ESTUDIO ESTRUCTURAL DEL ACUÍFERO PROFUNDO DE CAMPO DALÍAS (ALMERÍA) MEDIANTE SÍSMICA DE REFLEXIÓN

TOMO III: ANEXO II

Informe de adquisición secciones sísmicas. Campaña 01AL

ANEXO II

Informe de adquisición secciones sísmicas. Campaña 01AL

Compagnie Générale de G

ALBAIDA

FINAL REPORT
CREW 134.32.21

2D SEISMIC SURVEY
CAMPO DE DALIAS

Compagnie Générale de Géophysique

CONTENTS

1 PRESENTATION

On behalf of Albaida, a 2D seismic survey was conducted in the CAMPO DE DALIAS area. Seismic operations ran over 1 month from November 18th to December 20th.
J.Mathieu party Chief under the CGG head office supervision of M. Larroque managed CGG crew 134 32-21 on field.
CGS partner of CGG for E. Aracil represented this job attends with us.

2 DESCRIPTION

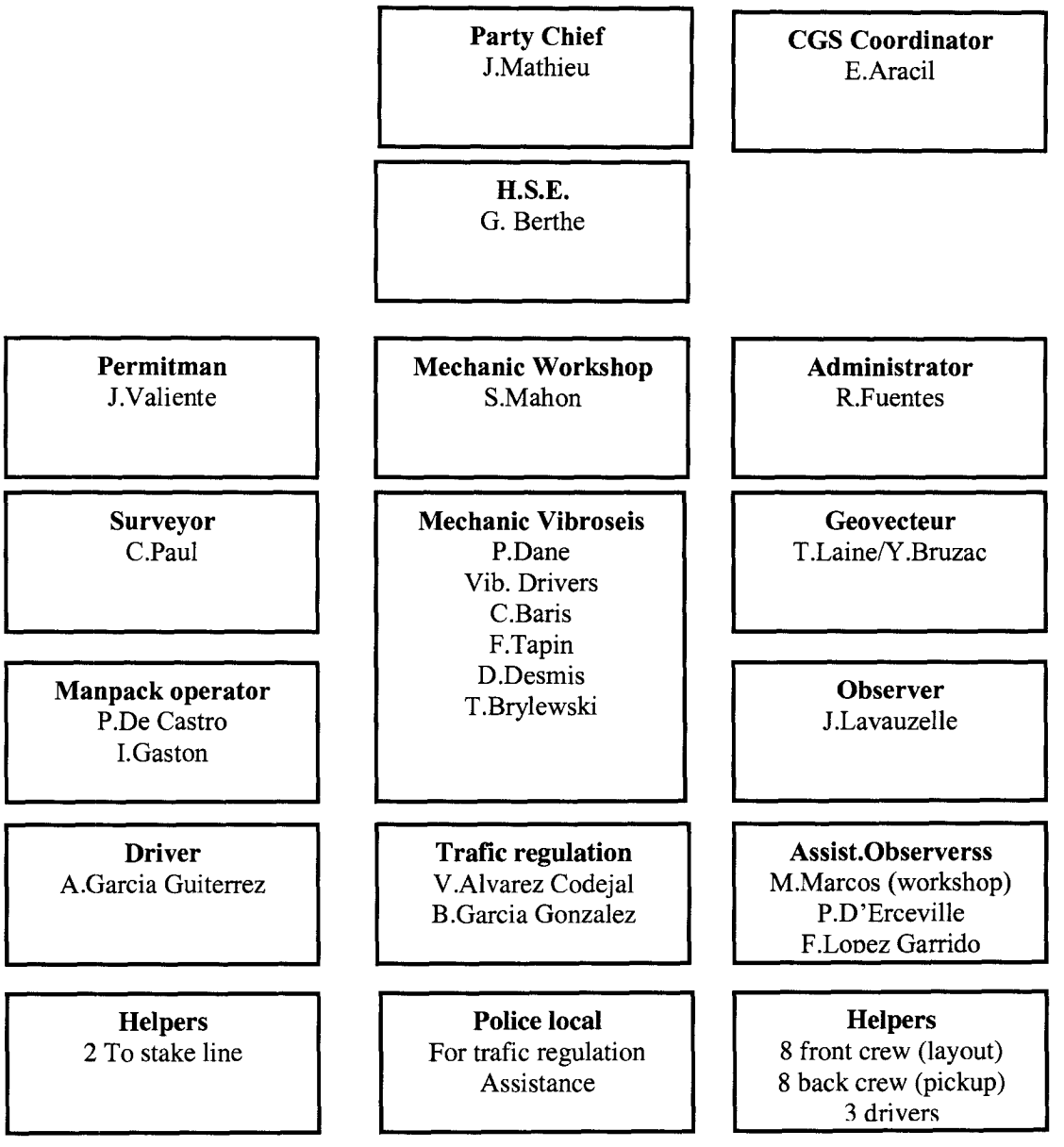
2.1 AREA SITUATION

The 2D area is located in Andalusia, 25 Km west of Almeria.

2.2 GENERAL INFORMATION

CGG established the office in Santa Maria de Alguila, a village East of EL JIDO (50000 inhabitants), on the highway Almeria-Malaga. In spite of the agricultural vocation of the region, the economy takes benefits of the tourism activities. Several villages scattered the work area including San Augustin, Mata gorda, San Silvestre and Roquetas de mar The north part of the survey is located on the foothills of a sierra (Morron: 2236m) the southern lines ended up near the sea. The survey was carried in autumn, characterized in such type of Mediterranean climate with mild temperatures and low precipitation.

2.3 CGG CREW ORGANIGRAM



3 OPERATIONS

3.1 PERMITTING

Permitting was done by CGG with one permitman from Extension Tecnica S.A. J. Valiente.
Schedule of permitman work:

10st of November to 20 December.

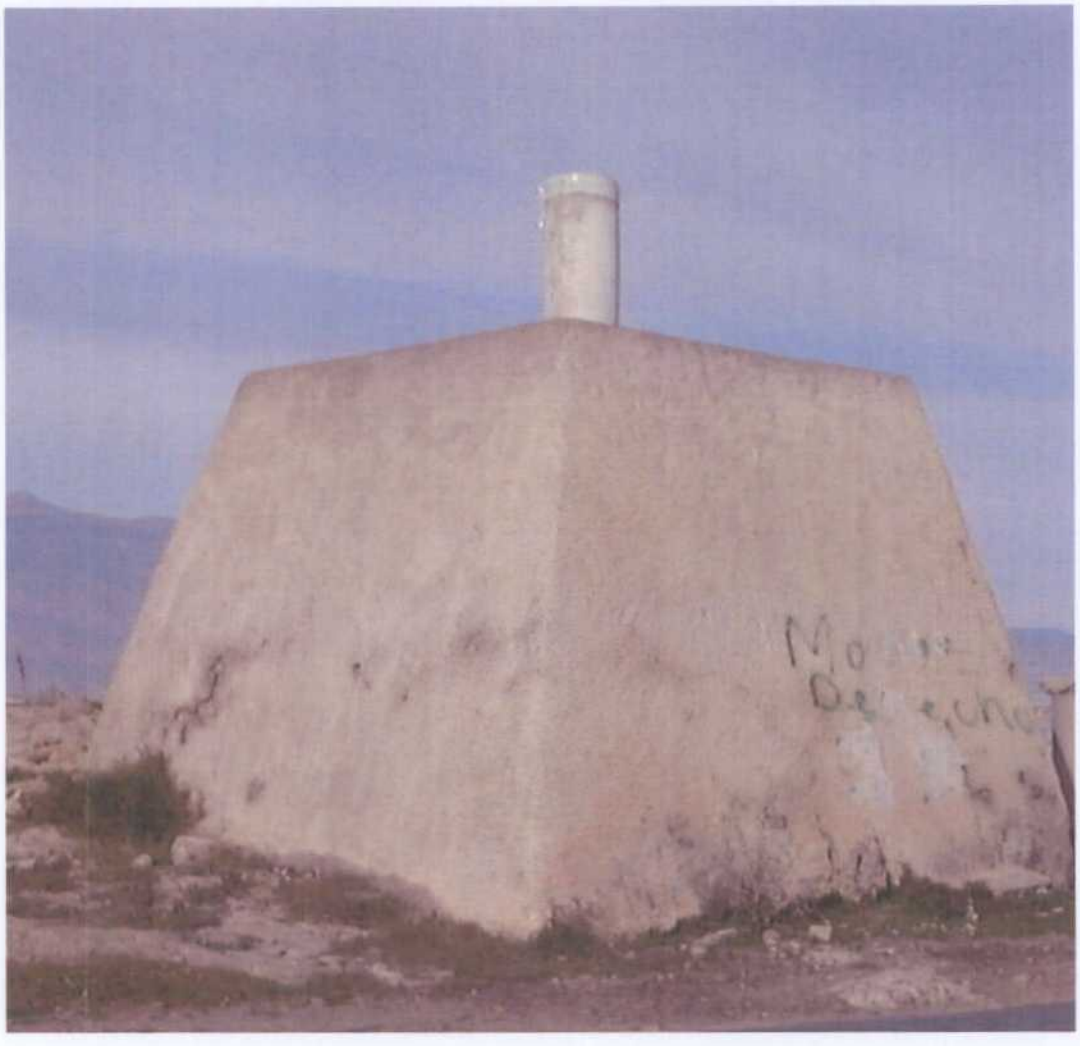
Fonction:

To obtained *permit work* from local administration (National and municipal road, *Medio ambiante etc...):*

To identified with the *cadastre map* and field scouting, all difficulties on this seismic program (water and gas pipes, constructions, on and underground, crossing high way, city, villages etc...).
Proposal a program modifications when the dammage risk is too high
Coordinate with CGG safety department and local police, the trafic regulation on roads.

3.2 SURVEYING

Differential positioning survey method was used for both positioning and leveling the seismic points. The existing control station "**Aguilas**" was used as reference point for the survey.



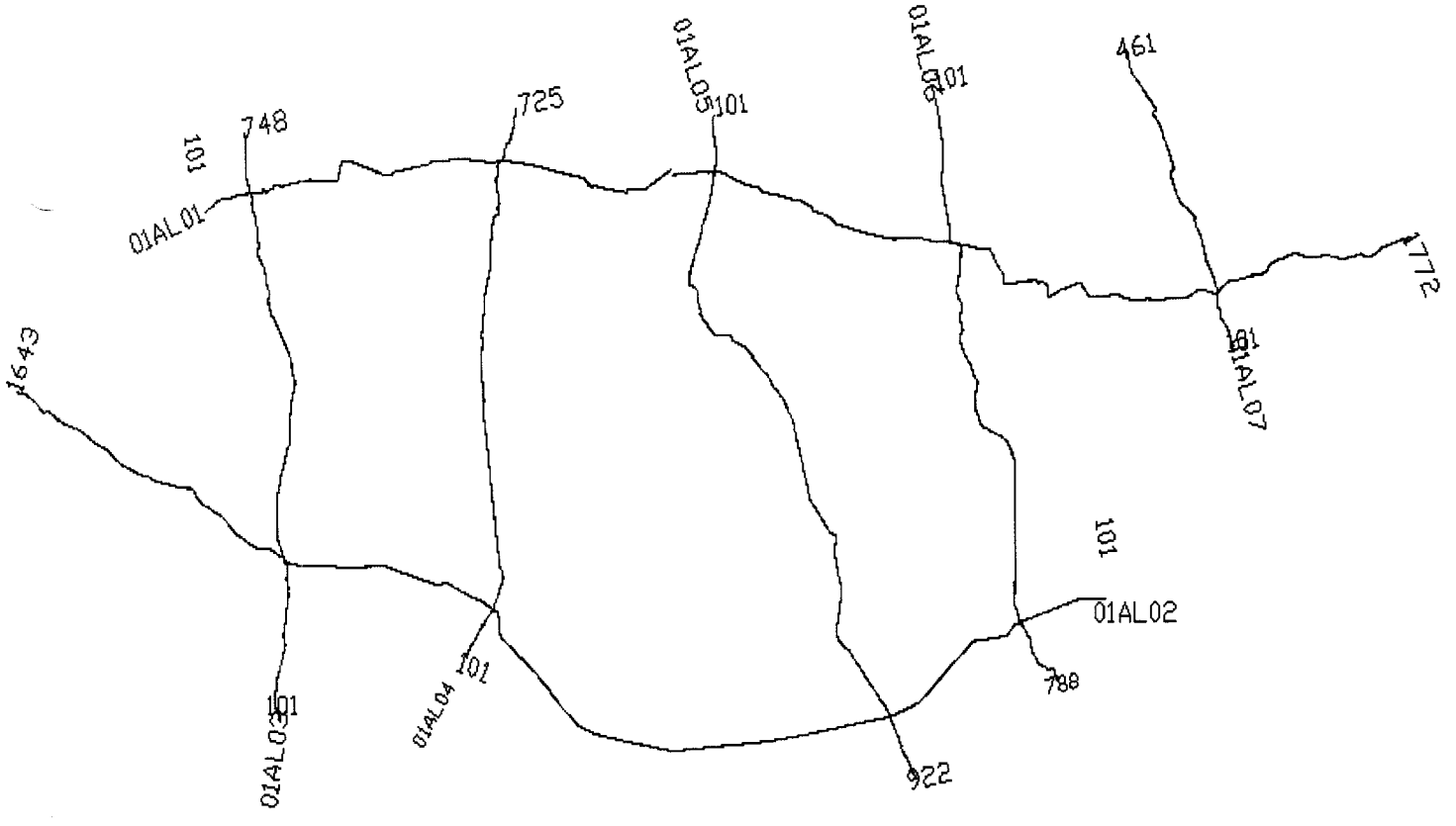
BANOS: Geodetic point

Easting: 514334.74
Northing : 4062028.47
Elevation : 17.3

A total of 80 Km seismic lines were planned on 6 lines along tracks and roads, finally 95,4 Km was surveyed on 7 lines

Number of lines EX: 01AL05
01 = year
AL = Client ALBAIDA
05 = Line number

3.2.1 POSITIONING MAP



3.2.2 SURVEY PARAMETERS

1- Satellite Ellipsoid Datum:	GRS80
Name of the Spheroid:	WGS 84
Semi major axi:	6 378 137.000
Inverse Flattening:	298.257223563
Units:	International meter

2- Local Ellipsoid Datum:	HAYFORD 1909
Name of the Spheroid:	ED50
Datum:	ED50
Semi major axis:	6 378 388.000
Inverse Flattening:	296.9999996135
Units:	International meter

3- Projection	
Name:	TM
Type:	Universal Transverse Mercator
Grid zone:	30 N
Central meridian:	3° 00' 00.00'' W
Latitude at origin:	0° 00' 00.00'' N
False Easting:	500 000 .00
False Northing:	0.00
Scale Factor at origin:	0.9996
Units:	International meter

4- Datum Shift (Local to WGS84):	
X Translation:	Dx = -97.874
Y Translation:	Dy = -101.841
Z Translation:	Dz = -130.806
X Rotation (Wx):	0
Y Rotation (Wy):	0
Z Rotation (Wx):	0
Scale factor (PPM):	1.0000000

The WGS-84 co-ordinates have been determined in applying the CGG datum shift from the known local co-ordinates. The same parameters were used in reverse way to determine the final positions into the local system. As a result, the final data in the local co-ordinates system is integrated in the existing local system while the WGS-84 co-ordinates released are derived from the CGG datum shift parameters mentioned above.
For further GPS survey, the standard datum shift parameters used usually in Spain would be appropriate in combination with WGS-84 derived either from IGN or measurements determination.
The local co-ordinates in the 3 dimensions will remain consistent.

3.2.3 SURVEY: EQUIPMENT – PERSONNEL AND LOGISTIC

EQUIPMENT

- 3 GPS Receivers Single Freq. Sercel NR102
- 1 GPS Receiver Differential station Single Freq. NDS200
- 4 Survey controllers Husky FS/2
- Hardware:
- 2 PC Computer Pentium
- 1 Printer HP laser 6P
- Software:
- TSO version 1.52
- Microsoft Office software.

PERSONNEL

The survey crew was split in two separate entities in charge respectively of Manpack surveying and staking.

Chief Surveyor:	C.Paul
Operators GPS:	De Castro Pena, Cazon Martin
Driver:	1
Helpers:	2

The standard crew of Manpack included 1 operator, while the staking crew included 1 foreman, 1 driver and 2 Helpers.

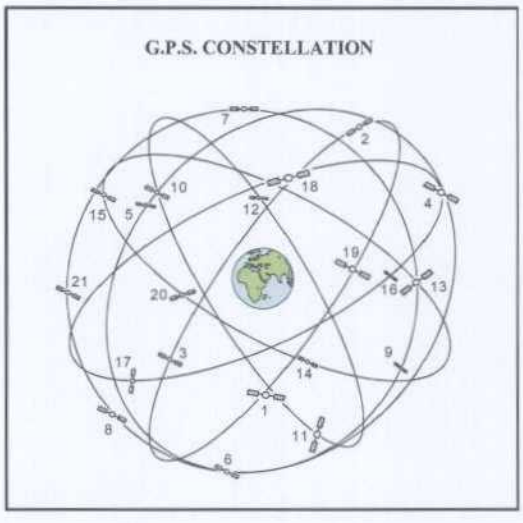
LOGISTIC SUPPORT

The transportation of the personnel was ensured with 2 Land Rover types Defender 4 by 4 equipped of VHF radios.

3.2.4 INTRODUCTION TO THE GLOBAL POSITIONING SYSTEM (GPS)

The GPS made available a downgraded signal for civilian use. By measuring the random variation of that positioning at a known point the correction could be calculated and transmitted to an independent GPS receiver at an unknown location.
SERCEL equipment was used to acquire the surveying field data.
The SERCEL NR 102 Manpack receiver has been using for the completion of the survey. The differential system enables to elude the issue of biases inherent to the system, to achieve accuracy of positioning lower than 1 meter. See below the basic principle of the system.

3.3 PRINCIPLE OF GPS



3.3.1 SPACE SEGMENT

24 satellites orbit the earth every 12 hours at an altitude of about 20200-km. In the full constellation, four SVs orbit in each of the six different planes inclined about 55 degrees to the equator. Each satellite contains several high-precision atomic clocks and each satellite constantly transmits radio signals using its own unique identifying code.

3.3.2 CONTROL SEGMENT

The control segment consists of a group of four ground based monitor stations. The satellites are tracked continuously, the satellite ephemeris and clock corrections calculated and transmitted to each satellite at least daily.

3.3.3 USER SEGMENT

The user segment consists of various GPS receivers. Each GPS satellite transmits two radio signals. The L1 signal modulated with two pseudo random noise ranging codes, the P-code (Precision code which may be encrypted for military use) and the C/A code (Coarse/Acquisition), which is not encrypted. The L2 signal is modulated with the P code only. The frequency on the L1 and L2 signals is respectively 1575.42 MHz and 1227.60 MHz.

Remark: The C/A code may be degraded at any time and receivers may miscalculate a single point position by up to 100 meters. This problem can be almost completely eliminated by differential survey.

3.3.4 HOW RECEIVER CALCULATE LOCATION

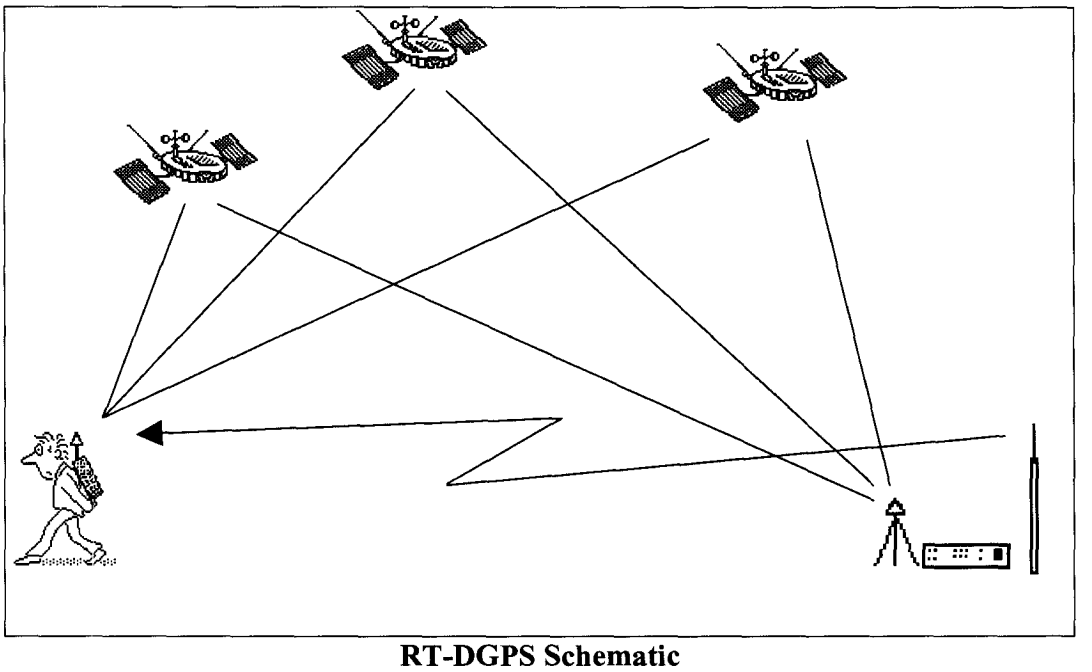
The receivers compute the distances from the satellites and calculate its position using resection techniques. Four satellites are needed to get a 3 dimensional position. The satellites and the receivers must be synchronized to generate the same code at the same time. The time difference between the same part of code multiplied by the speed of the light gives the distance.

3.3.5 SINGLE POINT POSITIONING

The receiver calculates its position in the field without any reference to any other receivers observing data at that time. The accuracy of this technique is +/- 30 meters with pseudoranges derived from P code and +/- 100 meters with pseudoranges derived from C/A code.

3.3.6 MANPACK NR102

The method of relative positioning is based on the premise that many error sources (i.e. orbit errors, effects due to ionosphere and troposphere, satellite clocks offsets, etc....) can be removed as a system shift or bias as they affect two (or more) receivers in the same way. Differential positioning uses simultaneous data from separate stations to the same GPS satellites in order to determine the relative position of one station with respect to another. For accurate 3-dimensional GPS positioning, a minimum of four satellites at an elevation of 15° elevation or more above the horizon must be available.



RT-DGPS Schematic

3.4 ORIGIN OF THE CO-ORDINATES

3.4.1 EXISTING STATIONS

"Aguilas" station derived from the existing network of The "Instituto Geografico Nacional"(IGN) was used to determine the differential station coordinates. "Banos" an Entinas stations were used as a control by static measurements. The WGS-84 co-ordinates used for the GPS measurements are derived from terrestrial triangulation on which the CGG datum shift has been applied. Prior the commencement CGG performed the survey of static baselines to ascertain the consistency of the references. The reference points are established at the top of bencharks mounted above several meters high concrete pillars. (See picture next page).

Aguilas, base point for the survey

Easting: 521761.81
Northing: 4072228.34
Elevation: 147.0

3.5 WORKING METHOD

One crew was set up to stake the lines and the Manpack crew followed closely to level the seismic positions and control the continuity of the numbering.

3.5.1 MANPACK

The Manpack NR102 (Differential positioning) survey method was used to perform the survey of the seismic program. The differential station was set up near the C.G.G. garage. The coordinates were issued from the geodetic point of AGUILAS.

MANPACK FILE TYPE

```
H01 PROSPECT NAME                Santa III            2D
H02 DATE OF SURVEY               2001
H03 CLIENT                       Enagas
H04 GEOPHYSICAL CONTRACTOR       CGG
H05 POSITIONING SYSTEM           DGPS
H10 HORIZONTAL DATUM NAME        ED50CGG
H11 SPHEROID NAME                HAYFORD1909
H12 SEMI MAJOR AXIS,FLATTENING   6378388.000              3.3670034
H13 VERTICAL DATUM NAME          METER
H14 DATUM SHIFT TX,TY,TZ           -97.87    -101.84    -130.81
H15 DATUM SHIFT RX,RY,RZ,SF         0.0000     0.0000    0.0000    0.0000
H20 PROJECTION TYPE              TM
H21 LATITUDE OF STD PARALLEL(s)   00000.000    00000.000
H22 LONG. OF CENTRAL MERIDIAN    -30000.000
H23 GRID ORIGIN                   00000.000    00000.000
H24 GRID COOR. AT ORIGIN         500000.000        0.000
H25 SCALE FACTOR                 0.9996000000
H26 SCALE FACTOR AT               00000.000     00000.000
H27 SKEW TO RECTIFIED             00000.000
H30 RECEIVER GRID                  30.00 5702 3053     518696.50    4524952.50
H31                               140.00     522090.40    4520907.80
H40 SHOT POINT GRID                33.54 1111 1111     518696.50    4524952.50
H41                               230.00     517931.50    4524310.50
H50 XY UNITS METRES     COEFF  1.00000000 Z UNIT METRES     COEFF  1.000000000
H55 JOB NAME                     8826
H59 JOB DESCRIPTION              Manpack
H60   LLLL     NNNN   EASTING    NORTHING  ELEV     Q
G    5252      3145  515299.80 4518499.40   140
G    5252      3146  515319.10 4518476.50   140
Eof
```

3.5.2 PRINCIPLE

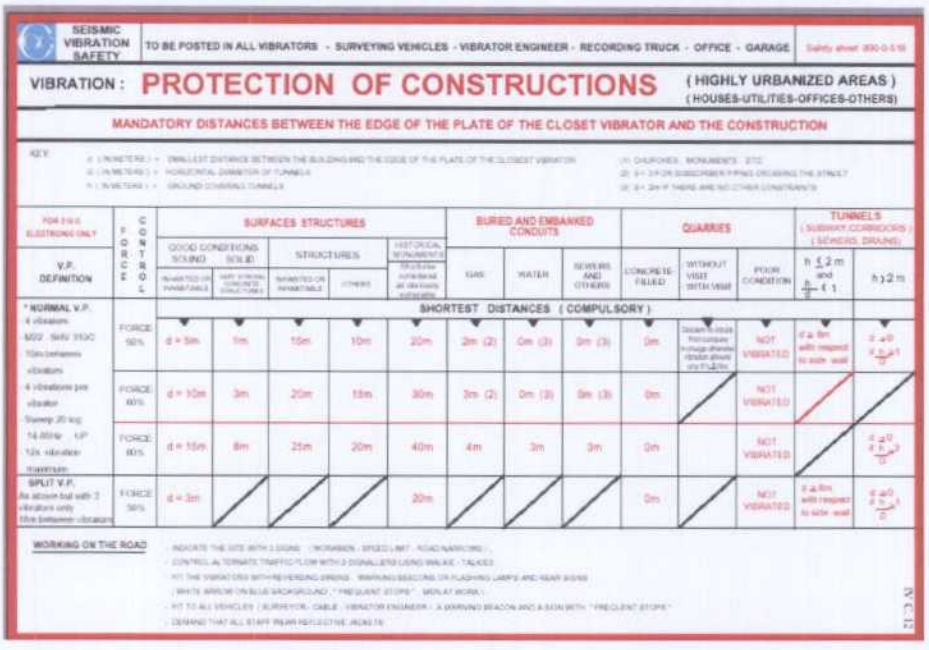
GPS employs at least two receivers that track the same satellites simultaneously. Real time surveys are differential surveys with a communications link (radio) between the differential station and the rover receiver. The differential station is located on a known point with the purpose to quantify the ambiguities (due to the GPS biases), calculate and broadcast by radio the correction which are applied to the Manpack rovers. The survey operator surveyor was in charge of the establishing the line documents and the carrying out of the offsets when it was necessary. In difficult areas the crews was allowed to use the magnetic compass to place the pegs. In such cases the differences of elevations calculated at the office. Each Seismic Point was marked with a peg planted on the position of the survey with a mark of paint on the ground. Color codes were blue for the receiver points and red for Sources points.

3.5.3 MANPACK – OPERATING MODE

First, the pre-plot coordinates are downloaded to the Manpack memory card at the office. On the field, once the required conditions achieved (reception of the Radio link and sufficient PDOP or good geometry of satellites spread), the user select the positions to stake out, then the software calculate the vector from the current position to the waypoint to be placed. Then, he moves to the requested position aid of the graphical display indicating the rover position in relation to the waypoint, the distance to track, and the azimuth of the vector. Once the requested position is determined and adjusted within a range of 50 cm accuracy, the coordinates the operator records the point.
The GPS system was used for all the survey, although some points had to be re-surveyed because of masks caused by the houses or the traffic.

3.6 OFFSETS SURVEY

Very few V.P. had to be offseted. As odd numbers were vibrated, replacements V.P. were inserted on even numbers when possible.



3.7 OFFICE

The processing included the trajectography computation to determine final coordinates and the quality controls.

3.8 MANPACK PROCESSING

The memory card for the Manpack are written with Winpros, and read daily. The field data were post processed to get final coordinates.
Once they were processed by " TRAJECTO" software, every set of surveyed final coordinates were ontrolled using EXCEL workbook.
Trimble Survey Office (TSO) is a graphical interface used generally for the Trimble applications, which nevertheless supports any defined formats. It is in fact linked with a database containing the information of the survey. TSO enables to classify the data using layers, which reveals itself convenient in the purpose of categorize the amount of data available in the project. The layers created in TSO included among others numerous attributes, receivers points per lines, sources points per lines, offsets points, gaps (survey pending to the pre-planning), skipped shot points, replacement shot points, non seismic features.

3.9 FAST STATIC PROCESSING

The fast static processing has been performing using GPSWINRS (SERCEL). The field data was transferred from the MEMOCARD, then the baselines were computed

3.10 QUALITY CONTROLS

Maximum SERCEL Q.C for X Y Z was 0.5m. Points were resurveyed if they were outside tolerance. In such case, it was due to a poor dilation of precision (HDOP in or PDOP). Another check was operated by GEOLAND and any anomaly reported to the survey office to be controlled.

Every day the Manpack crews have been asked to survey 2 points from the last survey. This survey overlap enables to compare two independent GPS sessions and by doing so, to ensure that the coordinates of the reference station is not erroneous and that the operator has entered a correct antenna height. All the traces spacing were checked. The shifts exceeding 1 m entailed a field control of the doubtful positions. Otherwise, the elevations differences between the successive point were systematically calculated to locate the inconsistent value, and as a result to point the possible errors. All these procedures were performed on daily basis.

3.11 DATABASE MANAGEMENT

The database management aimed to establish an effective system of query including the whole information available in survey department. The database consisted in Access file including numerous categorized classes such as dates, method of survey, position co-ordinates, among many others attributes defined previously. The information provided from the survey logs, the sketch lines, the mapping. The database was connected with Arcview 2.3 in order to draw up various maps on query, such as progress maps, offsets maps, progress per crew, etc...

3.12 LINE DOCUMENT

The line sketches contained all the information relating to the features located on the line or nearby.

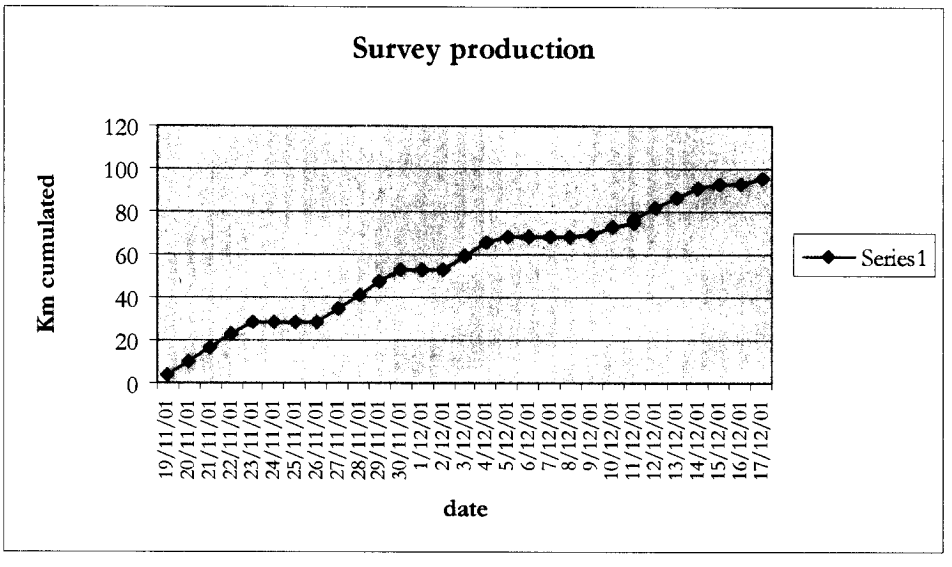
3.13 GEOLAND LINKS

Geoland software enables to define seismic point positions in the purpose to ensure an optimized fold over the prospect. The fold gaps are generally the result of cancelled points or large offsets generated on the field. Geoland process consists to run coverage simulations in order to locate the gaps, and eventually compensate its by moving the shot points. Therefore the links with the survey department are numerous and permanents. Survey dept. provides the survey of the features (non-seismic objects), the field positions of the SPs enabling Geoland to run the procedure on the base of real updated information. In reverse order, Geoland instructs to perform changes in the positions, or to survey additional shot points.

3.14 SURVEY PRODUCTION

The survey production started on 31st July 2001 and ended on 2nd October 2001. After the completion of the program, one Manpack crew was appointed to fill the gaps and perform the additional surveys instructed by the Geoland department.

3.15 SURVEY PROGRESS



N.B.: December 6 and 8 are local holidays and production was performed in 20 working days.

Average daily production was therefore 4.77 km per working day.

3.16 JOB DESCRIPTION AND WORK PROCEDURES

Job descriptions mentioning the reliabilities and commitments of each position through the line management were distributed to the heads of crews. HSE departments provided various detailed work procedures relating to the survey over the Ban Rakam area. The procedures were review by the chief surveyor.

Every crew was provided a first Aid Kit, and 2 staffs per crews (the surveyor and the foreman in the case of survey crews) were given first-Aid training by the medic dept. The first aid workers were given a refreshing course every month.

Sectional and toolbox meetings were held on regular basis by CGG staff over the duration of the project. The sectional meeting including the expatriate staff was held every Tuesday during the operations and chaired by the chief surveyor. Every morning, prior the starting of the crew to the field, the field surveyor held a toolbox meeting. The topics mainly related to the work procedures and the hazardous situation possibly encountered on the field. Additionally to these procedures, the survey staff attended to an operational meeting held daily by the chief surveyor, where were touched sometimes HSE topics.

3.17 PROBLEMS ENCOUNTERED

First, the good experience of the staff enabled a quick start.
In further survey the planning should include the set up of a geodyne inertial traverse at the beginning of the survey. The combination of both GPS survey and geodyne inertial traverse will be helpful. In villages leveling was difficult because of the masks created by the houses or the trees.

The whole survey was conducted without any L.T.I. (lost time injury) or any accident and ended on December 20th after the last V.P.

4 RECORDING

4.1 PERSONNEL – EQUIPMENT AND LOGISTIC

PERSONNEL

1 Senior Observer
3 Assistant Observers (2 on line, 1 on workshop)
8 Front crew helpers (Spread layout)
8 Back crew helpers (Spread pick-up)
3 Drivers (traces transportation)
4 Vibroseis drivers
1 Vibroseis Mechanic
1 Refueling driver

EQUIPMENT

1 Recorder SN388 with accessories, installed on a MAGIRUS truck
450 Telemetric Boxes SU1 UL
450 Cable 55m long
600 Strings of 12 geophones 10 Hz
14 CSU
2 DPG Sercel VE 416
16 12V batteries (on lines)
20 VHF Radios
4 Vibroseis Mertz M22 buggies (30 000 lbs)
5 DSD Sercel VE416
4 Vehicles 4x4 Land Rover Defender
2 Vehicles 4x4 Iveco Daily DC
2 Toyota Pick-up
1 Refueling truck
1 Workshop trucks

LOGISTIC

The transportation of the personnel and the materiel was ensured with 2: 4 by 4 IVECO Daily DC and 1 Land Rover type Defender 4 by 4
All cars were equipped of VHF radios.
The line control and repair was ensured by 2 assistants line with 2 Land rover and spare materiel (cable, boxes and strings of geophones).

Recording personnel was divised in 3 crews:

Front crew for layout materiel
Back crew for picks up materiel
Vibroseis crew
Fuel supply was ensured by the local Schell station (close to the workshop) and CGG refueling truck.
Daily fuel consumsion was 1200 liters.

4.2 GENERAL ACQUISITION PARAMETERS

Receivers:

Receivers spacing:	15 m
Active chanels:	240
Symetric spread:	120 + 120 traces (VP on the center)
Geophones per trace:	12
Geophones type:	SM4-10Hz

Vibroseis Point (VP): (between 2 traces)

VP spacing:	30m
Vibroseis type:	Buggy M22, Force: 30 000lbs
Vibroseis number:	3 (+1 spare)
Electronic:	Sercel VE 416
Investigation depth:	2000m
Coverage:	6000%

4.3 RECORDING PARAMETERS

The field parameters were defined prior recording by tests (See Annex):
After the analysis of single VP tests and beginning of line 01AL06 recorded with alternate parameters using linear and log sweeps, the following parameters has been choose for the rest of the survey :

Recording parameters:

Pre-amplifier Gain:	12dB
Filtre anti alias:	200 Hz
Recording length:	3 s
Sample rate:	2ms
Tape format:	SEG D (IBM 3480)

Spread:
Split spread 120/2/2/120: Offset Minimum 37.5m, Offset Maxi 1822.5m

Source parameters

3 vibrators centered on VP location

Distance between plates	13m
Sweep:	12-110Hz, Log 10 dB over the sweep range, length 10s, tapers 250ms
Vertical Sum :	4 or 8 depending of noise ratio (more than 10 μV for stack 4)
Phase rotation:	No
Noise editing:	Diversity stack

Split spread 120/2/2/120: Offset Minimum 37.5m, Offset Maxi 1822.5m

Exemple of information sended to processing center

AREA:	***dalias***
LINEA:	***01AL06***
CUENCA:	***dalias***

PARAMETROS de REGISTRO
Registrado por : C.G.G.(134 32 21) 01 dic - 01 dic 2001

LABORATORIO:

Tipo:	***SN-388***	***Formato:***	***SEGD 8058***
Longitud registro:	***3 s***	***Muestreo:***	***2 ms***
Cobertura:	***60***		
Cintas:	***3480***	***Cintas No.:***	***1- 7***
Gan. pre-ampli:	***12 db***	***Notch:***	***out***
Filtro BF:	***out***	***Filtro HF:***	***200 hz, -3 dB***

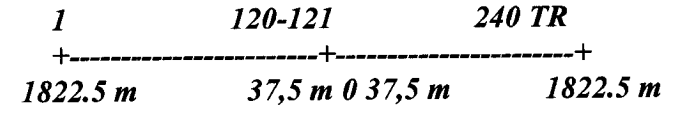
BASE SISMOGRAFICA:

Numero de trazas:	***240***	***Distancia entre trazas:***	***15 m***
Geofonos/traza:	***12***	***Tipo de Geofonos:***	***SM4 - 10Hz***

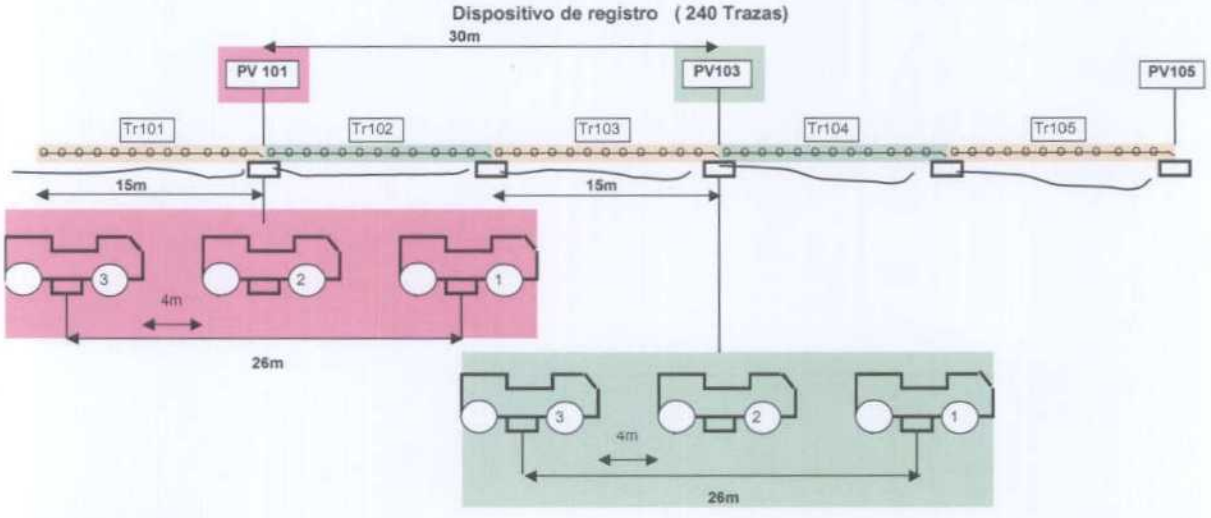
PUNTO DE TIRO:

Distancia entre PT's:	***30 m***	***Situacion:***	***entre trazas***
Fuente energia:	***vibrosismica***	***Longitud barrido:***	***10 s***
Barrido: 12-110 hz, log 10 db		***Barridos por VP:***	***4***
N° de vibros por PV:	***3***		

DISPOSITIVO



Schema of field operation



Inter trazas 15 m

Inter PV 30 m

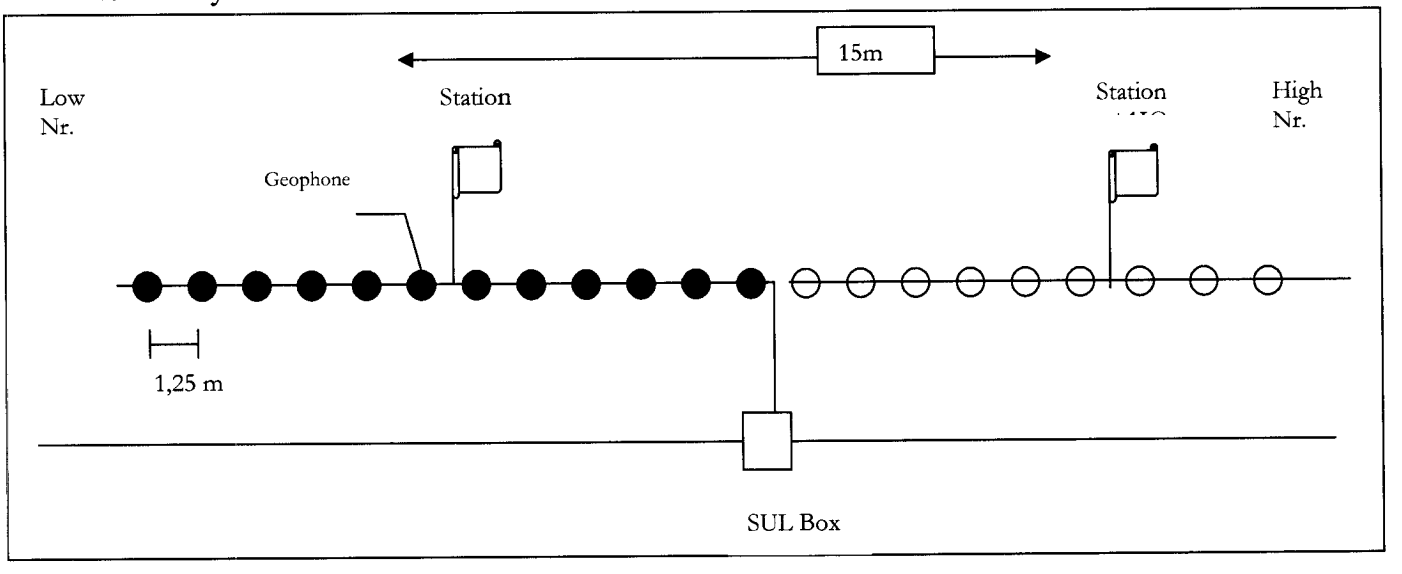
Inter geofonos 1,25 m

Mission 134 32 21

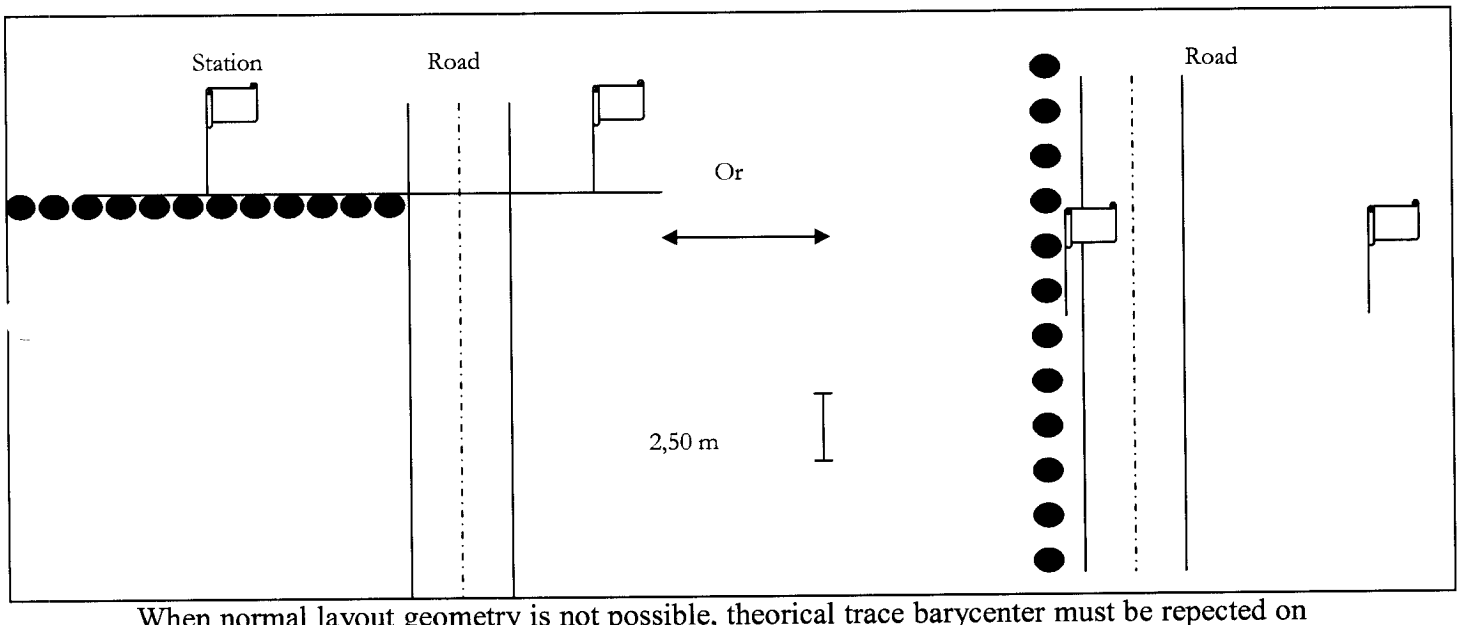
4.4 LAYOUT OF THE GEOPHONES (TRACE)

Trace position: (Depending of the field anomaly, road, houses, river etc...)

Normal layout:



Bunched layout: Station



When normal layout geometry is not possible, theorical trace barycenter must be repected on paint mark on ground and geophones positioned far away from noise source (generator, river, water pompe etc...).

Quality control on field:

VP position: the "chef de terrain" before the operation controls all positions; *pilot* valided (or modified for safety raison).

Trace position: Layout along road

Recording truck

Line power unit and Telemetric station Unit SN 388 UL1

Production
Finally, a total of 95,325Km (3179 VP) was recorded in 19 days of production, (167 VP average daily production).

A total of 65 theoretical VPs has been skipped due to the lack of access, Water pipe, bridge or unsafe construction close to the VP position 63 of these 65 VP has been recupered and 95,400 Km was surveyed.

Only 4 hours stand by due to the bad weather (heavy rain Saturday 15th December).
Hereby is the recapitulation of the Surveying and Recording Department activity.

5 SEISMIC LINES INFORMATIONS

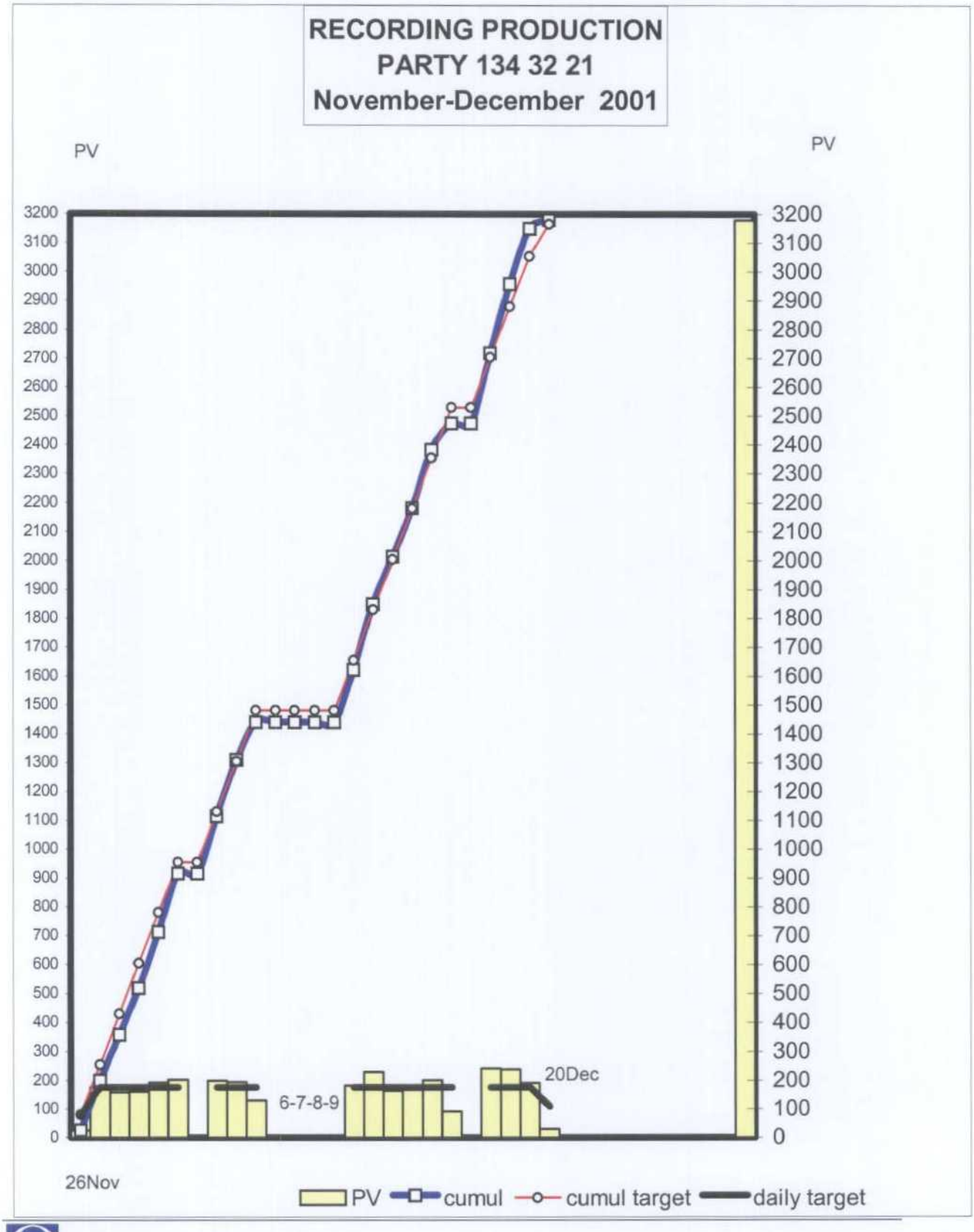
SURVEYED					RECORDED				
LINE	FROM	TO	KM	Total Traces	LINE	FROM	TO	KM	Total PV
01AL1	101	1772	25,08	1672	01AL1	101	1771	25,065	834
01AL2	101	1644	23,16	1544	01AL2	101	1643	23,145	772
01AL3	101	748	9,72	648	01AL3	101	747	9,705	324
01AL4	101	725	9,375	625	01AL4	101	725	9,375	313
01AL5	101	922	12,33	822	01AL5	101	921	12,315	411
01AL6	101	788	10,32	688	01AL6	101	787	10,305	344
01AL7	101	461	5,415	361	01AL7	101	461	5,415	181
Total			**95,4**	**6360**	**Total**			**95,325**	**3179**

Front crew working along road and police assistance

Operations in city with police assistance

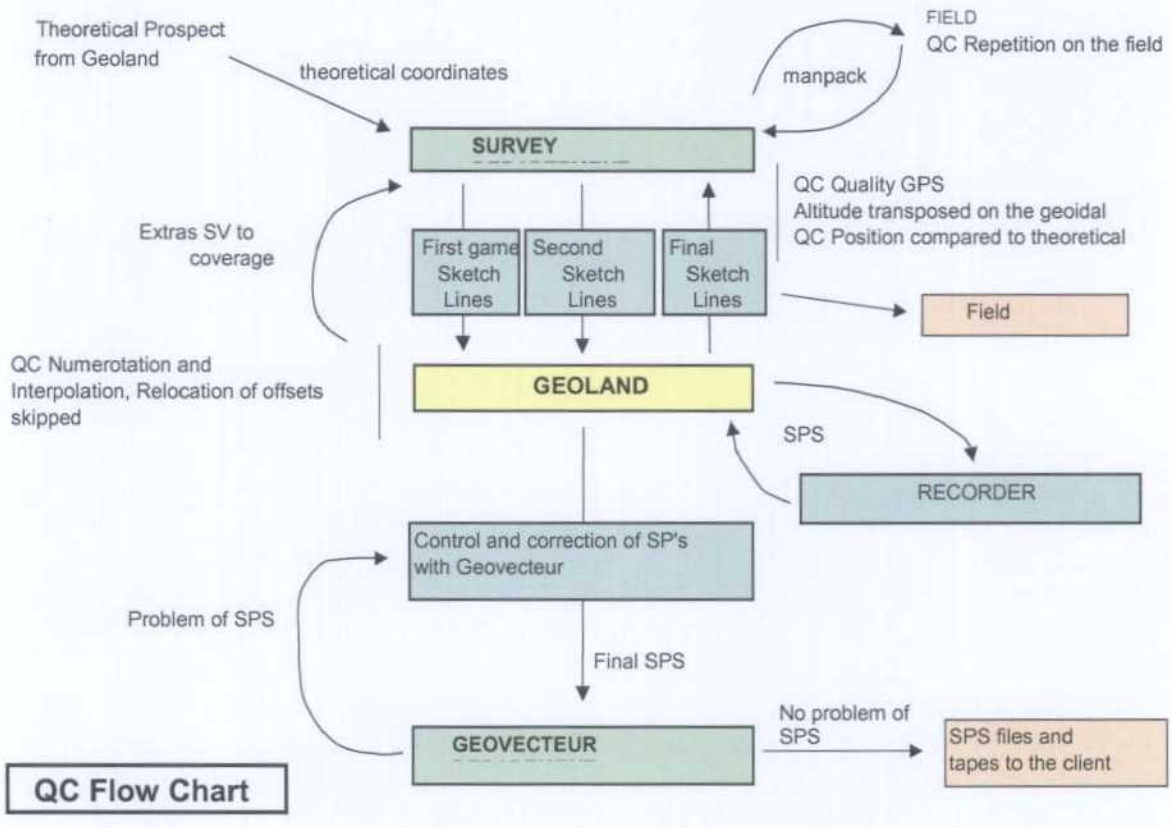
6 DETAILED ANALYSIS OF RECORDING DAILY PRODUCTION

OPERATIONS REPORT:												
	SURVEY					Remarks	RECORDING					Remarks
DATE:	LINE	From ST	To ST	TOTAL	KM		LINE	From PV	To PV	Total PV	KM	
	Mobilisation											
11/19/01	01AL06	101	365	265	3,975							
11/20/01		366	788	422	6,345	End line						
11/21/01	01AL02	101	501	401	6,015							
11/22/01		502	901	400	6,000							
11/23/01		902	1301	400	6,000							
11/24/01		Levelling				Levelling	*Mobilisation*					
11/25/01							Tests similarity vibroseis					Tests Geovect.
11/26/01		Levelling				Levelling	01AL06	101	149	25	0,735	Tests sweep
11/27/01	01AL02	1302	1643	342	5,145		01AL06	151	499	175	5,250	
	01AL03	101	179	79	1,185	Levelling						
11/28/01	01AL03	180	603	424	6,36		01AL06	501	787	144	4,320	End of line
						Levelling	01AL02	101	127	14	0,420	Start of line
11/29/01	01AL03	604	748	145	2,175		01AL02	129	449	161	4,845	Pb noisy traces
	01AL01	101	369	169	4,035	Levelling						crossing village
11/30/01	01AL01	370	737	368	5,520	Levelling	01AL02	451	835	193	5,790	
12/1/01						Levelling	01AL02	837	1243	203	6,090	
12/2/01												Vandalism on line
12/3/01	01AL05	101	510	410	6,150	Levelling	01AL02	1245	1642	200	6,000	crossing village
12/4/01	01AL05	511	922	412	6,180	Levelling	01AL03	101	487	194	5,805	Start of line
12/5/01	01AL04	163	389	227	3,390	Levelling	01AL03	489	747	130	3,900	End of line
12/6/01	National holliday						National holliday					
12/7/01												
12/8/01		holliday						holliday				
12/9/01												
12/10/01	01AL04	101/163	389/605	278	4,185	Levelling	01AL05	101	463	182	5,445	Start of line
	01AL04	606	725	120	1,800		01AL05	465	921	229	6,870	End of line
12/11/01	01AL01	738	875	138	2,070	Levelling						
12/12/01	01AL01	876	1203	328	4,920	Levelling	01AL04	101	427	164	4,935	Start of line
							01AL04	429	725	148	4,440	End of line
12/13/01	01AL01	1204	1505	302	4,530	Levelling	01AL01	101	139	20	0,585	Start of line
12/14/01	01AL01	1506	1772	266	4,005	Levelling	01AL01	141	541	201	6,030	
12/15/01	01AL07	101	267	167	2,505		01AL01	543	725	92	2,760	Rainy stand by 4 h
12/16/01												
12/17/01	01AL07	268	461	194	2,910	Levelling	01AL01	727	1211	243	7,290	Wind
12/18/01						Levelling	01AL01	1213	1689	239	7,170	Wind
12/19/01	End of production						01AL01	1691	1771	41	1,230	
							01AL07	101	397	151	4,500	End of line
12/20/01							01AL07	399	360	30	0,915	End production
	Demobilisation survey crew						Demobilisation recording crew					Demob crew
Total	Survey			6257	95,400 Kms		Recording			3179	95,325 Kms	


RECORDING PRODUCTION
PARTY 134 32 21
November-December 2001
PV
PV
3200
3100
3000
2900
2800
2700
2600
2500
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
6-7-8-9
20Dec
26Nov
PV
cumul
cumul target
daily target

7 QUALITY CONTROL

7.1 QC CHART



7.2 PERSONNEL

1 Seismologist (Geovecteur)

7.3 EQUIPMENT

2 RS6000 Computers with 4GB HD
2 External HD 18 GB
2 Exabyte Tape Reader/Writer
2 Fuji Cartridge Reader
1 Thermal plotter OYO GS 612
1 Color Printer Format A0
1 Black and white Printer
1 Power Supply

7.4 GEOLAND® SOFTWARE

Geoland® is a management system designed to guarantee then quality of the support data on land or shallow water acquisition crews.
The core of the software is a single relational database (Oracle Database System), and it is dedicated to daily manage tasks such as Survey Preplanning and QC, Recording order preplanning and QC, SPS (or others files formats) creation, data exchange with processing unit (Geovecteur).

Survey preparation:

Import of scanned or aerial or satellite maps; Calibration of these maps.
Digitization of non-seismic objects (prospect boundaries, roads, tracks, rivers, exclusion areas, etc).
Setting up of the standard parameters, such as numeration, swath numeration, and recording order.

7.5 DAILY PLANNING AND UPDATING THE SURVEYING JOB

Import of local or specifics non-seismic objects according to the progress of the survey
Update of the real coordinates after surveying
QC and validation of the surveyed data (comparison between real and theoretic coordinates, elevation curves, DGPS statistics explorations)

7.6 DAILY PLANNING AND UPDATING THE RECORDING JOB

Definition of the recording sequence.
Delivering of the planned production on floppies in compatible format with recorder (SN388).
Checking of the Vibrations Locations against the surveyed coordinates after shooting. Each suspected point (11 in the total prospect) has been resurveyed and rechecked.
Update of the real production after shooting (spreads and attributes).

7.7 FINAL DELIVERING

Final survey map
Final SPS file

7.8 GEOVECTEURPLUS® SOFTWARE

Geovecteur® is an integrated processing package including interactive applications for QC, analysis and processing data.
Some of these applications are:

Xjob: Job builder showing the processing flow applied to the data
Velcom: Velocity picking based on velocity spectrum and mini-stacks
Mvp: Velocity picking of constant velocity scans
Exam: display of data on screen
Xqc: Viewing of seismic attributes; plots of these attributes
Seismic: Trace editing, mute picking
Sditr (stack dromo interactive): refraction statics computation and repositioning

Geovecteur® on 2D crew:

Processing of instrument tests (recorder and vibroseis truck similarities)
Copying SEGD format field tapes or cartridges
Reformatting field data into internal CGG format
Reading of SPS disks and building 2D geometry files and libraries
Geometry QC by analysis of Linear Move Out stacks and using Sditr
Elevation field static application
Production of inline stacks.
Display on electrostatic paper.

Final Delivering:

Original Cartridges
CD Rom with SPS files
Inline stacks

7.9 REPORTING AND MAPPING: DBLAND AND ARCVIEW

Dbland has been designed to set up a standard crew acquisition follow – up.
It keeps historical data for each seismic point and can monitor acquisition progress
Log of daily crew production for each department
ArcView can be connected to the Dbland database in order to produce daily progress maps
Or customized maps according to the client's requests.

8 HSE PROCEDURES ON CREW

8.1 SAFETY INDUCTION

Prior to be sent to the field the staff newly employed was given a safety induction including basic safety at work training, CGG health and safety policy, CGG safety procedures, fire training, first aid training. Refreshing was evenly conducted along the duration of the survey.

8.2 MEDICAL CHECK

Every worker involved during the survey campaign has been medically checked before the employment.

8.3 PERSONAL PROTECTIVE EQUIPMENT

Every worker was supplied an ID card with photography and required to produce it at any check during working hours.
The following items were provided to the workers:
- boots
- Ropes
- First Aid Kit
- Handset Radios

8.4 JOB DESCRIPTION AND WORK PROCEDURES

Job descriptions mentioning the reliabilities and commitments of each position through the line management were distributed to the heads of crews. HSE department provided various detailed work procedures relating to the survey over the *Campo de Dalias*. The procedures were review by the H.S.E advisor.
Toolbox meetings were held on regular basis by CGG staff over the duration of the project... Every morning, prior the starting of the crew to the field, the field crews held a toolbox meeting. The topics mainly related to the work procedures and the hazardous situation possibly encountered on the field. Additionally to these procedures, the survey staff attended to an operational meeting held daily by the chief surveyor, where were touched sometimes HSE topics.

9 CONCLUSIONS

This survey has been conducted without any major problem: No down time only 4 hours stand by occurred due to the bad weather.
No noticeable incident occurred during the field operations. Roads and tracks used by vibs have been used without any impact on the environment.
The following and control of the work is a result of the good cooperation between CGG, local authorities and the client representatives.

134 - 32 - 21

TEST REPORT

Campo de Dalias Seismic Testing Program

26-27th of November, 2001

On behalf of

ALBAIDA SPAIN

134 - 32 - 21

TEST REPORT

Dispatching list:
Enrique Aracil Avila UTE CGS CGG
Angel Rodriguez LOCS

Jean Mathieu, Party Chief / seismic crew 134-32-21
Thibault Laine / QC Geovecteur seismic crew 134-32-21
JJ. Postel-A. Depeyras / C.G.G./ T.M.G Massy
M. Larroque / C.G.G. Country Manager Spain

10 SUMMARY

CGG carried out those tests on behalf of ALBAIDA.
The purpose of this set of test was first to identify from single VP and on a piece of seismic line stack the best sweep frequency range and the VP effort in term of vertical stack.

Sweep low frequency limit: 12 Hz
Sweep high frequency limit: 110 Hz was preferred to 120 Hz
Sweep type: Logarithmic 10dB over sweep range was preferred to linear sweep
Sweep length: 10 sec was preferred to 8sec as initially planed
Sweep taper: 25 ms cosine taper
Number of sweep per VP: 4 sweeps
Vibrator array: in-line array without move-up

11 TEST OVERVIEW

The test program was divided into 2 parts:

- **Part 1- Sweep parameters on single VP:**

- **Part 2- Alternate sweep parameters on 2D production line 01AL-06:**

Recording parameters:

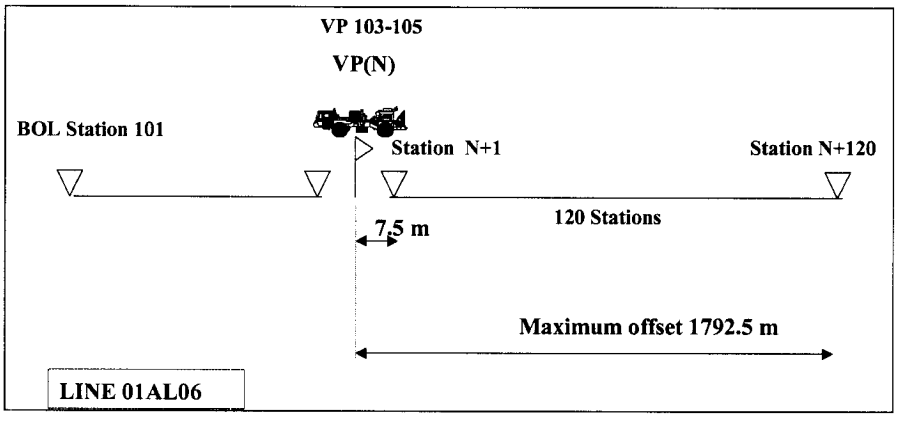
SN388 V.8.4 (SU1 UL) – CS VE416 V 10.1
RCV interval: 15m
VP interval: 30m
Record length: 3 seconds
Sampling rate: 2 ms
Format: SEG D 8058 with surveyed X,Y,Z in trace header
Pre amplifier gain: variable 12dB
HC filter: 0.8 freq. Nyquist minimum-phase / -3dB at 200 Hz
LC filter: Out
Notch filter: Out
Noise elimination: Out

Part 1- Sweep parameters on single VP:

Comparison of sweep has been performed at the beginning of line 01AL-06 on VP 103 and 105 as follows:

Reference Sweep 1: 12-120 Hz, linear, length 10s, Sum 2, taper 250ms
Sweep Test 2: 12-120 Hz, log 10dB, length 10s, Sum 2
Sweep Test 3: 12-110 Hz, linear, length 10s, Sum 2
Sweep Test 4: 12-110 Hz, Log 10dB, length 10s, Sum 2
Sweep Test 5: 12-110 Hz, linear, length 10s, Sum 4
Sweep Test 6: 12-110 Hz, Log 10dB, length 10s, Sum 4

Date: 27th of March 2001 (julian date 330)
Recording spread:
Split spread 120/0/0/120: Offset Minimum 7.5m, Offset Maxi 1792.5m



Record N°	Sweep parameter	Number of vibrators	Number of sweeps	Sweep length	Drive	Taper both ends	VP location
7001	**LINEAR 12 – 120 Hz**	3	2	10s	50 %	250 ms	103
7002	**LINEAR 12 – 120 Hz**	3	2	10s	50 %	250 ms	105
7003	**LOG 10dB 12 – 120 Hz**	3	2	10s	50 %	250 ms	105
7004	**LINEAR 12 – 110 Hz**	3	2	10s	50 %	250 ms	105
7005	**LOG 10dB 12 – 110 Hz**	3	2	10s	50 %	250 ms	105
7006	**LINEAR 12 – 110 Hz**	3	4	10s	50 %	250 ms	105
7007	**LOG 10dB 12 – 110 Hz**	3	4	10s	50 %	250 ms	105
7008	**LOG 10dB 12 – 120 Hz**	3	2	10s	50 %	250 ms	103
7009	**LINEAR 12 – 110 Hz**	3	2	10s	50 %	250 ms	103
7010	**LOG 10dB 12 – 110 Hz**	3	2	10s	50 %	250 ms	103
7011	**LINEAR 12 – 110 Hz**	3	4	10s	50 %	250 ms	103
7012	**LOG 10dB 12 – 110 Hz**	3	4	10s	50 %	250 ms	103

Part 2- Alternate sweep parameters on 2D production line 01AL-06:

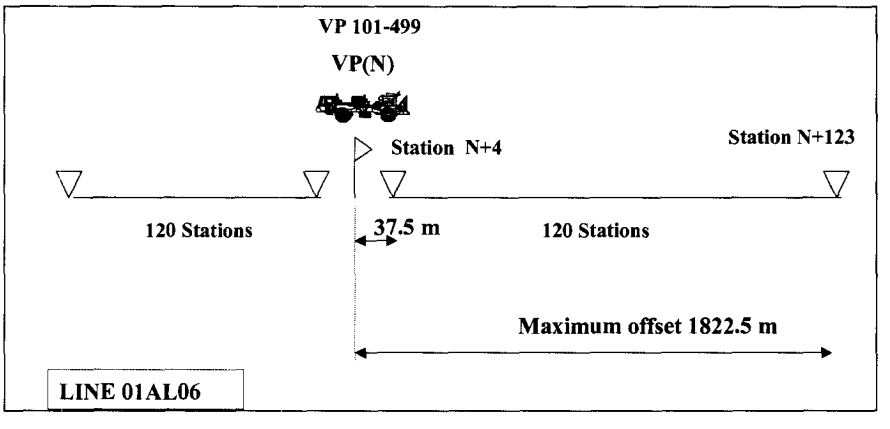
The beginning of the line 01AL-06 from VP101 to 499 has been recorded using alternate sweeps linear and logarithmic.

Sweep 1: 12-110Hz, linear, length 10s
Sweep 2: 12-110Hz, Log 10 dB, length 10s
For these VP, Sum 2 and Sum 4 have been dumped on cartridge (2 records per VP)

Date: 26th – 27th of November 2001 (julian date 330 & 331)
Alternate sweep parameters:
LINEAR 12 – 110 Hz, 3 Vibs, 2 and 4 sweeps 10s, and taper 250ms
LOG 10dB 12 – 110 Hz, 3 Vibs, 2 and 4 sweeps 10s, and taper 250ms

Source array:
3 vibrators centered on VP location without move-up.

Recording spread:
Split spread 120/2/2/120: Offset Minimum 37.5m, Offset Maxi 1822.5m



Record N°	Sweep type tested	Vibs	Sum	SPS Code	Remarks
1	LINEAR 12 – 110 Hz	3	2	**V4**	**EXTRA DUMP ON CARTRIDGE**
2	LINEAR 12 – 110 Hz	3	4	**V3**	
3	LOG 10dB 12 – 110 Hz	3	2	V2	Extra dump on cartridge
4	LOG 10dB 12 – 110 Hz	3	4	V1	

11.1 GROUND ROLL

A ground roll cone noise is present on all records with 2 major type of velocity, around 700m/s and 1200m/s. This follows the depth of the unconsolidated layer (Weathering Zone), which varies a lot along the line. The frequency of this noise is about 15 Hz.
This noise is less strong on the log sweep due to the 12 Hz starting frequency and the short time spent on low frequency band.

11.2 AMBIENT NOISE

The ambient noise on this line was low except some local vehicles.

11.3 REFRACTION

The main refractor velocity is about 2400 to 2650m/s on the major part of the line. This refraction marker has been used for geometry QC with and offset range from 700 to 1300m with a good reliability. However, the end of the line shown a drastic change with this marker disappearing, certainly due to a velocity inversion (higher velocity upper low velocity medium). The geometry QC has been performed on the first valid marker with 1800 m/s over the offset range 240-330 m only.

11.4 REFLECTION

Beginning of line 01AL-06 is poor and becomes muck better after a while with a good reflector around 600ms with a RMS velocity about 2400m/s. This horizon is then dipping, coming up to 350 ms on the south part of the line.

12 RESULTS

Processing of the single VP records was done on Geovecteur processing software/ IBM RS6000 station:

- Reformatting to Geovecteur internal format
- Amplitude recovery
- Frequency analysis on shot gather
- Attribute analysis mainly about frequency bandwidth, dominant frequency and S/N ration on a signal window.

Figures 1 to 4 in annex 1 show an example of single VP and amplitude spectrum.
Figures 5 to 9 in annex 1 show attributes compute on single VP test and on the production test phase (figure 9).

Stack processing was done on Geovecteur processing software/ IBM RS6000 station:

- Reformatting to Geovecteur internal format
- Spherical divergence correction
- FK filtering with rejected velocity from 0 to 1300m/s
- Gapped predictive deconvolution gates 200 – 1000ms, Gap 16ms, Operator length 60 ms Prewhitening 0.5 %
  Times are referenced from first break time
- FIELD STATIC CORRECTION (ELEVATION VC=2000M/S, DP 0M) TO FDP
- AMPLITUDE EQUALIZATION USING A 300 MS SLIDING WINDOW, OVERLAP 150 MS
- NMO CORRECTION
- STACK IN CDP MODE
- FIELD STATIC APPLICATION FROM FDP TO DP 0 M
- AMPLITUDE EQUALIZATION USING A 300 MS SLIDING WINDOW, OVERLAP 150 MS

FOR THE PRODUCTION/TEST PHASE, THE DIFFERENT STACKS HAVE BEEN PERFORMED USING ALL SUM4 VP, ALL SUM2 VP AND SEPARATE LINEAR & LOG SWEEPS PRODUCING A 30 FOLD ONLY.
THE FIGURES 1 TO 6 IN ANNEX 2 SHOW THESE STACKS. FIGURE 7 SHOWS A RESIDUAL STATIC STACK ON THE 60 FOLD STACK.

MISCELLANEOUS:

AT THE BEGINNING OF THE SURVEY, THE POLARITY OF GEOPHONE AND VIBRATOR ACCELEROMETERS HAS BEEN CHECKED TO COMPLY SEG POLARITY BY A TAP TEST. THE VIBRATORS SIMILARITIES HAVE BEEN CHECK UNCORRELATED AND CORRELATED.
THE FIGURES 1 TO 3 IN ANNEX 3 SHOW THE RESULTS OF THESE TESTS.

12.1 RECORDING PARAMETERS

Drive level: 70% but had to be adjusted to 50% according the buildings and structures

Noise elimination: No

Harmonic elimination: Phase rotation 90°with Sum 4

12.2 SWEEP PARAMETERS

Sweep type: Log 10dB was clearly better than Linear sweep due to the strong ground roll wave generated by the linear sweep.

Sweep low frequency limit: 12 Hz

Sweep high frequency limit: 110 Hz

Number of Vibrators per VP: 3

Vibrator Pattern: Due to the short trace spacing, the in-line pattern with no move up is the best solution to respect the COG and the frequency content of the data.

Sweep length: 10 sec.

Number of sweeps per VP: 4

13 CONCLUSION & RECOMMENDATIONS

The general data quality is quite good: the ground roll wave is rather reduced when using the sweep log 10dB over the sweep range.

The most obvious point due to logistic indicates that we have to use an in-line vibrator pattern (but not too long so as not to affect high frequencies).

We have to keep in mind that:

- Results on individual PV is very dependant on the base-plate to ground coupling
- Results on individual PV is very dependant on the WZ thickness
- Results might be very dependent on the work area, and noise characteristics might change from one area to the other.

The static corrections will be a challenge for solving the variability of the WZ thickness in order to preserve the 90-100Hz.

Author: A. Depeyras / Area Geophysicist Compagnie Générale de Géophysique

14 LIST OF A4 FIGURES IN ANNEX:

Annex 1

Figure 1: Single VP, Sum2, Linear sweep
Figure 2: Single VP, Sum2, Log sweep
Figure 3: Single VP, Sum4, Linear sweep
Figure 4: Single VP, Sum4, Log sweep
Figure 5: Frequency bandwidth attribute
Figure 6: Main frequency attribute
Figure 7: S/N ratio signal 600ms
Figure 8: S/N ratio signal 1000ms
Figure 9: Main frequency attribute on prod/test data

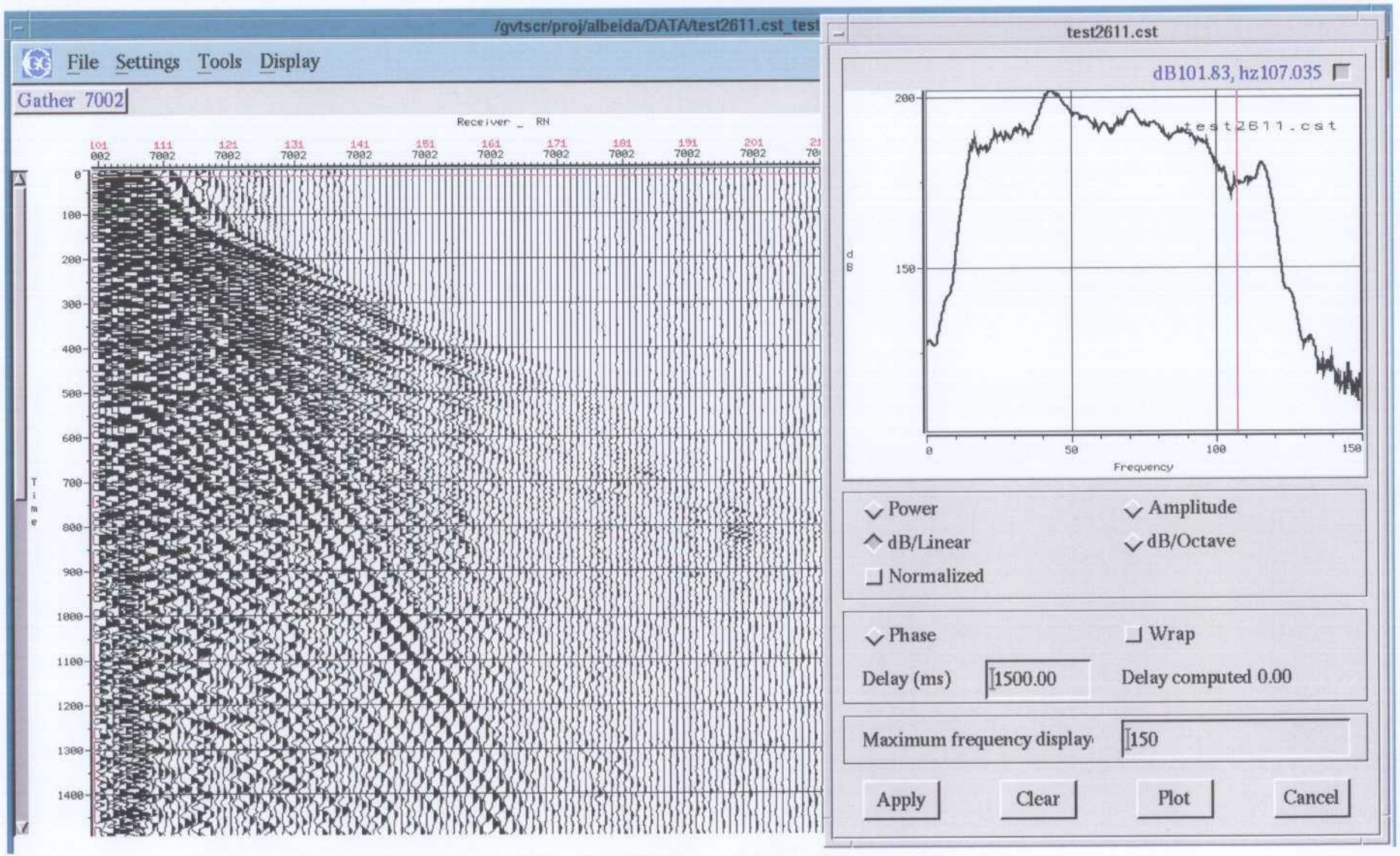
Annex 2

Figure 1: Stack all Sum4 VP (Linear/Log)
Figure 3: Stack all Sum2 VP (Linear/Log)
Figure 3: Stack Sum4 VP (Log sweep only), Fold 30
Figure 4: Stack Sum4 VP (Linear sweep only), Fold 30
Figure 5: Stack Sum2 VP (Log sweep only), Fold 30
Figure 6: Stack Sum2 VP (Linear sweep only), Fold 30
Figure 7: Stack all Sum4 VP (Linear/Log) with residual statics

Annex 3

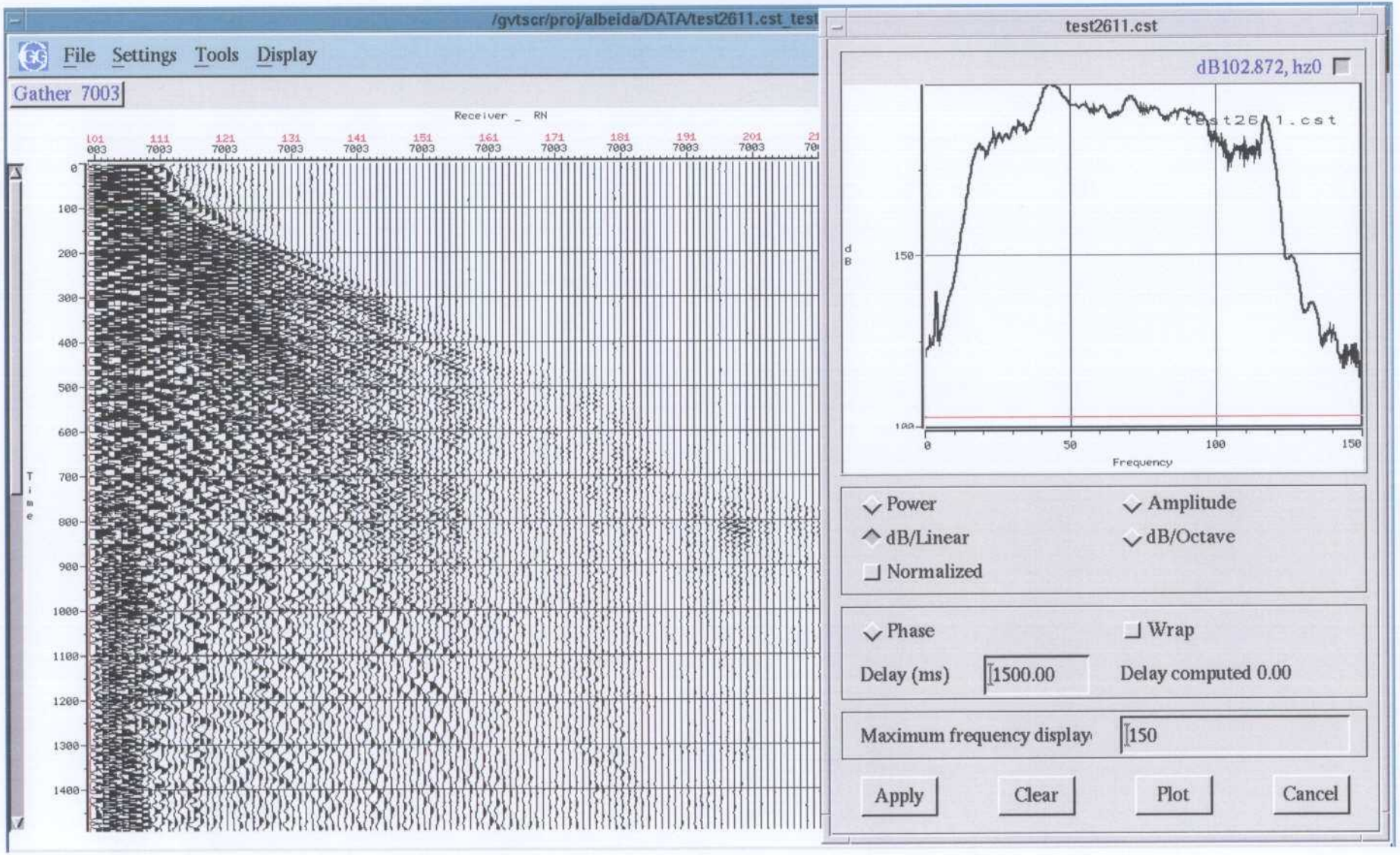
Figure 1: Tap tests on geophone and vib accelerometers
Figure 2: Vib sweep test uncorrelated
Figure 3: Vib sweep test correlated

ALBAIDA 2D SPAIN



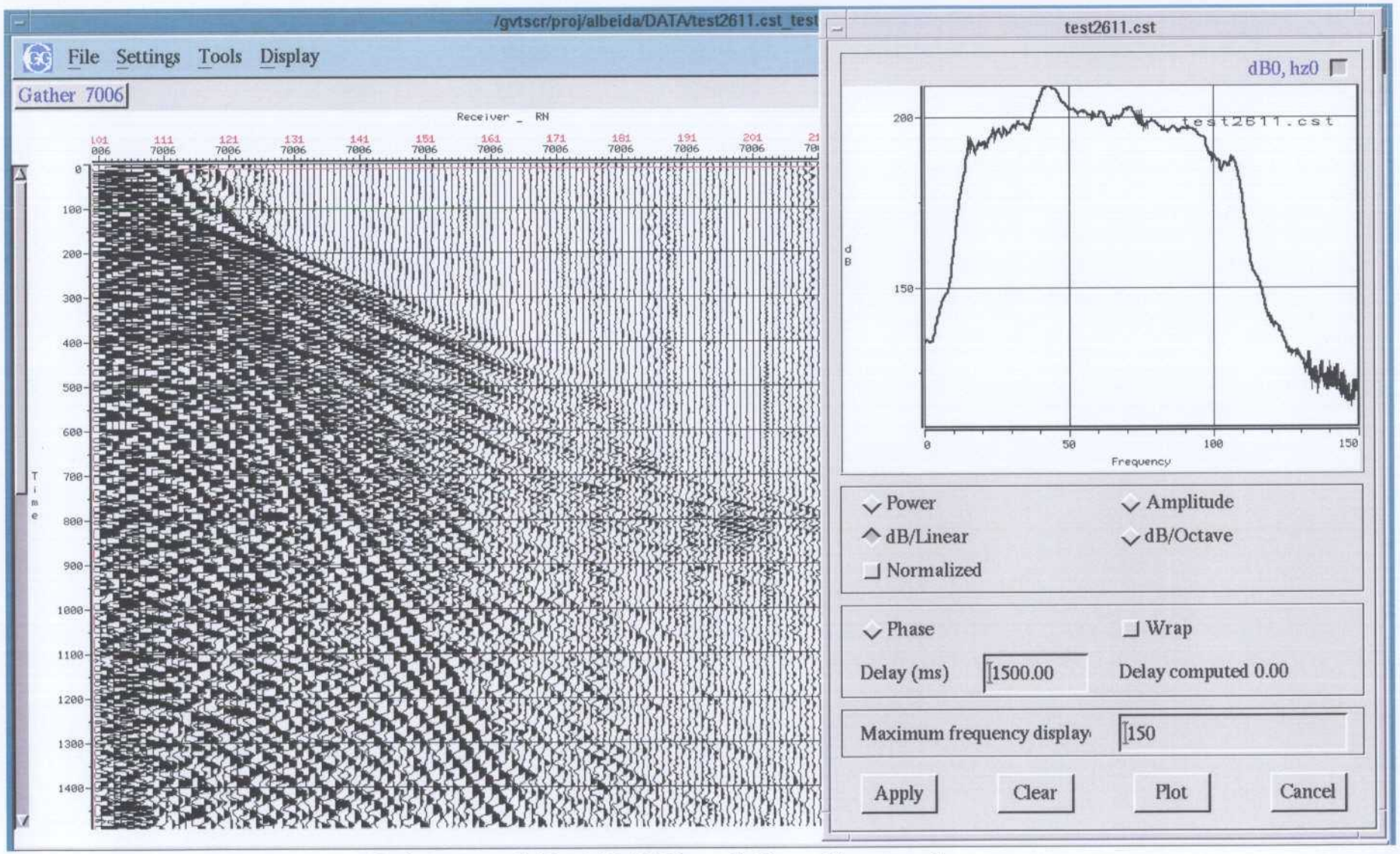
Linear 12-120Hz, 10s, Sum 2

ALBAIDA 2D SPAIN



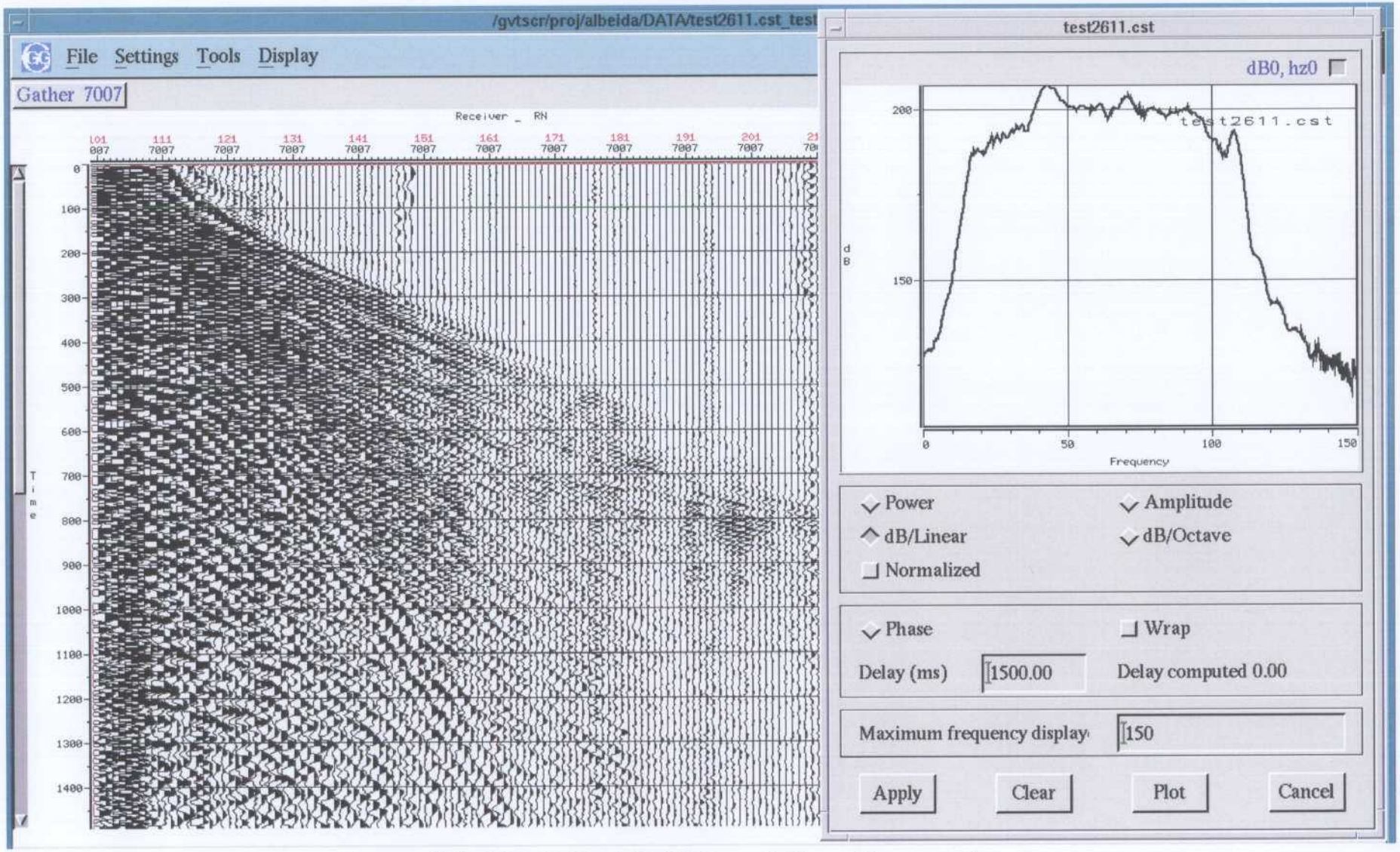
Log 10dB 12-120Hz, 10s, Sum 2

ALBAIDA 2D SPAIN



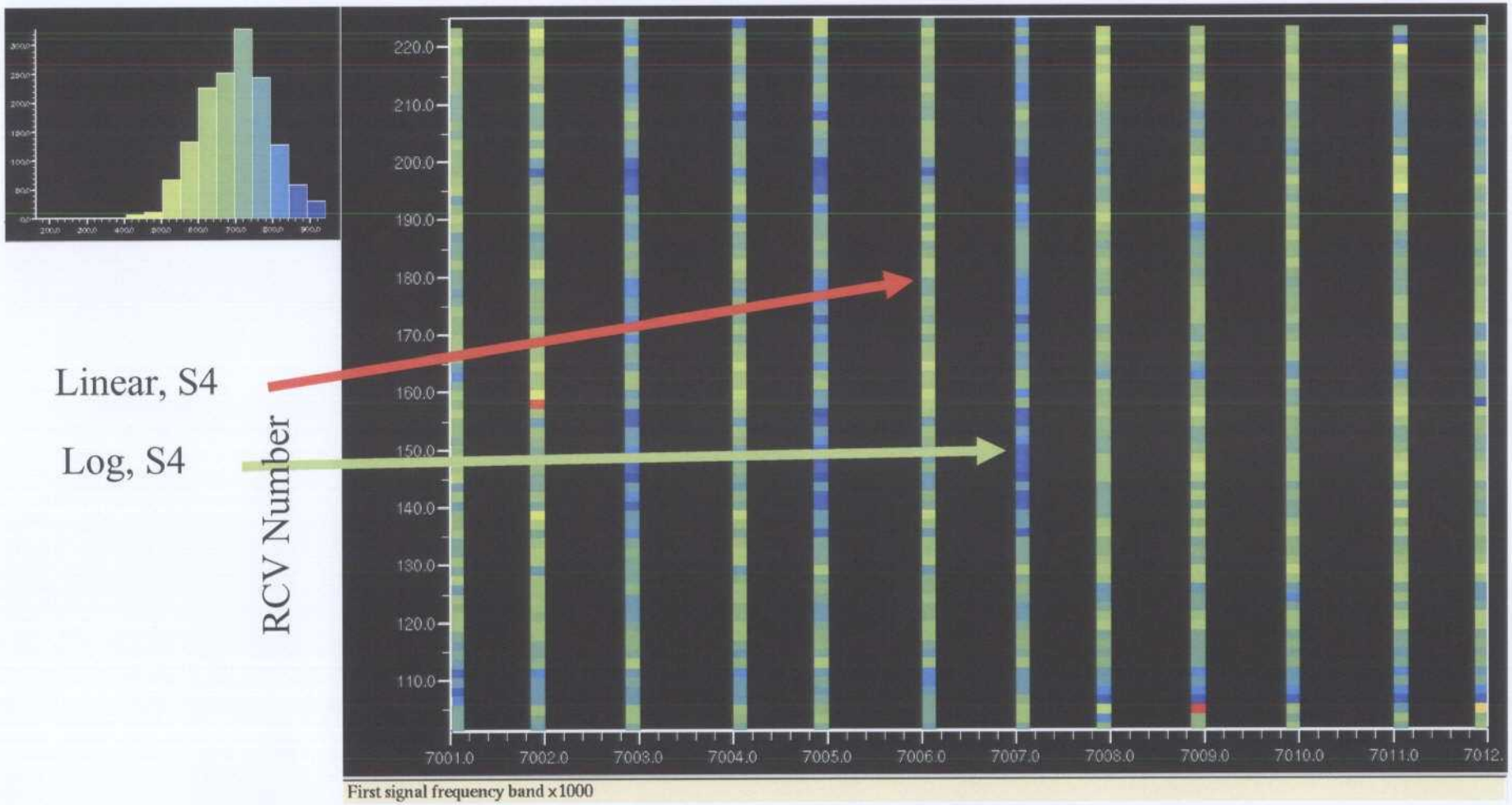
Linear 12-120Hz, 10s, Sum 4

ALBAIDA 2D SPAIN



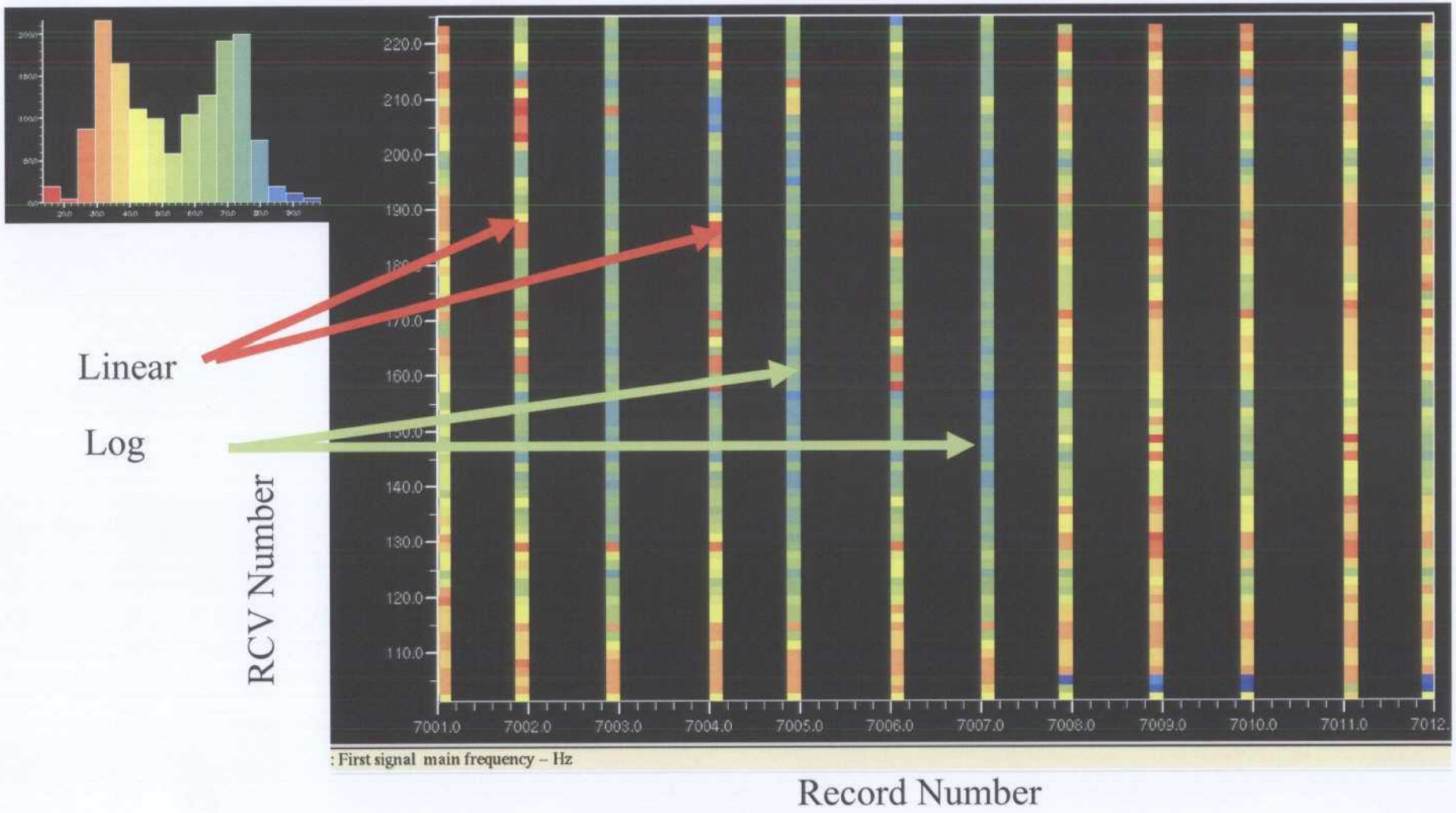
Log 10dB 12-120Hz, 10s, Sum 4

ALBAIDA 2D SPAIN



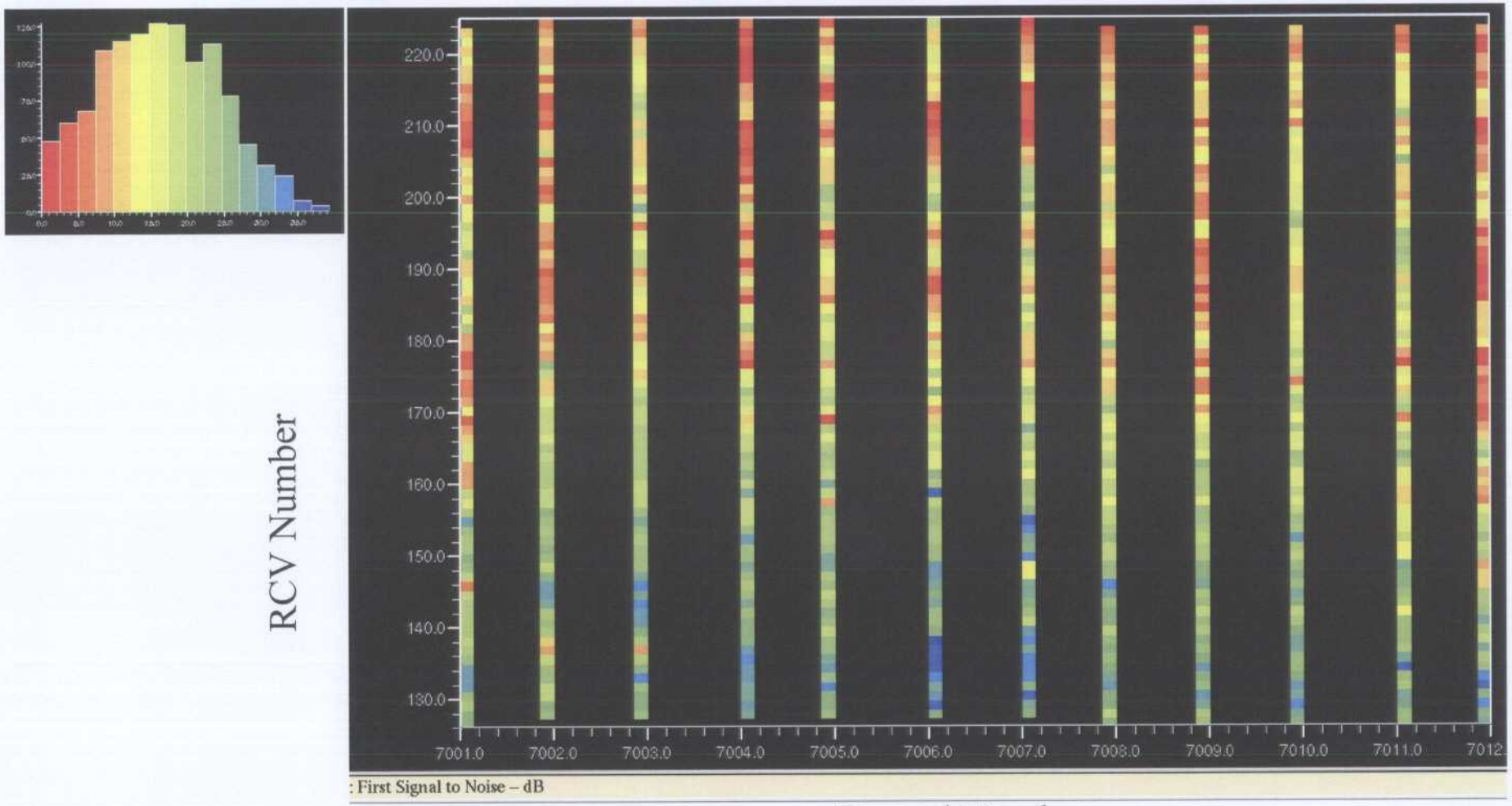
Frequency Bandwidth, Signal T600ms, W400ms, V2400m/s

ALBAIDA 2D SPAIN



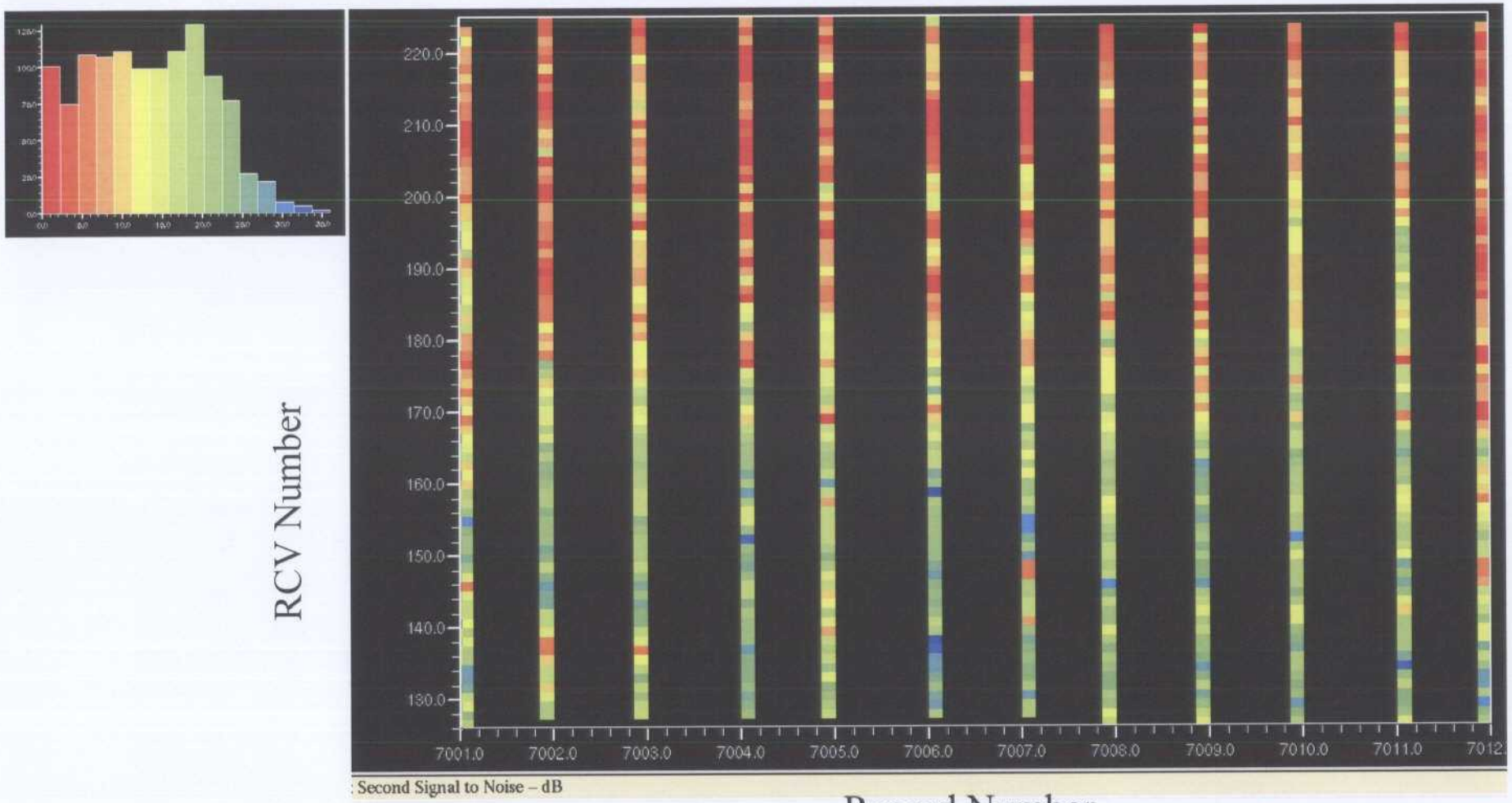
Main Frequency, Signal T600ms, W400ms, V2400m/s

ALBAIDA 2D SPAIN



S/N ratio, Signal T600ms, W400ms, V2400m/s

ALBAIDA 2D SPAIN

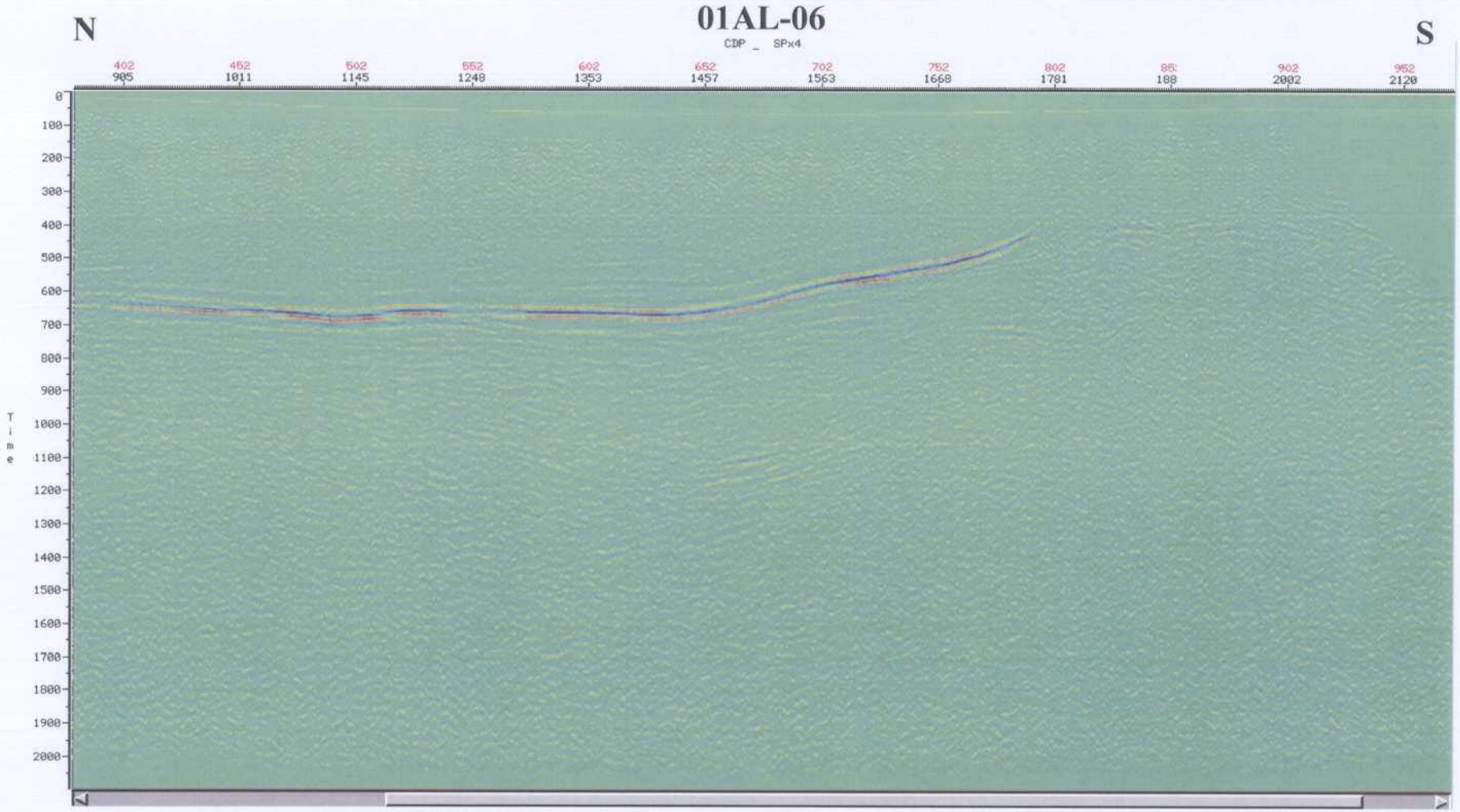


S/N ratio, Signal T1000ms, W400ms, V2400m/s

ALBAIDA 2D SPAIN

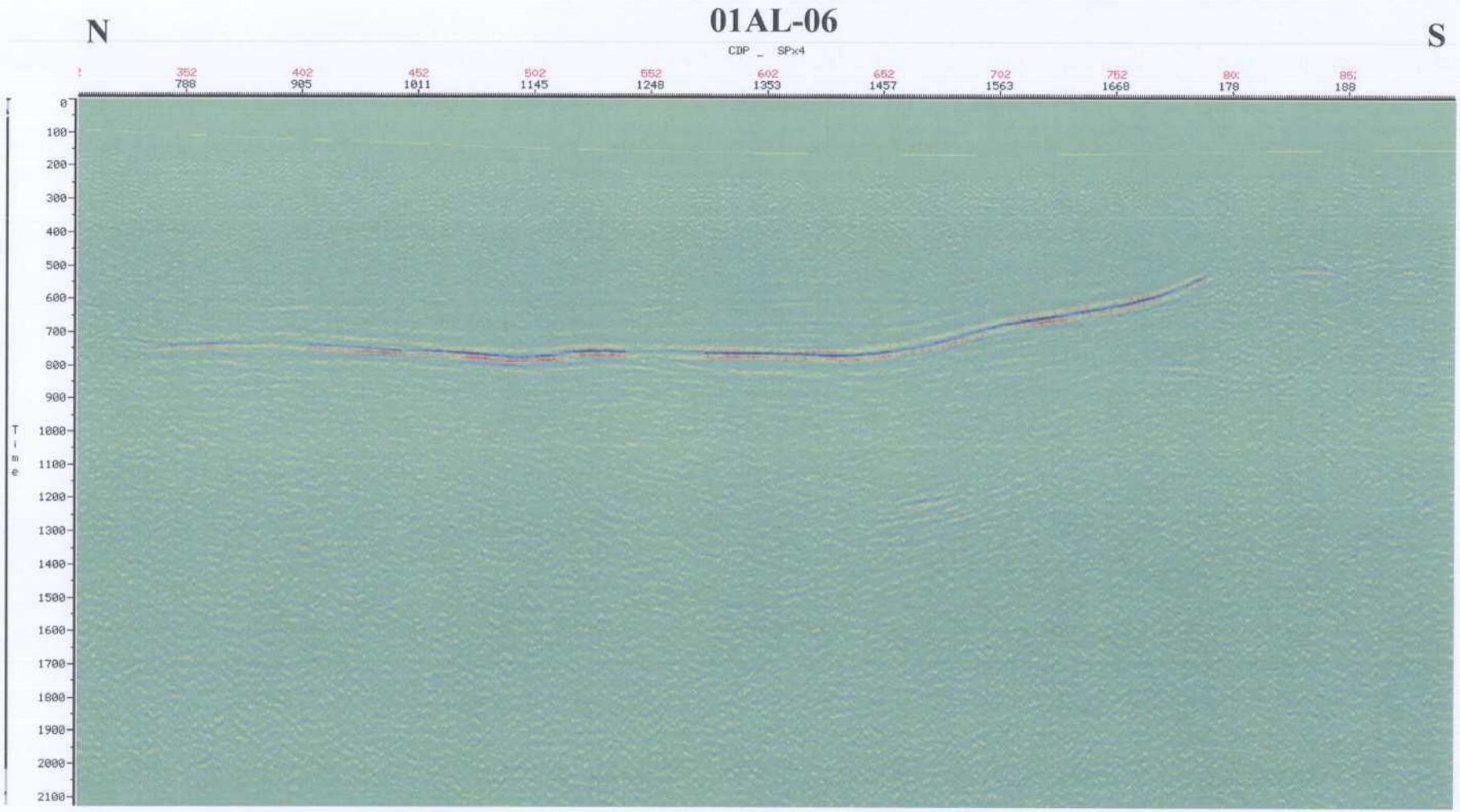
Main Frequency, Signal T600ms, W400ms, V2400m/s

ALBAIDA 2D SPAIN



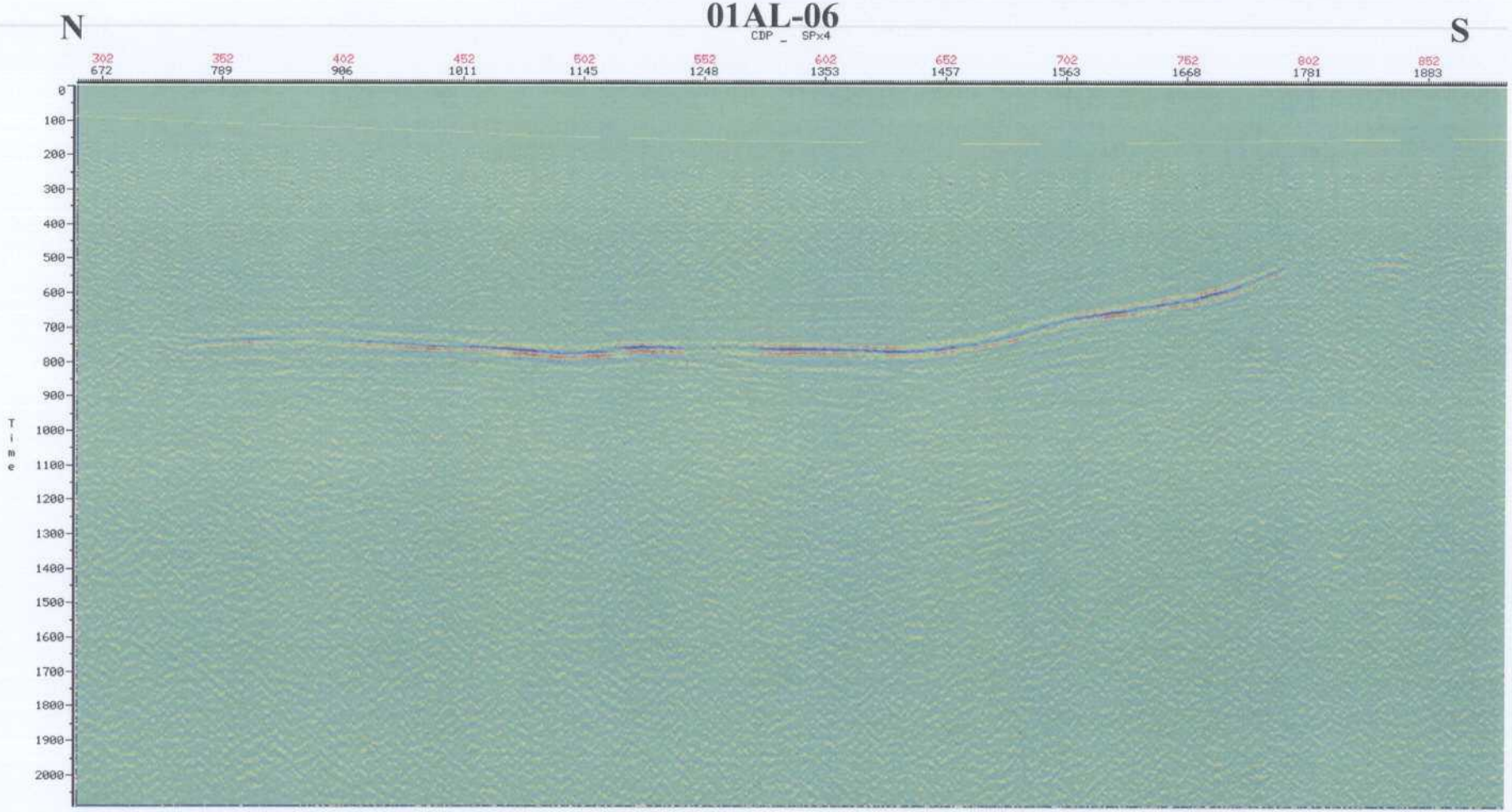
All Sum4 Linear/Log 12-110Hz, 10s, Fold 60

ALBAIDA 2D SPAIN



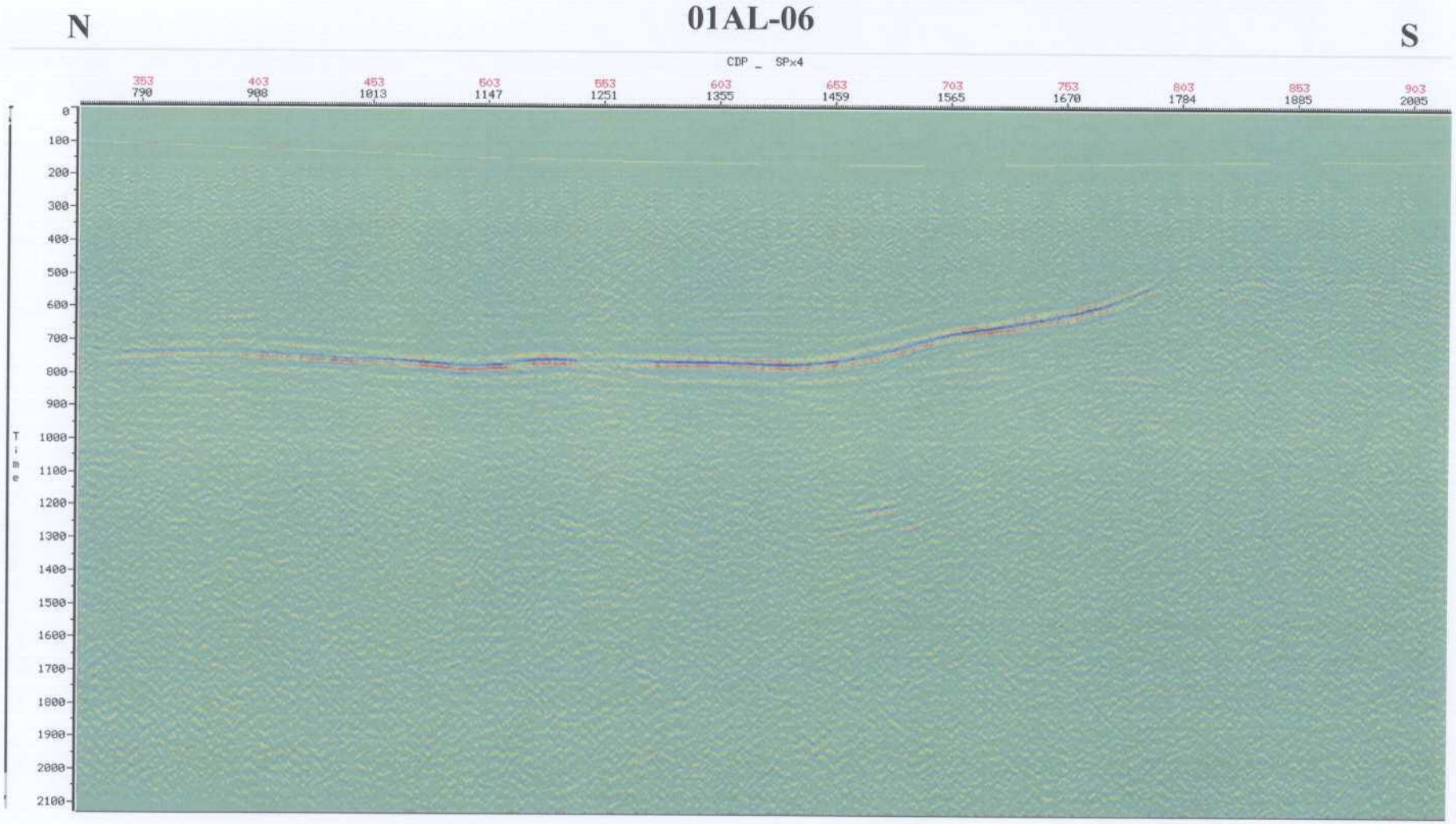
All Sum2 Linear/Log 12-110Hz, 10s, Fold 60

ALBAIDA 2D SPAIN



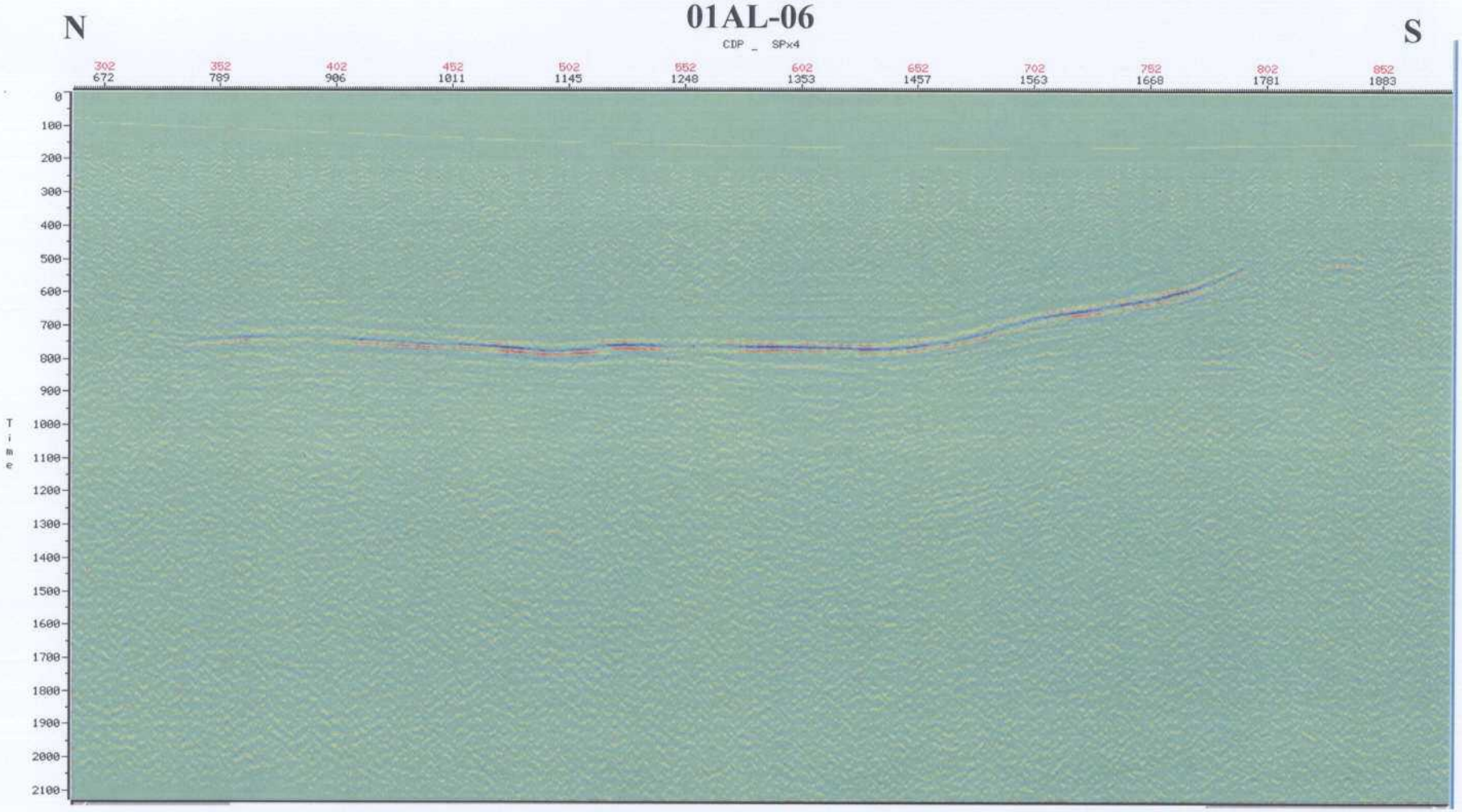
Sum4, Log 10dB, 12-110Hz, 10s, Fold 30

ALBAIDA 2D SPAIN



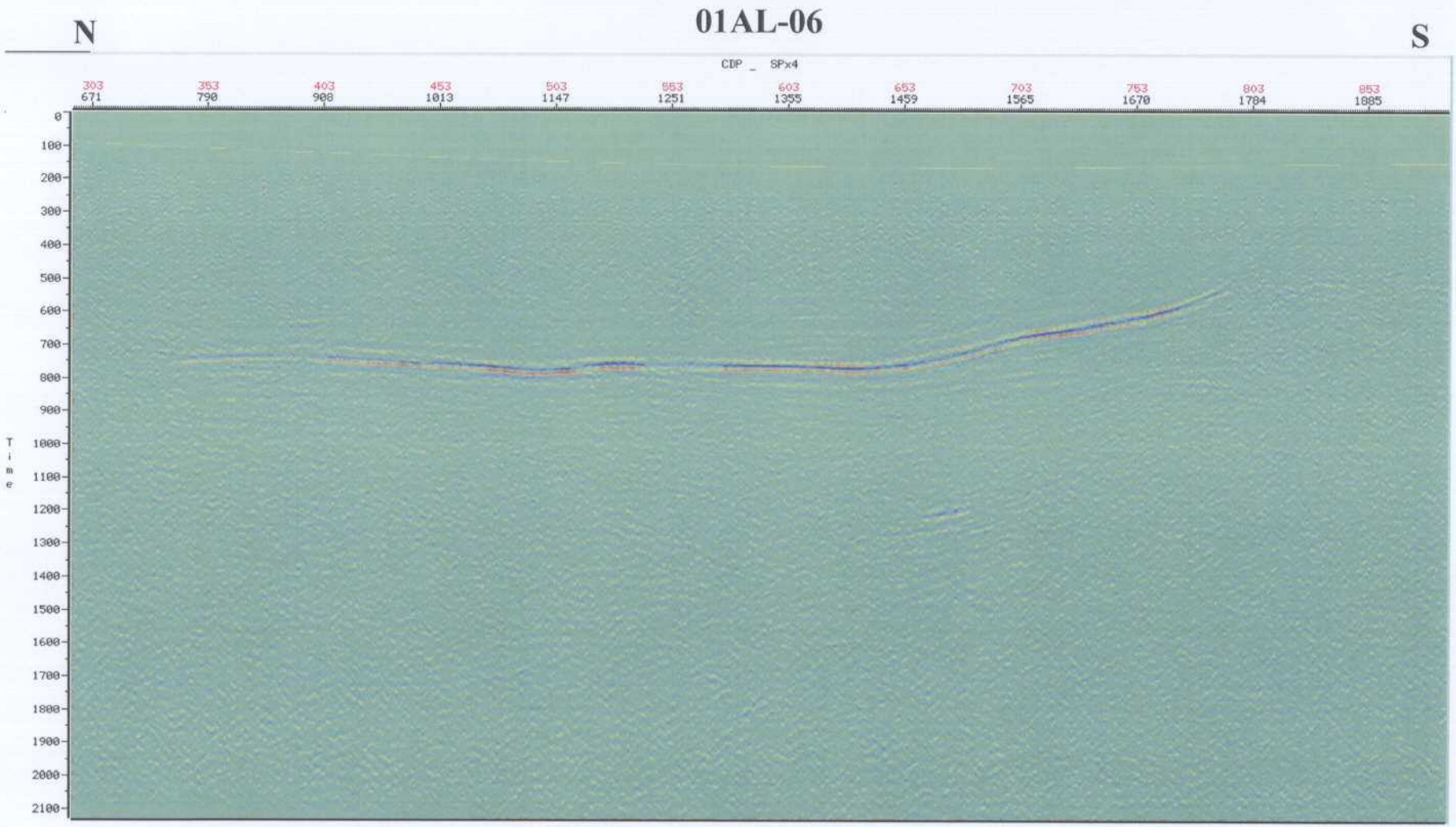
Sum4, Linear 12-110Hz, 10s, Fold 30

ALBAIDA 2D SPAIN



Sum2, Log 10dB, 12-110Hz, 10s, Fold 30

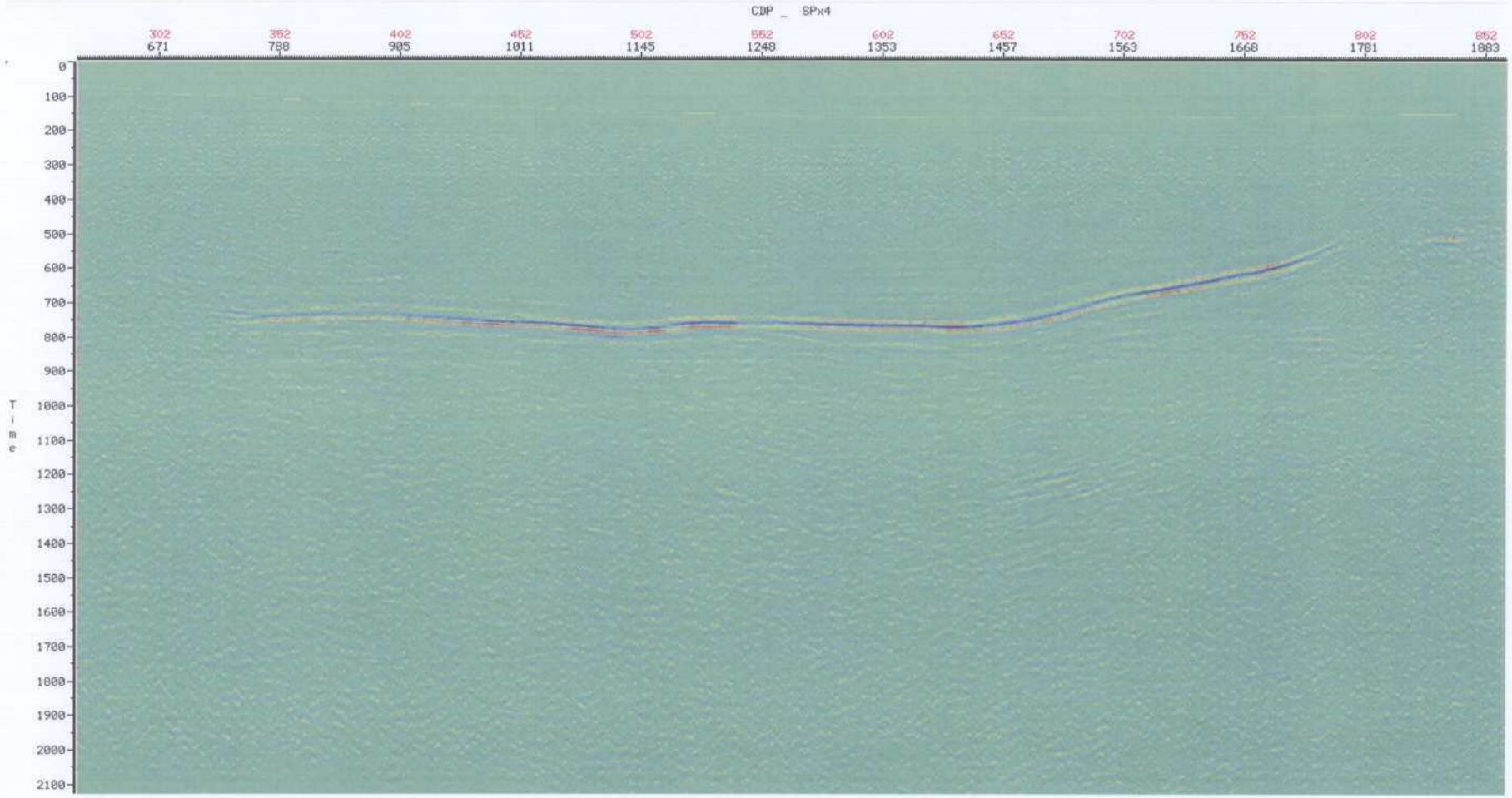
ALBAIDA 2D SPAIN



Sum2, Linear 12-110Hz, 10s, Fold 30

ALBAIDA 2D SPAIN

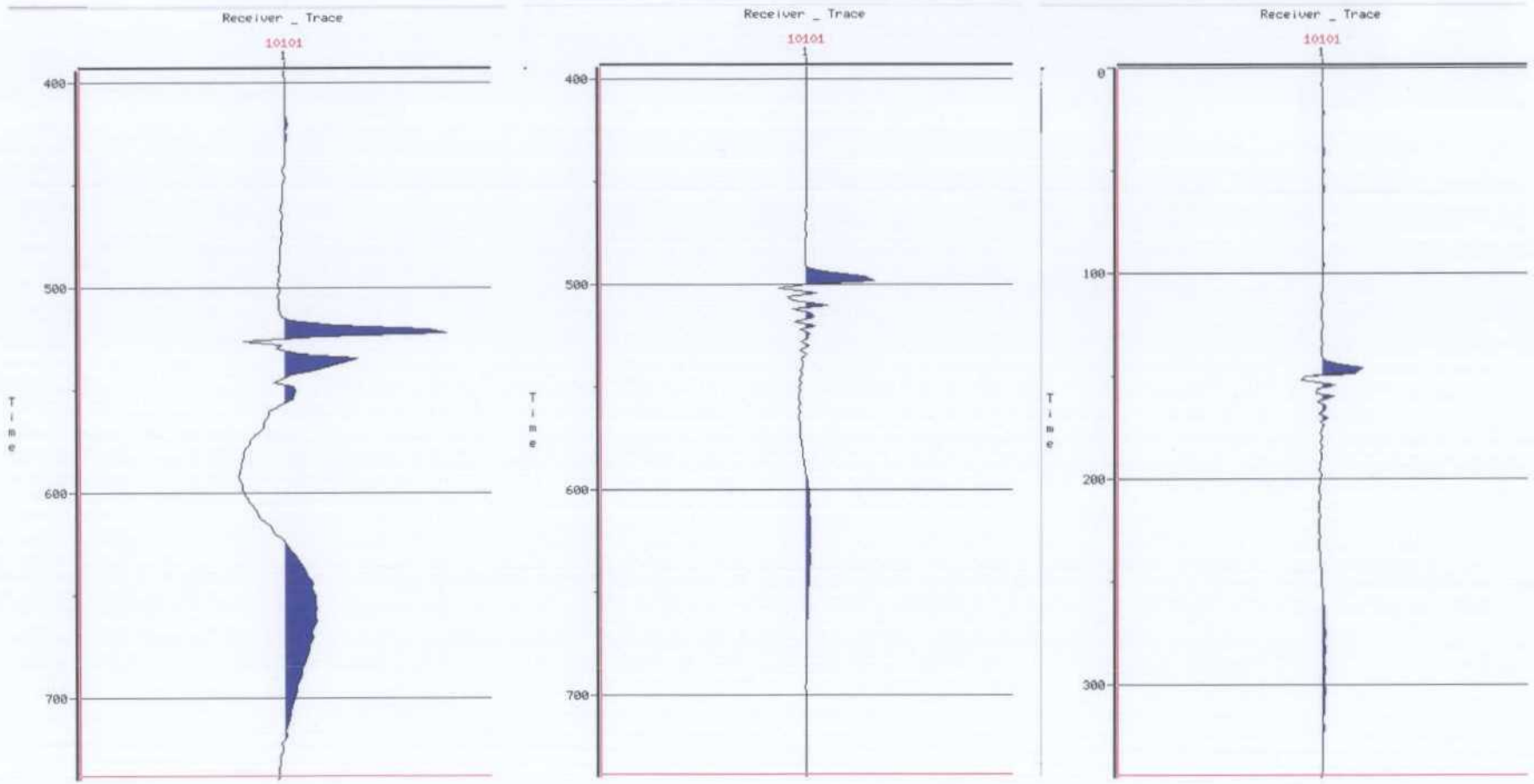
N **01AL-06** **S**



All Sum4 Linear/Log 12-110Hz, 10s, Fold 60

Residual static Stack, Fold 60

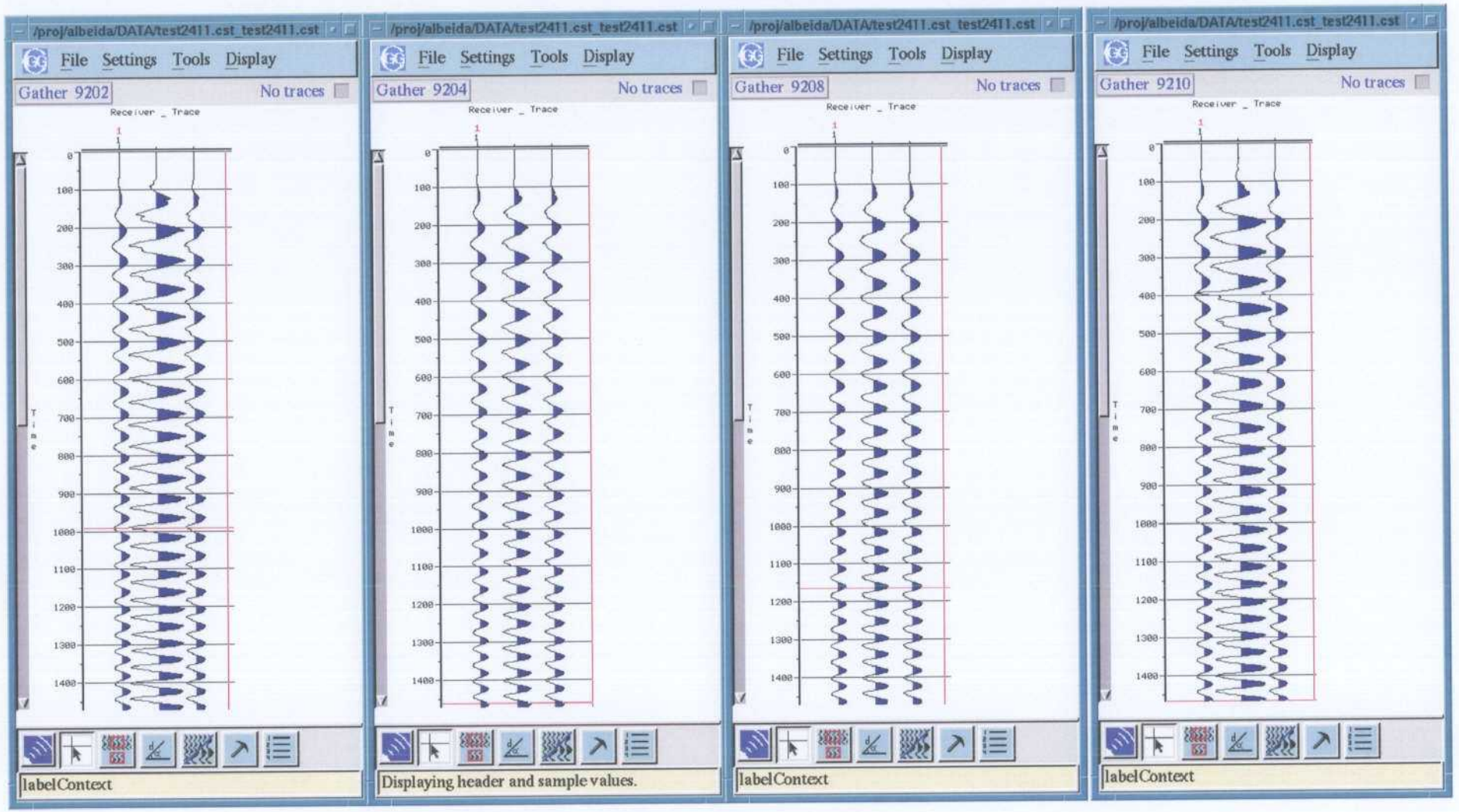
ALBAIDA 2D SPAIN



Geophone **Mass Accelerometer** **Plate Accelerometer**

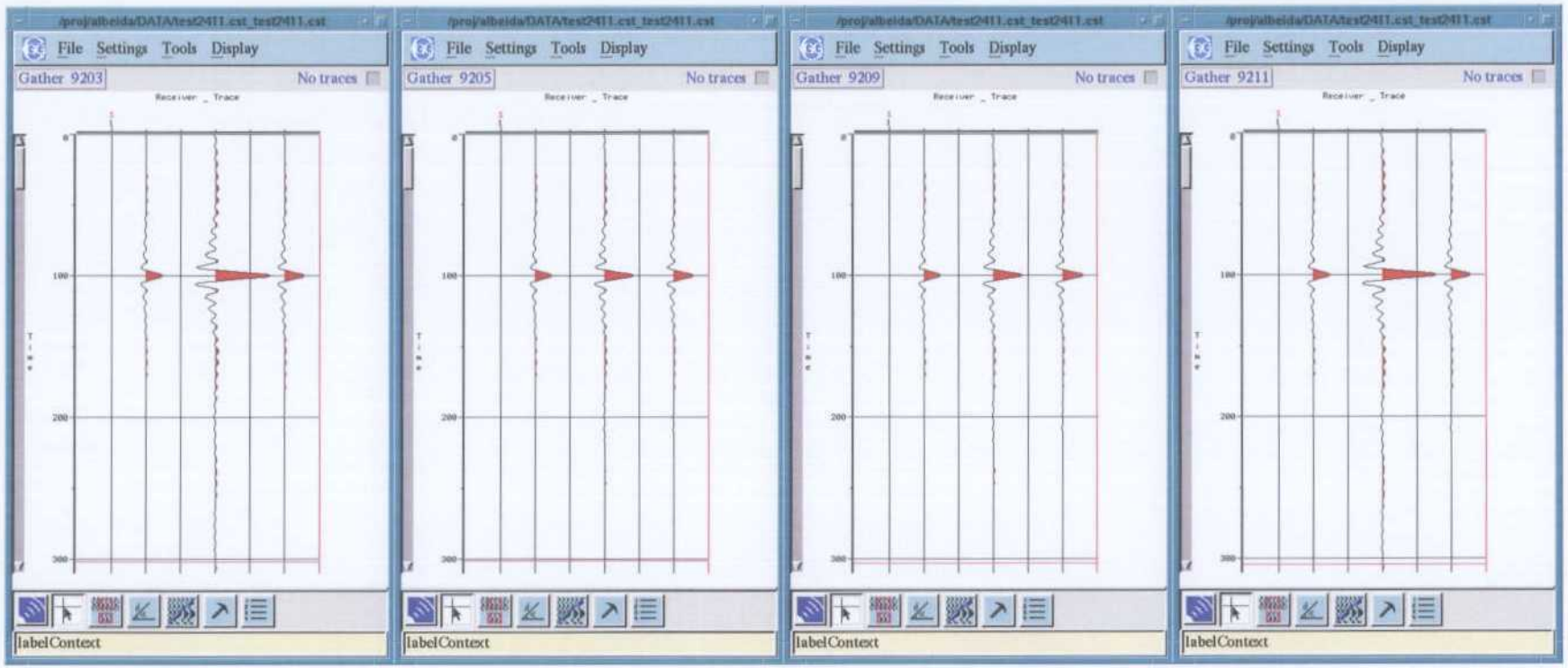
Polarity Control by Tap Test

ALBAIDA 2D SPAIN



Vibrator Similarity Test

ALBAIDA 2D SPAIN



Vibrator Correlation Test

H.S.E.
Final Report

LAND SEISMIC ACQUISITION

CREW *134 32 21*

BLOCK *CAMPO DE DALIAS - SPAIN*

HSE FINAL REPORT

Report written by: Berthe G

Name of the Party Chief: Mathieu J

Signature of the Party Chief: .....

Diffusion: Country Manager - Area Manager - TQZ

CONTENTS

SUMMARY

	Current month	Project
Medical checks	0	0
Inductions (number of inducted persons)	33	33
Trainings (number of trained persons)	5	5
HSE Committee meetings	1	1
Sectional meetings	0	0
Tool box meetings	36	36
Inspections	5	5
Cross-inspections	0	0
Local and general management inspections	1	1
External audits	1	1
Drills and Exercises	0	
Near misses / Unsafe acts / Unsafe conditions	7	7
Material Accidents	0	0
First Aid cases	0	0
Medical treatment Cases	0	0
Restricted Workday cases	0	0
Lost Time Injuries	0	0
Fatalities	0	0
Number of days worked without LTI	27	27
Medical Cases	0	0
Lost time Medical Cases	0	0
Total solid waste produced (m^3)	1	1
Total solid waste recycled or delivered to facility	1	1
Water consumption		
Environmental Dammages	0	0
Number of Action points created by the crew	20	20
Number of Action points completed	15	15
Working hours total	9620	9620
Working hours CGG senior Staff	1830	1830
Working hours CGG auxilliaries		
Working hours Subcontracted personnel	7790	7790
Number of kilometers driven	36500	36500
Number of hours flown	NA	
Number of hours sailed	NA	
Costs: PPE		
Costs: Fire fighting equipment		
Costs: Medical and health		
Costs: Environment		
Costs: Miscellaneous HSE		

1. General Comments

Survey crew started to work on November 18th.
Recording crew tested lines on November 23rd and 24th and vibrators from the 25th to 26th.
Shooting from November 26th to December 20th.

RISKS

1 Traffic was the major problem due to one numerous main and small roads with curves reducing visibility and fast running cars.
- Workers were instructed to work safely on the road, everybody wearing traffic jacket and avoiding to stand by on the black side.
- Drivers were teached to respect the speed limit and park their vehicle in a safe way.
- When the vibrators were working on the road, one alternative traffic system was in place with two women with one talky walky at both extremities of the vib site. Local policy was present in case of heavy traffic, important crossing road or working in town area.
- Cables crossing the road were protected with rubber protections at day time and taken away from the road at night time.
- Rotating warning light was employed on the working site on every car.

2 Communication: The radio communication was not sufficient due to the use of three channels only. Four channels would have been a minimum. Portable phones were very useful and would be developed as a completed communication system.

EDUCATION

1 PPE: Mechanic and vibrator team with safety shoes. Traffic jackets were obligatory to work. Generally PPEs were correctly used and safety rules respected.

2 Induction and medical checks: Every worker was medically checked and inducted before to start working.

3 Meetings: Toolbox meeting system was functioning correctly. A strong effort would be necessary in case of a new crew for formalise sectional meetings No problem for the HSE monthly meeting.

ACCIDENTS

No accidents occurred on the crew

2. Medical checks - Inductions - Trainings

Date	Medical check	Induction Present	Training Present	Doctor / Instructor	Course	Content
23/11/01		1		Safety advisor	Incoming Induction	Existing risks, Responsibility of every body, safety meetings, PPE, Environmental politic, communication and medical evacuation
24/11/01		6		Safety advisor	Incoming Induction	Existing risks, Responsibility of every body, safety meetings, PPE, Environmental politic, communication and medical evacuation
25/11/01		3		Safety advisor	Incoming Induction	Existing risks, Responsibility of every body, safety meetings, PPE, Environmental politic, communication and medical evacuation
26/11/01		23		Safety advisor	Incoming Induction	Existing risks, Responsibility of every body, safety meetings, PPE, Environmental politic, communication and medical evacuation
26/11/01			2	Safety Advisor	RADIO USE	Switch, channels, procedures
26/11/01			2	Safety Advisor	Altertnate traffic	Procedure
28/11/01			1	Safety Advisor	FIRE EXTINGUISHER	Description, how to prepare the instrument, how to fught fire, limits of the instrument
TOTAL	0	33	5			

3. HSE Meetings

	Actual for the project	Planned for the project
Country Manager meeting	1	1
HSE Committee Meetings	1	1
Sectional Meetings	0	12
Tool box Meetings	36	42

See attached forms

3.1. HSE Committee Meetings (See attached reports at the end of the report)

3.2. Sectional Meetings summary: No formal sectional meetings on this crew

4. Audits / Inspections

4.1. Inspections and cross inspections (internal to the crew)

	Inspections		Cross inspections to other departments	
	Actual	Planned	Actual	Planned
Survey	1	1		
Recording	1	1		
Vibrators	1	1		
Workshop	1	1		
Cable workshop	1	1		
Total project	5	5	0	

Every day the surveyor visited the surveying crew. Front and back crew, vibrators have been inspected daily by the safety advisor or party chief

4.2. Local and General Management inspections based on check-lists

	Actual	Visitors	Planned
General Check-list	1	*Larroque*	1
Total project	1		1

RATE PERFORMANCE: 94 %

4.3. External audits for the project

	Date	Scope	Auditors	Conclusion / Rating
1	12/12/01		G SAADA	3/4
2				
3				
4				
5				
6				
7				

See the attached report. **RATE BPERFORMANCE 3/4**

5. Drills

Local authorities, hospital or firemen would be concerned in case of a medevac or fire drill on the crew, it's impossible to do it. It's just possible to train people to give a correct alarm or to know how to use a fire extinguisher.

	Month		Project
	Actual	Planned	Actual
Medevac			
Fire			
Man Lost	**NON APPLICABLE**		
Spillage			
Security	**NON APPLICABLE**		
Helicopter crash	**NON APPLICABLE**		
Vessel evacuation	**NON APPLICABLE**		
H2S	**NON APPLICABLE**		
Man Over Board	**NON APPLICABLE**		
TOTAL	0		0

6. Significant Near Misses / Unsafe Acts / Situations

No	Date	Unsafe act / situation	Reported by	Action	Action Party	Potential Severity	Status / Deadline
1	26/11	Problem to fix the arial of the recording truck	Observer	Arial ordered already on the previous crew	PC	C3	
2	05/12	No " No smoking sign " on the refuelling car	Safety Advis	Fix warning pannels	Safety Advisor	C2	11/12
3	28/11	Electrical wiring without protection in the recording truck	PC	Fix a correct protection	Observer	C2	
4	30/11	No protection on the central seat in the land rover	PC	Fix a correct protection	Mechanic	B4	15/12
5	26/11	No back protection on the cable trucks	Safety Advis	Fix a correct protection	Mechanic	B2	03/12
6	27/11	Turning light on some vehicle not well visible	Surveyor	Fix a second one or change the location	Mechanic	C2	
7	04/12	No towel in the WC	PC	Provide towels	Safety Advisor	E2	11/12

7. Safety performance and statistics

Time	Working hours	MAA	FAC	MTC	RWC	LTI	FAA	END	LTMC
Month 1	9620	0	0	0	0	0	0	0	0
TOTAL	9620								

ACCIDENT ON THE CREW: NULL

8. Health performance and statistics

It's difficult to record health statistics because the crew is living in town and everybody is free to go and see a doctor.

LOST TIME BY MEDICAL TREATMENT: NULL

	PATHOLOGY	Total Nb of cases	Total LTMC Nb of cases	Total Nb of days lost
1a	Respiratory diseases due to dust or toxic agents			
1b	Respiratory diseases not due to dust or toxic agents			
2a	Skin diseases and disorders due to toxic agents			
2b	Skin diseases and disorders not due to toxic agents			
3a	Musculoskeletal disorders: upper limb and neck disorders associated with repeated trauma			
3b	Musculoskeletal disorders: back problems and lower limb and neck disorders asociated with repeated trauma			
3c	Musculoskeletal diseases not associated with repeated trauma			
4	Cancers and Malignant blood diseases			
5	Poisoning (systematic effects of toxic materials)			
6	Noise induced hearing loss			
7a	Infectious and Parasitic diseases: Malaria			
7b	Infectious and Parasitic diseases: Food poisoning			
7c	Infectious and Parasitic diseases: others			
8	Disorders due to work-related mental stress			
9	Disorders due to physical agents (other than noise and toxic materials)			
10	Cardio vascular diseases			
11	Nervous diseases other than tension headache			
12a	Eye diseases: Eye condition due to dust or toxic agents			
12b	Eye diseases: Eye condition not due to dust or toxic agents			
13	Ear, nose and throat diseases			
14	Genito-urinary diseases			
15	Dental diseases			
16	Surgical conditions			
	TOTAL	0	0	0

9. Environmental performance and statistics

WASTE TYPE	Produced	Buried	Burnt	Recycled	Deliver to facility
Contaminated soil (m^3)	0				
Solid biodegradable wastes (m^3)	0				
Solid non biodegradable wastes (m^3)	0				
Maintenance wastes (workshops) (m^3)	1				1
Waste oil (m^3)	0.25			0.25	
Medical wastes (m^3)	0				
TOTAL WASTE (m^3)	1.25				

WATER	Produced	Spread	Deliver to facility
Grey and black waters (m^3)			

CONSUMPTION	Project
Water consumption (m^3)	
Paper consumption (kg)	19
Fuel consumption (l)	14500

CLEARING IN FORESTED AREAS	Opening
Seismic lines (km)	0
Camps (ha)	NA
Helipads / Dropping zones (ha)	NA

10. Action points follow up

ORIGEN	FECHA	DESCRIPCION	ACCION	RESPONSABLE	CUMPLIMIENTO	OBSERVACION
AudTaller2811	28/11/01	Faltan carteles	Completar los carteles	Asesor de segur	10/12/01	
AudTaller2811	28/11/01	Botequin 1er auxilios incompleta	Completar la caja 1er Auaxilios	Asesor de segur	15/12/01	
AudTaller2811	28/11/01	Falta lava ojos	Proveder lava ojos	Asesor de segur	29/11/01	
AudTaller2811	28/11/01	Instrumentos inadecuados para subir	Proveder una escalera	Asesor de segur	29/11/01	
AudTaller2811	28/11/01	Bombillas sin proteccion	Cambiar las lamparas con lamparas protegidas	Mecanica	29/11/01	
AudTaller2811	28/11/01	Falta agua	Proveder reserva de agua	Mecanica	29/11/01	
AudTaller2811	28/11/01	Productos inflamables sin proteccion	Almacenar los productos peligrosos en cantinas identificadas	Mecanica		
AudTaller2811	28/11/01	Tambores sin dispositivo anti fuga	Mejorar el deposito de aceite con dispositivo anti fuga	Mecanica	10/12/01	
AudTaller2811	28/11/01	No PPE al fuente de limpieza	Comprar guantes de goma para la fuente de limpieza	Mecanica	10/12/01	
AudTaller2811	28/11/01	Destino del aceite usada ?	Investigar para la destinacion final del aceite usado	Mecanica	15/12/01	
AudTaller2811	28/11/01	Mecanico no conoce el uso de un extintor	Treinamiento del mecanico al uso de un extintor y de la manta antifuego	Asesor de segur	28/11/01	
AudTaller2811	28/11/01	Recipientes sin identificacion	Identificar los recipientes	Mecanica	29/11/01	
UA1	26/11/01	Antenna del coche labo mala	Cambiar la antenna	Laboratorio		2 Antennas ordenadas desde 132 34 32
UA2	28/11/01	Aparatos electricos sin proteccion en el camion del labo	Suministrar proteccion	Laboratorio		
UA3	26/11/01	No proteccion anti caida en los camiones de cable	Hacer una cuerda adecuada	Mecanica	03/12/01	
UA4	27/11/01	Fuego girando invisible de atras en el coche 903	Fijar un secundo fuego girando	Mecanica		
UA5	04/12/01	No toalla en los servicios	Suministrar papel o toalla	HSE	11/12/01	

UA6	30/11/01	Sitio de land rover sin proteccion para la gente de atras	Suministrar proteccion	Mecanica	15/12/01	
UA7	05/12/01	Vehiculo de gasoleo sin senalisacion	Suministrar panel	Mecanica	11/12/01	
UA8	11/12/01	Documentos CGG oficiales no traducidos en la lengua del pais	Hacer la traduccion de los documentos antes de trabajar en un pais	Massy		

11. Meeting reports

Crew committee meeting	Location / Crew	Date	Duration
	Spain 134 32 21	24/11/01	30 '

ATTENDANCE					
Name	Position	Name	Position	Name	Position
Mathieu J	Party chief	Bruzac Y	Geovector		
Dane P	Field Manager	Berthe G	HSE Advisor		
Paul C	Surveyor				
Lavauzelle J	Observer				
Mahon S	Mechanician				
Merino M	Cable repair				

#	Topics – Action points	Action party	Dead line
1	Organisation and production		
2	Risk encountered and assesment		

CHAIRMAN	HSE ADVISOR	PARTY CHIEF
Name and signature Mathieu J	Name and signature Berthe G	Name and signature Mathieu J

HSE MS CHECKLIST

I. LEADERSHIP AND COMMITMENT OF THE MANAGEMENT STAFF: (Score each item 0 to 2)	10	12
* Necessary resources (such as personnel, equipment, money and time) allocated to HSE matters.	1.5	2
* HSE meetings attended and chaired.	1.5	2
* HSE audits and inspections conducted.	1.5	2
* Accident/incident investigations led by management staff.	2	2
* CGG HSE rules and regulations applied to subcontractors and HSE matters communicated to them.	1.5	2
* HSE reports received and acted on .	2	2

N.B. Management staff means Country manager, Party chief and Departmental heads.

II. CORPORATE POLICY AND STRATEGIC OBJECTIVES: (Score each item 0 to 3)	7.5	9
* The corporate HSE policy, strategic objectives and management system explained and discussed with the crew management personnel during the corporate management visits or audits.	2.5	3
* The corporate strategic objectives, converted into individual specific objectives for all the crew management personnel by the Country manager, during the project start-up review.	2.5	3
* The Corporate HSE policy and objectives displayed, properly disseminated to all employees and implemented.	2.5	3

III. ORGANISATION, RESPONSIBILITIES, RESOURCES, TRAINING, COMMUNICATION, DOCUMENTS & STANDARDS:	15	20
1. HSE ORGANISATION: (Not defined, not fully implemented, defined and fully implemented) (Score this item 0 to 2)	1.5	2
* An HSE Organigram available with fully dedicated HSE Advisor having direct access to the Country manager and a clear line management reporting system. * Responsibilities of Key personnel clearly written and issued to incumbents as a Job description.		
2. DEFINITION OF THE LINE MANAGEMENT RESPONSIBILITY: (Not defined, not fully implemented, defined and fully implemented) (Score this item 0 to 5)	3.5	5
* Preparation: Contingency plans - Safety work procedures - Check lists - HSE/Job training/Specialised training - Accident/incident reporting and investigation system - Techniques to measure HSE performance. * Execution: Visible management commitment to HSE - HSE to be a line management responsibility - Motivation - Communication: (participate and chair HSE meetings). * Verification: Accident investigation - Unsafe Acts and Near misses reports - Audits of the HSE standards and practices - Drills - Evaluation of safety performance.		
3. RESOURCES (Human and Material): (Score this item 0 to 2)	2.5	3
* Facilities, plant and equipment meet legislative and HSE regulatory requirements. Competent personnel and adequate infrastructure respond to and mitigate emergency situations. * Resource allocation reviewed monthly for new development during the management meeting.		
4. TRAINING: (Not defined, not fully implemented, defined and fully implemented) (Score this item 0 to 4)	3	4
Basic HSE training - Job training - Specialised HSE training - Management training - Regular HSE drills		
5. COMMUNICATION (HSE Meetings): (Score this item 0 to 2)	1	2
HSE meetings organisation schedule defined - HSE meetings structure defined.		
6. DOCUMENTATION: (Not available, available but not fully used, available and fully used) (Score this item 0 to 2)	1.5	2
HSE International References - CGG Corporate HSE Procedures - CGG Country/Crew HSE Documents available.		
7. STANDARDS: (Not defined, not fully implemented, defined and fully implemented) (Score this item 0 to 2)	1.5	2
* Applicable standards clearly defined.		

V. HAZARD AND EFFECTS MANAGEMENT PROCESS (HEMP):	12	16
1. HAZARD IDENTIFICATION: (Identification of major hazards) (Score this item 0 to 4)	3	4
Major hazards related to the different activities Identified.		
2. HAZARD ASSESSMENT: (Assessment of major hazards) (Score this item 0 to 4)	3	4
Major hazards related to the different activities Assessed, work hazard analysis done for every work type, documented, issued to staff and discussed at HSE meeting		
3. HAZARD CONTROL: (Adequacy of control measures) (Score this item 0 to 4)	3	4
a. Safety rules and regulations in place - Warning system, warning signs and posters displayed at hazardous work areas - Permit To Work system (PTW) clearly known to staff and strictly followed. b. Safe work procedures - Check lists - Training- Supervision- Known contingency plans - Regular drills in place. c. Qualified and competent personnel for equipment usage - Appropriate Equipment specification - Appropriate equipment maintenance - Appropriate PPEs.		
4. HAZARD RECOVERY: (Adequacy of recovery measures) (Score this item 0 to 4)	3	4
Contingency plans (medevac, fire fighting, spillage control, search and rescue, man over board, security) - Medical personnel and facilities (first aid, camp clinic, referral hospitals, ambulance) - PPEs - Rescue plan in :e of Force Majeure (gross evacuation, life saving) - Notification (address of local authorities, police stations, fire brigades, army commandant) - Communication (radio, telephone, telex, fax) - Transportation (land, water, air) - Reclamation/Remediation/Restoration plans		

V. HSE PLANNING, PROCEDURES AND STANDARDS:	10	16
1. PLANNING: (Score each item 0 to 2)		
* HSE case/document developed, based on the HSE MS and HSE Plan, used by all supervisors and updated after any major operational change, subsequent to an unsatisfactory HSE audit or to a serious accident/incident.	1	2
* Long range planning: Adequate human resources, equipment, tools and services to do the work - Safe workplace - Safe method of working - Adequate time scale. * Medium range planning: Future operational changes (as camp move, new field camps, etc.) anticipated. * Daily planning: A daily planning in conjunction between the different operational departments established.	2	2
2. HSE PROCEDURES: (Not defined, not fully implemented, defined and fully implemented) (Score this item 0 to 6)	3	6
* HSE critical activities covered by safe work procedures, prepared and reviewed by the departmental heads, explained and issued to the personnel carrying these activities during the job training.		
3. HSE STANDARDS: (Not defined, not fully implemented, defined and fully implemented) :ore this item 0 to 6)	4	6
* Applicable HSE standards verified according to Check lists prepared and reviewed by the departmental heads.		

VI. IMPLEMENTATION AND MONITORING:	10	14
1. IMPLEMENTATION: (Score this item 0 to 6)	4	6
a. Corporate strategic objectives implemented on the crew with due regard for the HSE policy and HSE MS. b. Country HSE plan implemented by the crew management and line supervisors. c. At the work-site level, specific tasks achieved according to safe work procedures issued to each employee.		
2. MONITORING:		
a. Active monitoring: (Not defined, not fully implemented, defined and fully implemented) (Score this item 0 to 2)	1.5	2
* Active monitoring techniques well defined and followed. Unsafe act audit - Sectional inspection - Crew management inspection - Country management audit. * Active performance indicators well defined and targets reached. The monthly number of: HSE meetings - HSE inspections and audits - Drills - Training sessions.		

Reactive monitoring: (Not defined, not fully implemented, defined and fully implemented) (Score this item 0 to 2)	1.5	2
* Reactive monitoring techniques well defined and followed. Based on the system of accidents/incidents investigation and reporting in place. * Reactive performance indicators well defined and targets reached. Safety: Fatality, LTIF, TRCF, Severity, NM and UA reports - Health: LTMC - Environment: Spills, Fires, Complaints.		
3. ACCIDENT/INCIDENT INVESTIGATION AND REPORTING: (Score this item 0 to 4)	3	4
* Accident/Incident investigation on site and conducted by defined team leaders from the management staff. * Appropriate accident/Incident investigation report. * The follow up of the accident/incident recommendations rapid, effective and publicised.		

VII. COUNTRY MANAGEMENT AUDITS, CORRECTIVE ACTIONS AND IMPROVEMENT:	**4.5**	**7**
1. OBJECTIVES OF HSE AUDITS: (Score this item 0 to 3)	2	3
* Conformance and effectiveness of the established HSE Plan with its implementation on the crew verified. * HSE quality of the activities evaluated, shortcomings identified and remedies suggested. * Quality and regularity of the active and reactive monitoring system on the crew checked.		
AUDITS PLAN: (Score this item 0 to 2)	1	2
* Programmed according to an established schedule and structured for full coverage.		
3. AUDITS RECOMMENDATIONS, CORRECTIVE ACTIONS AND FOLLOW UP: (Score this item 0 to 2)	1.5	2
* Recommendations well defined (with action points - action parties - target dates), communicated to concerned personnel, implemented and follow up rapid, effective and publicised.		

VIII. CORPORATE (GROUP) MANAGEMENT REVIEW AND IMPROVEMENT PROCESS: (Score each item 0 to 2)	**4**	**6**
1. Performance and effectiveness of the HSE MS at the crew level reviewed during Corporate visit.	1.5	2
2. Performance and effectiveness of the HSE Plan at the crew level reviewed during Corporate visit.	1.5	2
3. Performance and effectiveness of the HSE Case at the crew level reviewed during Corporate visit.	1	2

COMMENTS AND ACTIONS POINTS

Refer to the action points mentionned under the different chapters

Auditor: Gabriel SAADA	**Party Chief: Jean Mathieu**	**Date: 13/12/2001**
Signature:	**Signature:**	**Score: 73 %**

CLIENTE : ALBAIDA.....

BRIGADA Nº..134 32 21.....

CHECK-LIST PARA EL CONTROL DE SEGURIDAD BRIGADA TERRESTRE

PAIS : ESPANA.....

Numeracion	la brigada	Respuestas SI	Respuestas NO	PREGUNTAS	OBSERVACIONES
		SI	NO		
				GESTION	
1		X		• Compromiso obvio de los responsables.	
2		X		• Conocimientos de las responsabilidades.	
3		X		• Conocimientos de los procedimientos y planos de emergencia.	
4		X		• Standardes aplicados a los contratistas.	
5		X		• Formacion de los nuevos contratados.	
6		X		• Formacion continua del personal.	
7		X		• Inspecciones regulares de los responsables.	
8		X		• Reuniones sistematicas.	
9		X		• Comunicacion de la informacion.	
10		X		• Analisis amplio de los accidentes e incidentes.	
11		X		• Estadisticas actualizadas.	
S/T		11	0		
				VEHICULOS	
12		X		• Choferes aptos (licencia) y competentes.	
13			X	• Control de los movimientos de los vehiculos.	
14		X		• Uso de los cinturones de seguridad.	
15	NA			• Equipos para el transporte del personal.	
16		X		• Equipos de seguridad y de primeros auxilios.	
17				• Herramienta.	
18		X		• Medios de comunicacion.	
19		X		• Documentos topograficos.	
20		X		• Medios de senalizacion.	
S/T		6	1		
	NA			EMBARCACIONES LIVIANAS	
21				• Pilotos aptos (licencia) y competentes.	
22				• Control de los movimientos de las embarcaciones.	
23				• Equipos de salvamento y de supervivencia.	
24				• Motor de emergencia.	
25				• Uso de los chalecos salvavidas.	
26				• Medios de comunicacion.	
27				• Equipos de navegacion y de senalizacion.	
28				• Uso del corto-circuito.	
29				• Numero maximo de personas embarcadas respetado.	
S/T					
	NA			HELICOPTEROS	
30				• Respeto de las consignas para transporte del personal.	
31				• Respeto de las consignas para transporte de material peligroso y cargas externas.	
32				• Cadena de abastecimiento de acuerdo a los estandares.	
33				• Control radio mantenido.	
34				• Conformidad de los helipuertos.	
35				• Equipos de localizacion y de supervivencia.	
36				• Equipos de seguridad.	
37				• Eslinga soltada al despegue y aterrizaje.	
38				• Reunion de seguridad para todo pasajero nuevo.	

39				• Enganchadores equipados de las protecciones individuales.	
S/T					
	NA			**PERFORACION**	
				PROFUNDA :	
40				• Mantenimiento preventivo.	
41				• Equipos de seguridad y de primeros auxilios.	
42				• Uso de los equipos de proteccion individual.	
43				• Medio de comunicacion en cada equipo.	
				PORTATIL :	
44				• Mantenimiento preventivo.	
45				• Equipos de seguridad y de primeros auxilios.	
46				• Uso de los equipos de proteccion individual.	
47				• Relleno del tanque de combustible con motor apagado.	
S/T					
				MECANICA	
48		X		• Uso de los equipos de proteccion individual.	
49		X		• Uso de los equipos de proteccion colectiva.	
50		X		• Equipos de seguridad y de primeros auxilios.	
51		X		• Segregacion de los productos inflamables.	
52		X		• Control de los vehiculos y de las embarcaciones.	
53		X		• Limpieza y arreglo.	
54		X		• Personal competente para una tarea especifica.	
55		X		• Proteccion de los elementos en rotacion.	
S/T		8			
				TOPOGRAFIA Y RADIONAVEGACION	
				RECONOCIMIENTO :	
56		X		• Medios de comunicacion.	
57		X		• Medios de posicionamiento y mapas.	
58			X	• Plano y horarios establecidos y comunicados.	
59	NA			• Provisiones de alimentos y combustible.	
60	NA			• Medios de senalizacion.	
61	NA			• Medio de supervivencia.	
	NA			APERTURA CON MACHETE Y MOTOSIERRA :	
62				• Formacion del personal.	
63				• Medios de comunicacion en cada grupo.	
64				• Uso de los equipos de proteccion individual.	
65				• Equipos de seguridad y primeros auxilios.	
66				• Funcionamiento de las seguridades en las motosierras.	
67				• Proteccion de la flecha durante el transporte.	
68				• Relleno del tanque de combustible con motor apagado.	
69				• Respeto de las distancias de seguridad entre dos derribadores.	
	NA			APERTURA CON TRACTOR :	
70				• Medios de comunicacion.	
71				• Equipos de seguridad y de primeros auxilios.	
72				• Uso de los equipos de proteccion individual.	
73				• Preparacion de las viabilidades y plano de acceso.	
				LEVANTAMIENTO :	
74		X		• Respeto de las distancias de tiro (implantacion).	
75		X		• Medios de comunicacion.	
76		X		• Equipos de seguridad y primeros auxilios.	
77			X	• Uso de los equipos de proteccion individual.	
S/T		5	1		
				ADQUISICION	
				TENDIDO - RECOGIDA :	
78		X		• Medios de comunicacion.	
79		X		• Uso de los equipos de proteccion individual.	

80		X		• Equipos de seguridad y de primeros auxilios.		
81		X		• La basura se recoge y se lleva al campamento.		
				APARATO :		
83		X		• Medio de comunicacion.		
84		X		• Equipos de seguridad y primeros auxilios.		
85		X		• Uso de los equipos de proteccion individual.		
86		X		• Consignas de distancia y secuencia de tiro.		
87		X		• Salida a tierra.		
S/T		9				
				FUENTE		
	NA			EXPLOSIVOS - ALMACENAMIENTO :		
88				• Veladores dia y noche.		
89				• Distancias de seguridad.		
90				• Materiales de seguridad.		
91				• Materiales de lucha contra incendios.		
92				• Perimetro anti-fuego.		
93				• Fulminantes en corto.		
94				• Control de existenciasy balances.		
	NA			EXPLOSIVOS - TRANSPORTE :		
95				• Transporte separado de la dinamita y de los fulminantes.		
96				• Material de seguridad y uso de las maletas para fulminantes.		
97				• Respeto de las consignas.		
	NA			EXPLOSIVOS - USO :		
98				• Aptitud del personal.		
99				• Uso de los equipos de proteccion individual.		
100				• Prohibicion de manipular explosivos con tormenta y viento de arena.		
101				• Respeto del procedimiento de carga y tiro.		
102				• Prohibicion de precargar en zona habitada (P < o = 3 m).		
103				• Prohibicion del uso de dos lineas de fuego.		
				VIBRADORES :		
104		X		• Equipos de seguridad y de primeros auxilios.		
105		X		• Uso de los equipos de proteccion individual.		
106		X		• Senalizacion y control de la circulacion sobre carretera.		
107		X		• Descenso de la presion hidraulica antes de bajar del vibrador.		
		X		Uniquement le personnel autorise sur le pont arriere.		
S/T		5				
	NA			CAMPAMENTO		
108				• Red electrica de 5 cables.		
109				• Iluminacion adecuada del campamento.		
110				• Salida a tierra de los generadores y traielers.		
111				• Medios de lucha contra incendios.		
112				• Control por radio de los grupos y vehiculos.		
113				• Visita médica del personal de la cocina.		
114				• Limpieza y arreglo de los lugares de almacenamiento.		
115				• Limpieza de la cocina y del comedor.		
116				• Eficiencia del sistema de evacuacion de aguas usadas.		
117				• Arreglo y limpieza del campamento.		
118				• Area de aterrizaje para evacuacion de urgencia.		
S/T						
				MEDIO AMBIENTE		
119		X		• Respeto del medio ambiente por el personal.		
120	NA			• Apertura minima de las brechas y cortes de arboles.		
121	NA			• Reduccion al minimo de los accesos.		
122	NA			• Limpieza de las brechas después de la explotacion.		
123	NA			• Prohibicion de cazar y hostigar la fauna.		
124			X	• Recuperacion y separacion de la basura (aceite, neumaticos, baterias, ...).		

125	NA			• Taponar los huecos de las explosiones.	
S/T		1	1		
				VISITANTE : LARROQUE.M.....	**EVALUACION = T.2/T.1 = 94 %**
	48	45	3	FECHA : .....28/11/01.....	
		T.2		FIRMA :	JEFE DE BRIGADA : ....MATHIEU J..... .....
			T.3		FIRMA : .....