H	
31.dat	8	24	3	H	
32.dat	8	20	1	H	
33.dat	8	20	3	H	
34.dat	8	16	1	H	
35.dat	8	16	3	H	
36.dat	8	12	1	H	
37.dat	8	12	3	H	
38.dat	8	8	1	H	
39.dat	8	8	3	H	
40.dat	8	4	1	H	
41.dat	8	4	3	H	
42.dat	8	0	1	H	
43.dat	8	0	3	H	
44.dat	12	0	1	H	
45.dat	12	0	3	H	

46.dat	12	4	1	H	
47.dat	12	4	3	H	
48.dat	12	8	1	H	
49.dat	12	8	3	H	
50.dat	12	12	1	H	
51.dat	12	12	3	H	
52.dat	12	16	1	H	
53.dat	12	16	3	H	
54.dat	12	20	1	H	
55.dat	12	20	3	H	
56.dat	12	24	1	H	
57.dat	12	24	3	H	
58.dat	16	24	1	H	
59.dat	16	24	3	H	
60.dat	16	20	1	H	
61.dat	16	20	3	H	
62.dat	16	16	1	H	
63.dat	16	16	3	H	
64.dat	16	12	1	H	
65.dat	16	12	3	H	
66.dat	16	8	1	H	
67.dat	16	8	3	H	
68.dat	16	4	1	H	
69.dat	16	4	3	H	
70.dat	16	0	1	H	

71.dat	16	0	3	H	
72.dat	20	0	1	H	
73.dat	20	0	3	H	
74.dat	20	4	1	H	
75.dat	20	4	3	H	
76.dat	20	8	1	H	
77.dat	20	8	3	H	
78.dat	20	12	1	H	
79.dat	20	12	3	H	
80.dat	20	16	1	H	
81.dat	20	16	3	H	
82.dat	20	20	1	H	
83.dat	20	20	3	H	
84.dat	20	24	1	H	
85.dat	20	24	3	H	
86.dat	24	24	1	H	
87.dat	24	24	3	H	
88.dat	24	20	1	H	
89.dat	24	20	3	H	
90.dat	24	16	1	H	
91.dat	24	16	3	H	
92.dat	24	12	1	H	
93.dat	24	12	3	H	
94.dat	24	8	1	H	
95.dat	24	8	3	H	

96.dat	24	4	1	H	
97.dat	24	4	3	H	
98.dat	24	0	1	H	
99.dat	24	0	3	H	
100.dat	0	0	5	S	Shaker
101.dat	0	0	15	S	Shaker
102.dat	0	0	1	H’	16lb Hammer
103.dat	0	0	3	H’	16lb Hammer

Figure 4. Data Recorder

Figure 5. Sledgehammer Striker

Day 2 – Linear grid layout

Jan 16, 2010 was the second day of the test. The participants for the second day were Barbara Luke, Chris Cothrun, Prajwol Tamrakar, Suchan Lamichhane, Pinthep Kittipongdaja, Karina Tam, Eduardo Gonzalez and Dianna Feica. We used the linear (single line) array of 144 geophones with the spacing of 0.2 m. The test array ran through the north-south direction exactly over the midpoint of the barrels. The centre point of the array coincides with the centre point of the line joining of barrels. The cable connecting the geophones was started from the lowest number i.e. 1 for the south end of the array. A total of 6 pairs of cables were needed to connect all geophones. The geodes were placed between each pair of cable to collect the data. The cables and 6 geodes were laid east to the array and the sources were located west to the array. The source of vibration for the test array was 8 lb sledgehammer. The position of the first hammer hit was south and slightly west of the array. It was located at the offset distance of - 0.5 m in the x-direction and – 5 m in the y-direction. The alignment of the source location is parallel to the test array and the hammer was stroked at every 1 m spacing. The total numbers of locations of hammer hits were 39, starting from station 0. So, the length of the source array was 39 m. The multichannel record has the sampling interval 20.833 µsec, record length 0.75 sec and delay -0.01 sec. Data was collected with 1 and 3 stacks. The data was recorded in Seg-2 file format. As we were

using the linear array, we named the first source position as station 0, second as station 1 and last one as station 39.

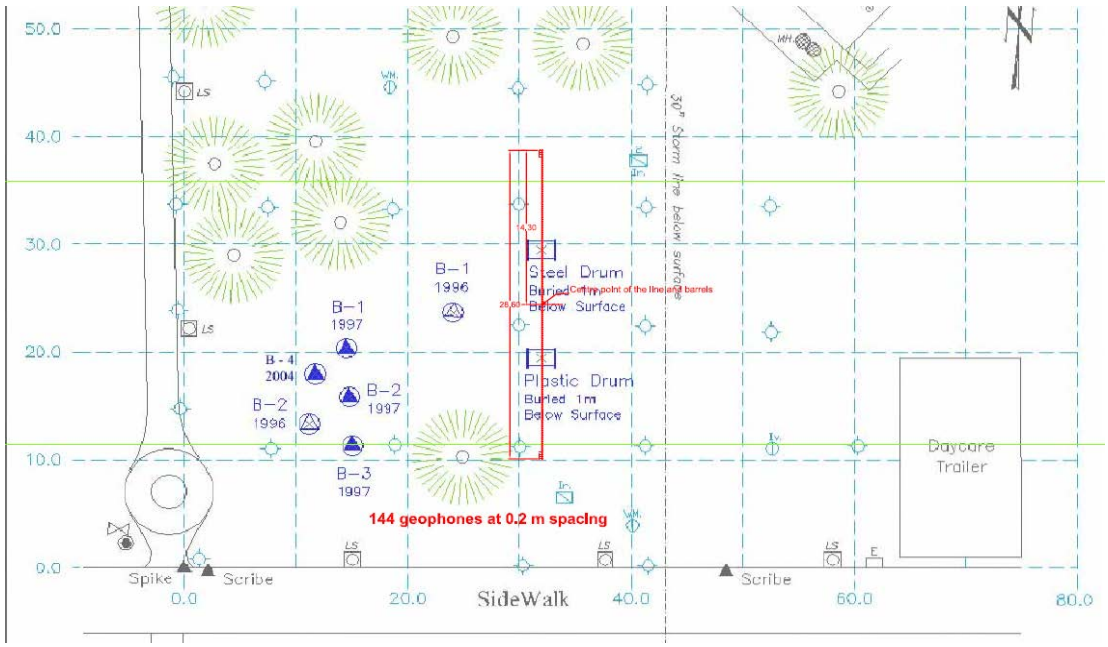


Figure 6. UNLV-EGTS map showing the linear grid layout for Surfbar-2 test.

Table2. Field data collection for Surfbar-2 Test (Linear grid layout).

Source Location	File name	No. of Stacks	Source type	Remarks
0	204.dat	1	H	H is 8 lb Sledgehammer
0	205.dat	3	H	
1	206.dat	1	H	
1	207.dat	3	H	
2	208.dat	1	H	
2	209.dat	3	H	
3	210.dat	1	H	
3	211.dat	3	H	
4	212.dat	1	H	
4	213.dat	3	H	
5	214.dat	1	H	
5	215.dat	3	H	
6	216.dat	1	H	
6	217.dat	3	H	
7	218.dat	1	H	
7	219.dat	3	H	
8	220.dat	1	H	

8	221.dat	3	H	
9	222.dat	1	H	
9	223.dat	3	H	
10	224.dat	1	H	
10	225.dat	3	H	
11	226.dat	1	H	
11	227.dat	3	H	
12	228.dat	1	H	
12	229.dat	3	H	
13	230.dat	1	H	
13	231.dat	3	H	
14	232.dat	1	H	
14	233.dat	3	H	
15	234.dat	1	H	
15	235.dat	3	H	
16	236.dat	1	H	
16	237.dat	3	H	
17	238.dat	1	H	
17	239.dat	3	H	
18	240.dat	1	H	
18	241.dat	3	H	
19	242.dat	1	H	
19	243.dat	3	H	
20	244.dat	1	H	
20	245.dat	3	H	
21	246.dat	1	H	
21	247.dat	3	H	
22	248.dat	1	H	
22	249.dat	3	H	
23	250.dat	1	H	
23	251.dat	3	H	
24	252.dat	1	H	
24	253.dat	3	H	
25	254.dat	1	H	
25	255.dat	3	H	
26	256.dat	1	H	
26	257.dat	3	H	
27	258.dat	1	H	
27	259.dat	3	H	
28	260.dat	1	H	
28	261.dat	3	H	
29	262.dat	1	H	

29	263.dat	3	H	
30	264.dat	1	H	
30	265.dat	3	H	
31	266.dat	1	H	
31	267.dat	3	H	
32	268.dat	1	H	
32	269.dat	3	H	
33	270.dat	1	H	
33	271.dat	3	H	
34	272.dat	1	H	
34	273.dat	3	H	
35	274.dat	1	H	
35	275.dat	3	H	
36	276.dat	1	H	
36	277.dat	3	H	
37	278.dat	1	H	
37	279.dat	3	H	
38	280.dat	1	H	
38	281.dat	3	H	
39	282.dat	1	H	
39	283.dat	3	H	

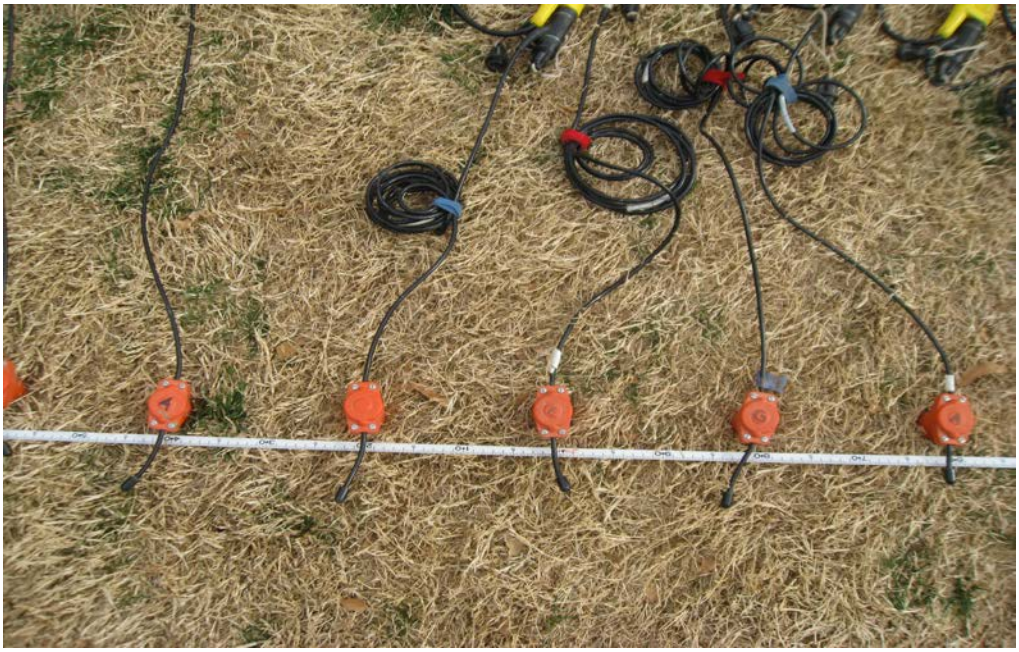
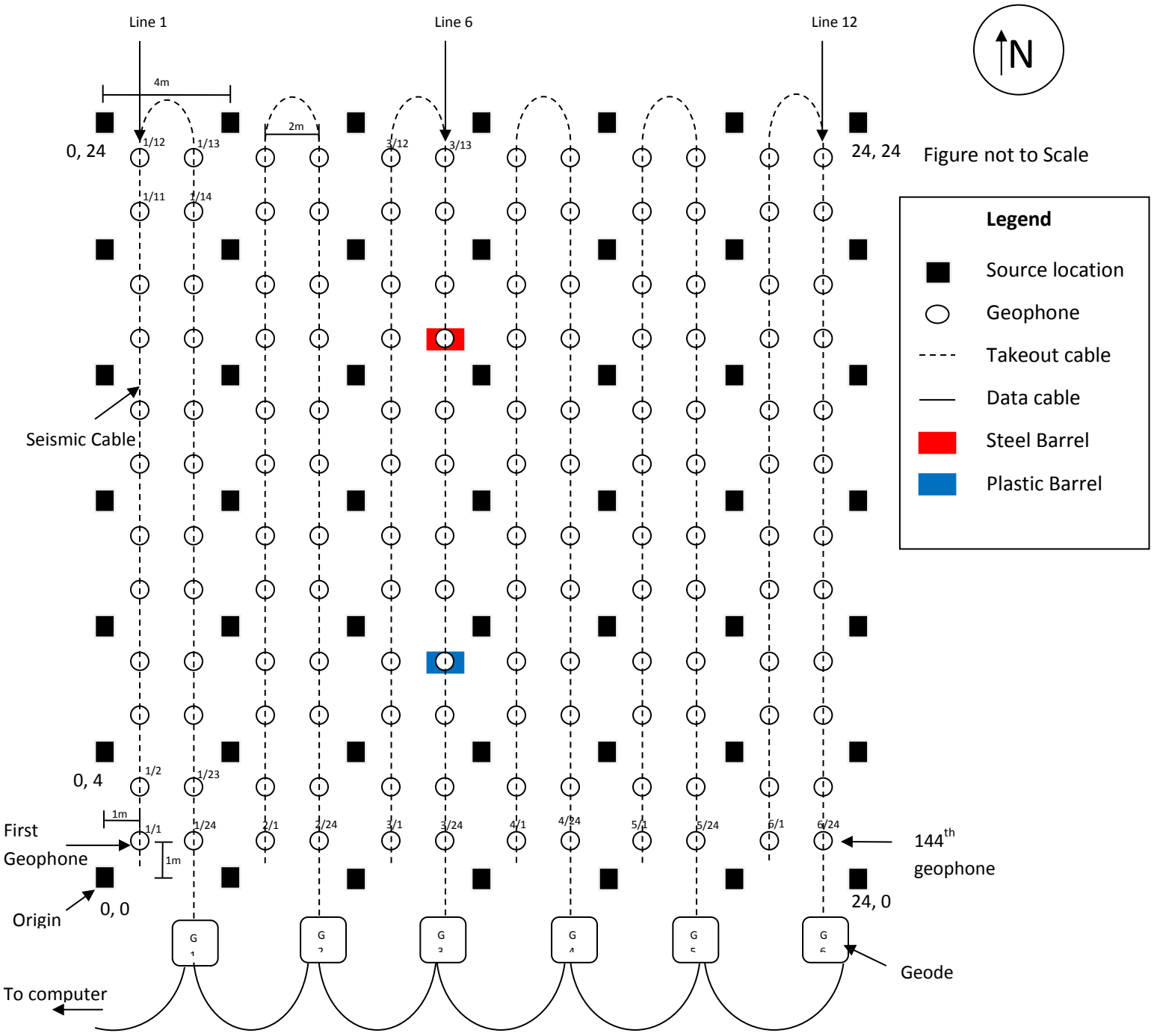


Figure 7. Geophones on the linear array grid.

Figure 8. Linear array grid for the Surfbar-2 test (View to the south)

Surfbar-2 Test square grid layout over UNLV-EGTS

15 Jan, 2010



Notes:

Geophone spacing 2m in X and Y direction

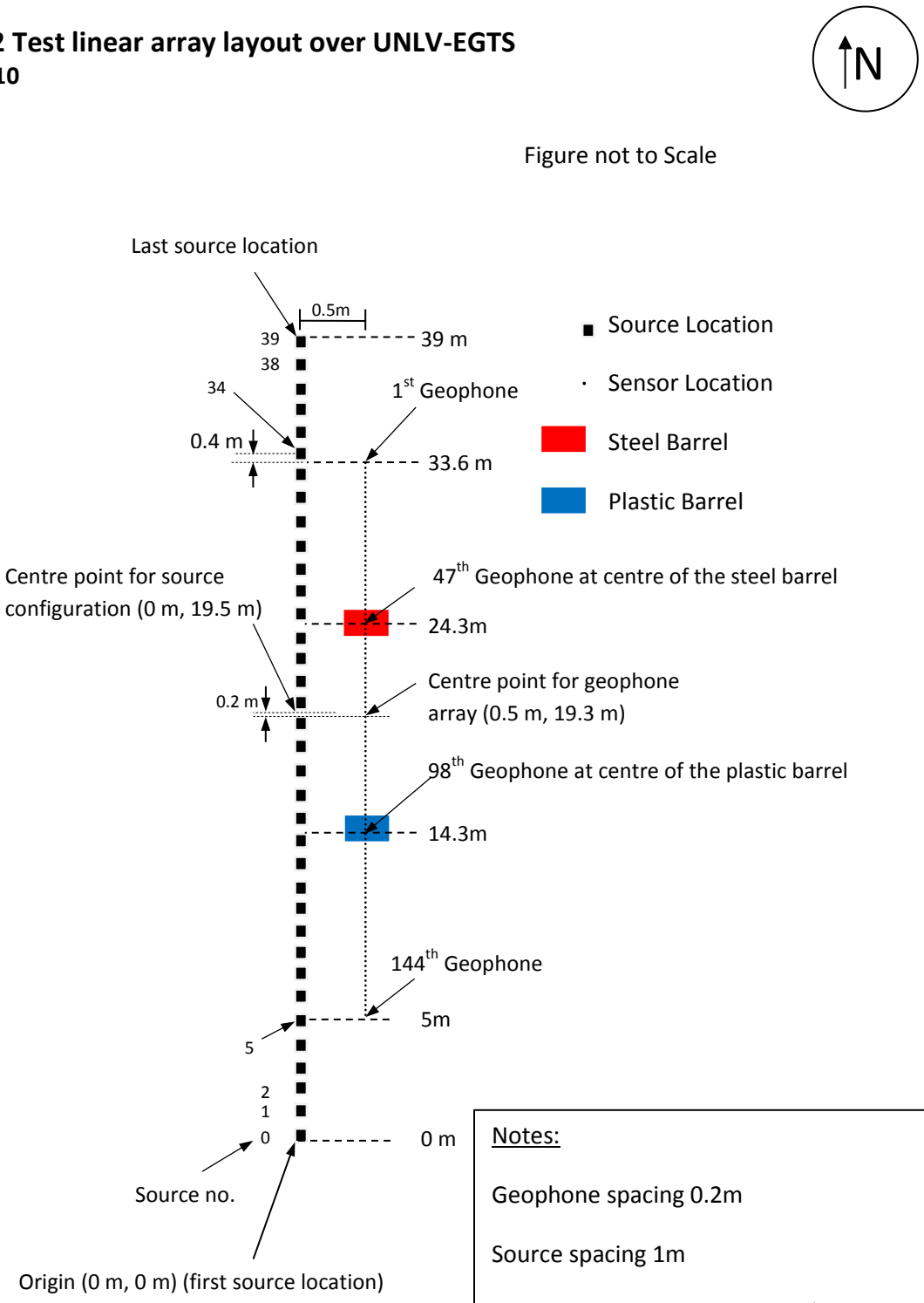
Source Separation 4m in X and Y direction

First source at grid origin

Plastic and steel barrels are at (11m, 7m) and (11m, 17m) with respect to grid origin

Each seismic cable consists of 24 channels. 6 Seismic cables consist of 144 geophones

Surfbar-2 Test linear array layout over UNLV-EGTS
16 Jan, 2010



Notes:

Geophone spacing 0.2m

Source spacing 1m

Plastic and steel barrels are at (0.5m, 13.3m) and (0.5m, 23.3m) with respect to origin