

Southern California Collaborative Offshore Geophysical Surveys: 2D Regional Shallow Geophysical Survey



PIs Neal Driscoll (Scripps) and Graham Kent (UNR)

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Cruise Report

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1.0 2D HIGH RESOLUTION MARINE SURVEY

Scripps Institution of Oceanography (SCRIPPS) and Southern California Edison (SCE) have initiated a collaborative research project and acquired 2D high resolution shallow seismic reflection data in summer 2013 in order to understand better the deformational history offshore San Onofre, California. All seismic operations occurred within Federal waters along the outer continental shelf and slope waters off southern California's coast, between Laguna Beach in southern Orange County and Encinitas in northern San Diego County, California (Figures 1-1 and 1-2).

1.1 Purpose

The overarching goal of the 2D regional shallow geophysical survey was to constrain the geometry and architecture of the fault systems offshore. This research has both societal and scientific relevance. Specifically, the survey is designed to constrain fault architecture and offset as well as evaluate fault models most capable of dominating future seismic ground motion at the San Onofre Nuclear Generating Station (SONGS). By characterizing the geometry of the Newport Inglewood/Rose Canyon (NI/RC) fault, the Carlsbad, San Mateo, and San Onofre trends, the Oceanside Blind Thrust (OBT), and their interaction, the project team will test between the various models for margin formation, which have important implications for potential ground motion in the region and specifically at SONGS.

1.2 Objective

Collect and process, high-resolution 2D shallow geophysical seismic reflection data to define the geometry of the NI/RC fault and shallow deformational structures associated with the Carlsbad, San Mateo, and San Onofre trends and the OBT.

1.3 Scope of Work

- We have assessed existing 2D shallow seismic reflection data obtained in the area to establish a regional geological framework
- We acquired 2D shallow seismic reflection survey data within the survey area
- We performed QA/QC on acquired data onboard the R/V New Horizon

- Processing new 2D shallow seismic reflection data is underway
- The results of the 2D shallow surveys were used to target and focus follow-on 3D P-Cable shallow survey.

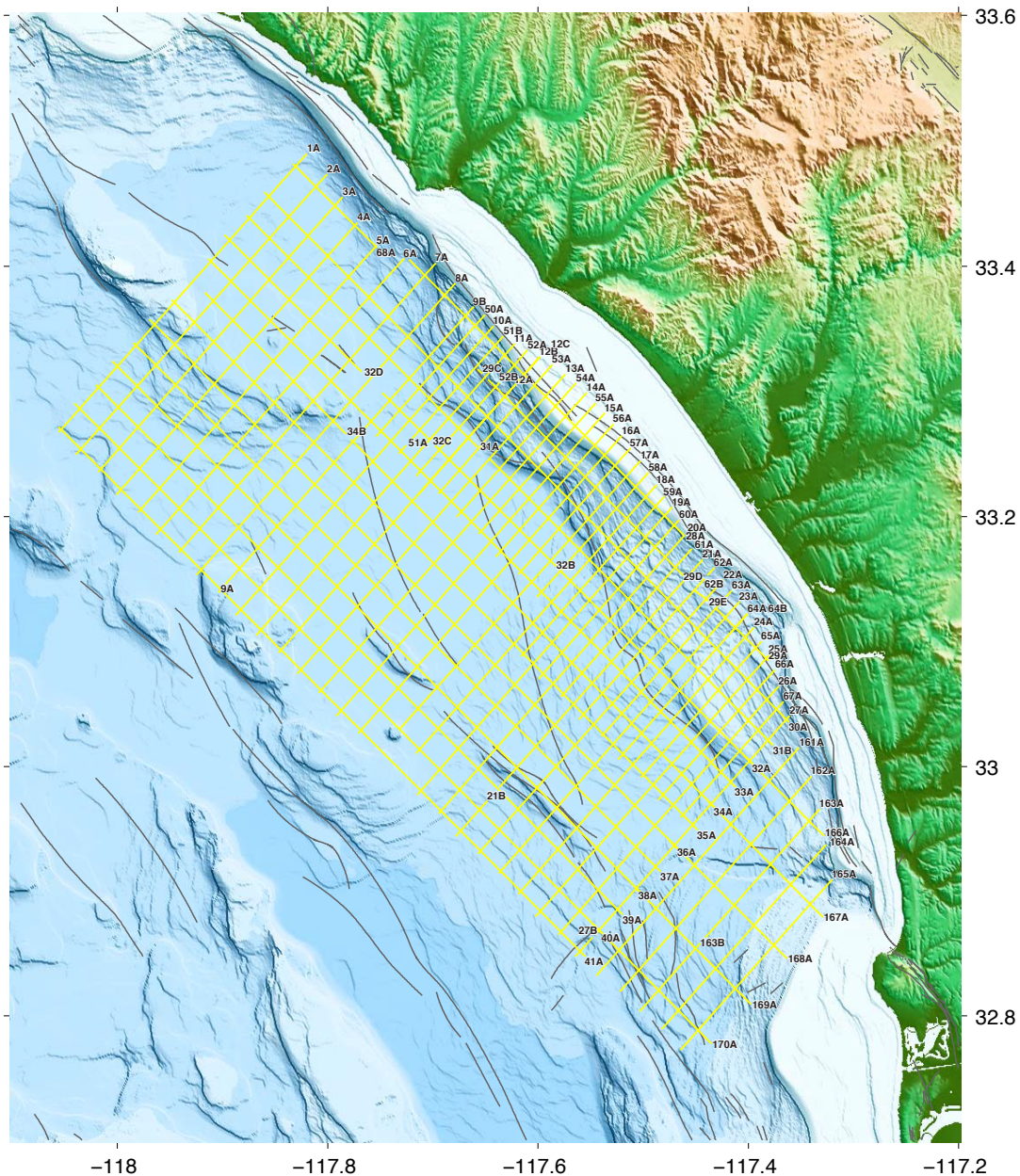


Figure 1-1. Shiptrack for 2D shallow regional survey (sparker data) conducted offshore southern California in summer 2013. Preliminary geophysical data are shown in Appendix I. Track lines are annotated.

- Use the shallow 2D seismic reflection data to identify locations for follow-on sampling and age dating of sea floor sediments, which combined with the focused 3D shallow geophysical survey will place constraints on the late Quaternary slip rate and recurrence interval of the offshore portions of the NI/RC Fault and the OBT Fault.

High-resolution regional data is required to examine the surficial structural deformation associated with the NI/RC and OBT fault systems. Such data will provide important constraints on the recurrence interval as well as the most recent event (MRE). Together with the focused 3D P-Cable surveys, these data will identify coring targets to establish a chronostratigraphic framework for the region. We will use a variety of sound sources, ranging from a sparker to a 1-15 kHz CHIRP system; this nested approach of imaging - similar to the data we acquired with great success offshore Iceland and in the Salton Sea - will allow us to examine the deformational structures across a range of scales (e.g., decimeters to 5 meters vertical resolution).

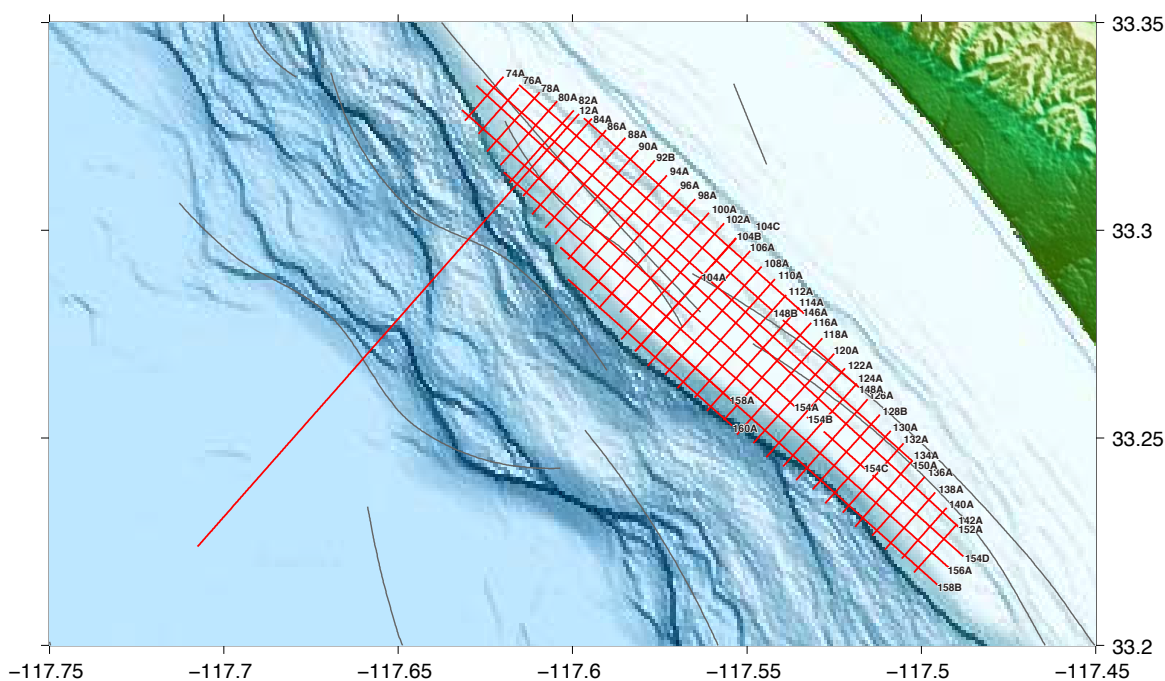


Figure 1-2. Shiptrack for 2D shallow regional survey (boomer data) conducted offshore southern California in summer 2013. Preliminary geophysical data are shown in Appendix J. Track lines are annotated.

The shallow marine seismic reflection project builds on and complements our reprocessing efforts of the Chevron and JEBCO 2D deep MCS data surveys. We have employed a sequenced approach to minimize time in the marine environment and maximize return from the

acquired data. These projects were performed in concert with the seafloor bathymetric surveys and will provide value added as the research vessels used during the seismic surveys are equipped with swath bathymetry systems (e.g., EM122 swath bathymetry). In summary, the results of the 2D regional shallow seismic survey placed important constraints on fault activity in the region.

We used the R/V New Horizon to acquire the 2D regional shallow data. Targets for the 2D shallow seismic survey were: (1) NI/RC, OBT, and PV faults, (2) sedimentary deposits and associated deformation, and (3) faults within metamorphic/ granitic bedrock and (4) San Mateo, Carlsbad, and San Onofre trends. One of the overarching goals of the 2D regional high-resolution survey was to image how the shallow surficial deformation is related (or not) to the deep-seated fault structures imaged in the reprocessed 2D deep seismic surveys.

1.4 Performed QA/QC on Raw and Processed 3D Deep Seismic Reflection Data

Scripps and UNR personnel were involved in the 2D high-resolution seismic reflection survey design and participated on the survey cruise to ensure data QA and QC and that the proposed targets are imaged properly. Both Scripps/UNR and Geotrace personnel will process the 2D seismic reflection data. The acquired seismic reflection data underwent QA/QC by Scripps/UNR during the cruise. Data processing is ongoing and once vetted, copies of the raw and processed data will be provided to SCE (digital data on hard drives) and archived at Scripps/UNR as well as Columbia University and University of Texas, Austin.

1.5 Specific Deliverables

- QA/QC on raw 2D regional shallow seismic reflection data
- Cruise Report for 2D regional shallow seismic reflection survey
- Processed 2D regional shallow seismic reflection data
- Technical Report for 2D regional shallow seismic reflection data

1.6 Summary Reports and appendixes

Subsea Project Summary for data acquisition and NCS navigation

Appendix A. NCS-Subsea Final Report

Appendix B. NCS-Subsea Production Log

Appendix C. NCS-Subsea Mobilization Report

Appendix D. NCS-Subsea Daily Production Reports

Appendix E. NCS-Subsea First Line Report

Appendix F. NCS-Subsea Offset Diagrams

Appendix G. Subsea Systems Seismic Observer Logs

Appendix H. Subsea Systems QA/QC Reports

Appendix I. Preliminary Sparker Data

Appendix J. Preliminary Boomer Data

Project Summary

SONGS 2-D Seismic Survey, August - September, 2013

In August of 2013 Subsea Systems, Inc.(SSI) was contracted by the University of California, San Diego (UCSD) and Scripps Institution of Oceanography(SIO) to provide geophysical services aboard the R/V New Horizon. These services consisted of both navigation positioning and 2-D high resolution seismic acquisition. SSI provided geophysical seismic equipment and personnel and subcontracted NCS-Subsea, Inc. (NCS) of Stafford, Texas to provide positioning equipment and personnel. Vessel mobilization took place from August 13 to 15 and data were acquired from August 16 to September 1. Demobilization occurred between September 1 and 3. The weather was exceptionally mild and the seas were calm for the majority of the survey. The survey area extended from Laguna Beach to La Jolla, approximately 60 km in length, and from the California state water boundary to 30 kilometers offshore. All survey data were acquired in federal waters. Approximately 2508 kilometers of high resolution 2-D data were acquired over a 17-day period.

Geophysical Equipment

2-D Streamer Systems

For this project Subsea Systems provided two complete GeoEel digital streamer systems. The primary system was a 48 channel, 6.25 meter group interval streamer with a total active length of 300 meters. The streamer depth was controlled by 4 cable levelers. Nominal depth was set to 2 meters for the beginning portion of the survey and changed to 3 meters for the majority of the survey. To improve positioning accuracy, a digital tail compass was fitted at the end of the streamer. This streamer was used in conjunction with the sparker source discussed below.

SSI also provided a GeoEel 24 channel 3.125 meter group interval streamer for use with the AP3000 triple plate boomer system. The 75 meter streamer was used in shallower, kelp-prone waters; to minimize the risk of fouling from kelp, cable levelers were not used. To improve positioning accuracy, a digital tail compass was installed at the end of the streamer.

Seismic Sources

In order to evaluate the proper source to be used on the October P-Cable survey, SSI provided two sources, a sparker source and a triple plate boomer.

For the majority of the survey, a three tip EG&G 402-7 sparker system was used, since the boomer source does not provide sufficient energy and frequency content in water depths greater than 500 meters. The sparker was towed at a nominal depth of 2 meters and at a distance of 25 meters from the stern. Source energy level was 2000 joules. Power to the sparker was supplied an Applied Acoustics CSPD 4000 volt capacitive discharge unit.

For the high resolution shallow water grid, the AP3000 triple plate boomer system was used. The source consisted of three boomer plates which were fired simultaneously at a total energy level of 1500 joules. Power to the plates was supplied by an Applied

Acoustics CSPD. The AP3000 was towed from a catamaran assembly at a nominal depth of 0.5 meters and at a distance of 25 meters from the stern.

Seismic Data Acquisition System

For streamer interface and control, a Geometrics SPSU (Shipboard Power Supply Unit) was used for each streamer. The SPSU interfaced by ethernet to a laptop PC which ran the Geometrics CNT data acquisition software. The raw streamer data was converted to SEG-Y format and stored on the computer hard drive. The SEG formatted data were backed up to a USB hard drive when each seismic line was completed. The Geometrics CNT software also provided many QC features. These included complete calibration of the streamer electronics, leakage and capacitance testing of hydrophones, display of all seismic channels, gathers of selected channels, and signal-to-noise measurements. Comprehensive logs recorded streamer depths, shot information and any errors that occurred. Data for the sparker source and 48 channel streamer was recorded at a sample rate of 0.5 milliseconds, a record length of 2.0 seconds and a firing rate of 6.25 meters. Boomer data from the 24 channel streamer was recorded at a sample rate of 0.25 milliseconds, a record length of 0.5 seconds and at a firing rate of 3.125 meters. The recording parameters were intended to duplicate those that would be used on the P-Cable survey later in the year.

Geophysical Personnel

SSI provided one engineer, Michael Barth. SIO and University of Nevada, Reno (UNR) provided necessary personnel to assist with deployment and to operate the seismic system during the survey.

Navigation System and Personnel

Positioning Equipment

The survey vessel was positioned using differentially-corrected GPS data. A Trimble SPS361 GPS receiver was used as the primary GPS system. A separate Trimble SPS361 GPS receiver was used as the secondary GPS system. The Trimble systems also provide true heading data. All position and heading data from the systems were logged in the P2/94 raw data files. WAAS (Wide Area Augmentation System) differential corrections were utilized during this survey, station 133 for primary and 138 for secondary. Source positioning was done using Subsea Systems proprietary DGPS units. The units were configured to receive WAAS corrections and to transmit data wirelessly to the vessel.

Positioning, Processing and QC Software

The NCS NavPoint integrated navigation system was used to provide positioning for the survey vessel and the 2-D seismic equipment. This system consisted of both online and offline components. The online components were the NavPoint Main, Longliner, Survey

Display, and Logging programs. The offline components were the FGPS SeisPos and FGPS P1Tools programs, used for processing and QC of the final data sets. Additional details of the navigation system are available in the NCS mobilization report.

Navigation Personnel

NCS provided a total of 5 personnel during the survey. In addition a field engineer was aboard for the mobilization and for several days of acquisition. Refer to the NCS mobilization report and DPRs for additional information.

Survey Vessel

The *R/V New Horizon*, owned by the University of California, San Diego, was provided by SIO for use as the survey platform. The *New Horizon* (Figure 4.1) is a 52m long purpose built research vessel operated by SIO Ship Operations. She was built in 1978 with a registered gross tonnage of 297 tons, a beam of 11m and a maximum draft of 3.7m. The *New Horizon* is propelled by two D398, 850hp Caterpillar diesel engines driving two variable pitch screws making her acoustically very quiet and ideal for seismic survey operations. Her two 230kW service generators supply ample electrical servicer for all survey instrumentation. A fuel capacity of over 40,000 gallons and an average consumption rate of 1,000 gallons per day push her range out to 9,600 miles and endurance to 40 days.



Crew List

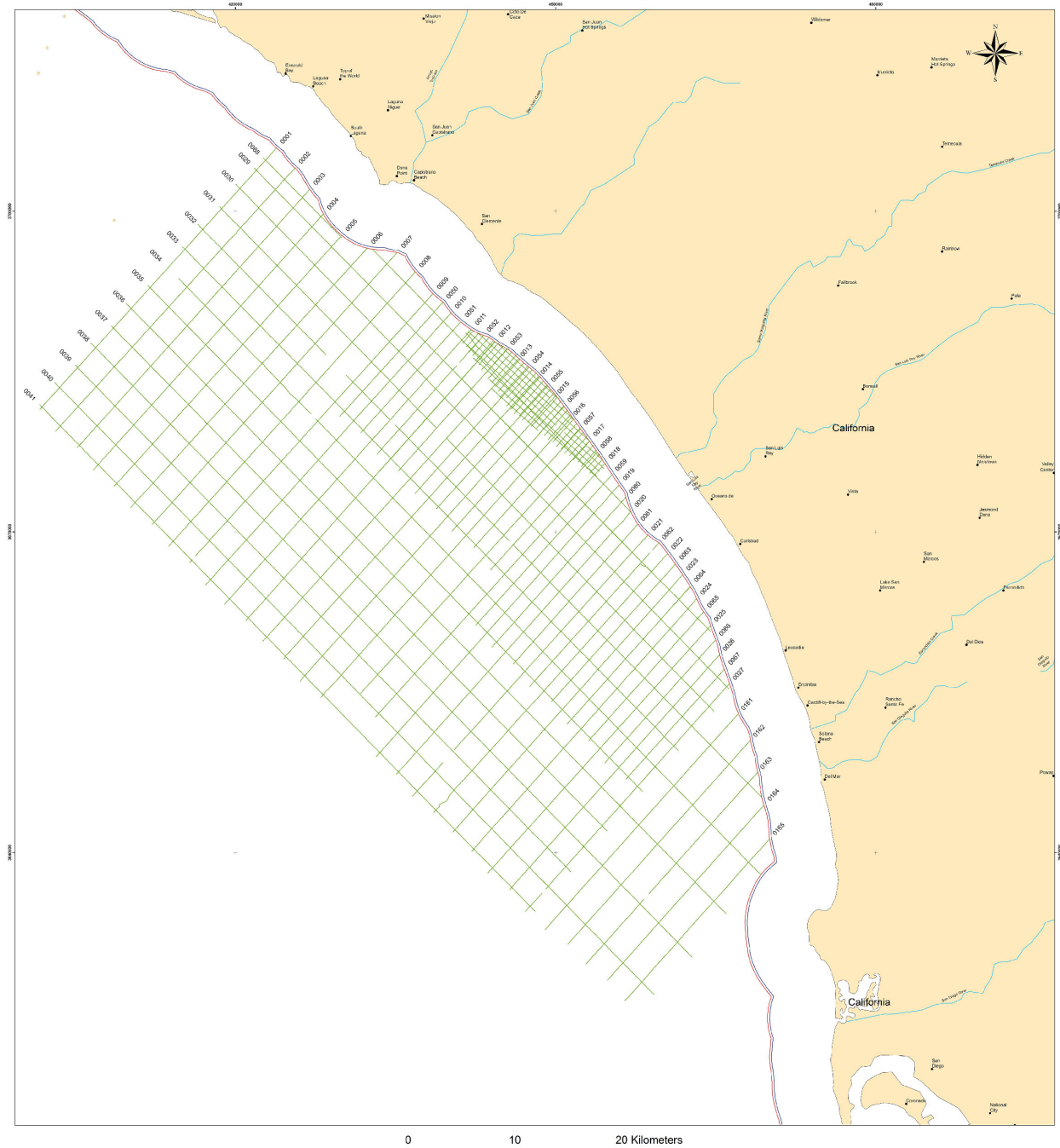
The following scientific and contract personnel participated in the 2-D survey:

Name	Position	Affiliation
Graham Kent	Chief Scientist	UNR
Alistar Harding	Co-Chief Scientist	SIO/UCSD
John Calderwood	Resident Technician	SIO/UCSD
Gulsen Ucarus	Post Doctorate	SIO/UCSD
James Holmes	Graduate Student	SIO/UCSD
Valerie Sahakian	Graduate Student	SIO/UCSD
Michelle Lande	PSO	SIO/UCSD
Kyle Reeder	Graduate Student	UNR
Joe Dierkhising	Graduate Student	UNR
Christine Ruhl	Graduate Student	UNR
Michael Barth	Survey Manager	Subsea Systems, Inc.
Jesus Gaytan	Field Engineer	NCS-Subsea Inc.
Matthew Grey	Chief Navigator	NCS-Subsea Inc
Micah Hall	Navigator	NCS-Subsea Inc
Matthew Christie	Navigator	NCS-Subsea Inc
Christopher Blakeway	Navigation Processor	NCS-Subsea Inc
Parker Williams	Navigation Processor	NCS-Subsea Inc

The ship's crew consisted of the following personnel:

Ian Lawrence	Captain	SIO/UCSD
Jack Purdy	First Mate	SIO/UCSD
Jude Izra	Third Mate	SIO/UCSD
Tom Schuler	Chief Engineer	SIO/UCSD
William Brown	Assistant Engineer	SIO/UCSD
Dave Weaver	AB Seaman	SIO/UCSD
Matthew Schulze	AB Seaman	SIO/UCSD
Dave Quinlan	AB Seaman	SIO/UCSD
William Bouvier	Oiler	SIO/UCSD
Jonathan Garcia	Wiper	SIO/UCSD
Ed Lograsso	Senior Cook	SIO/UCSD
Matrik Stein	Cook	SIO/UCSD

SONGS 2-D Geophysical Survey Postplot Map



0 10 20 Kilometers

Notes:

1. Coordinates are referenced to the WGS84 UTM 11N Coordinates System, and units are in meters.
2. This plot represents the west coast of the United States.

Legend

- Cities
- Platforms
- Wells
- Postplot Lines
- Fed State Boundary 200M Buffer
- Fed State Boundary
- BOEM Pipelines
- Rivers and Streams



Subsea Systems, Inc.

West Coast 2D High Res 2013 Postplots



Prepared For: Jesus Gaylan

Drawing #: 520 003 2013

Drafted By: AEP

CHK By: EMG

APP By:

Rev #: 1

Date: 06/13/2013

Sheet #: 1 of 2

SONGS 2-D GEOPHYSICAL SURVEY SUMMARY OF OPERATIONS, AUGUST 9 - SEPTEMBER 5, 2013

Date	Activity	System(s)	Km	Comments
9-Aug	Mobilization		0.0	NCS Equipment in Transit; on rental
10-Aug	Mobilization		0.0	NCS Equipment in Transit
11-Aug	Mobilization		0.0	NCS Equipment in Transit
12-Aug	Mobilization		0.0	NCS Personnel travel; NCS equipment at MarFac; Birds on rental
13-Aug	Mobilization		0.0	SSI and NCS equipment Installation and Calibration
14-Aug	Mobilization		0.0	SSI and NCS equipment Installation and Calibration
15-Aug	Mobilization		0.0	SSI and NCS equipment Installation and Calibration
16-Aug	Operations	Sparker/48 chl	0.0	Underway to survey area; testing; commence survey at 2127 hrs
17-Aug	Operations	Sparker/48 chl	144.5	
18-Aug	Operations	Sparker/48 chl	178.4	
19-Aug	Operations	Sparker/48 chl	177.8	
20-Aug	Operations	Sparker/48 chl	152.8	Change out Active Section 1 to SN 06-707, Replace DS 1010 (Damaged) with DS1007, Add Bird SN 24502 to end of Streamer Chl 48
21-Aug	Operations	Sparker/48 chl	178.0	
22-Aug	Operations	Sparker/48 chl	154.3	
23-Aug	Operations	Sparker/48 chl	182.9	
24-Aug	Operations	Sparker/48 chl	195.7	
25-Aug	Operations	Sparker/48 chl	198.3	
26-Aug	Operations	Sparker/48 chl & Boomer/24 chl	198.8	Switch to Boomer ~2200 hrs
27-Aug	Operations	Boomer/24chl	113.8	#2 Digitizer Power Supply failed - replace and run performance tests - ok
28-Aug	Operations	Boomer/24 chl & Sparker/48 chl	111.7	Switch to Sparker ~ 2300 hrs
29-Aug	Operations	Sparker/48 chl	131.2	
30-Aug	Operations	Sparker/48 chl	151.5	Remove kelp #1 Bird
31-Aug	Operations	Sparker/48 chl	171.1	Remove kelp from sparker, #1 and #2 Bird
1-Sep	Operations	Sparker/48 chl	67.4	End of Survey, Transit to port, At dock at 0720 Hrs; demob vessel
2-Sep	Demobilization		0.0	NCS personnel travel; SSI equipment off rental
3-Sep	Demobilization		0.0	NCS Equipment in Transit; SSI finishes demob of vessel
4-Sep	Demobilization		0.0	NCS Equipment in Transit; Birds off rental
5-Sep	Demobilization		0.0	NCS Equipment arrives Houston; off rental
Total Km			2508.2	
Total Operational Days			17	

SONGS 2-D Survey Summary by Date/Sequence Number

Date(Local)	Time(Local)	Sequence	Line No	Azimuth	FSP	LSP	First FFID	Last FFID	Source	KM Shot	Brief Comments
16-Aug-13	1027	44	11	222	1001	6495	11	4612	Sparker	34.34	Start of Survey, Sequence 44
17-Aug-13	0233	45	12	042	1001	6061	12	5081	Sparker	31.63	PSO Shutdown
17-Aug-13	0626	46	12	042	6258	6598	5082	5422	Sparker	2.13	
17-Aug-13	0711	47	13	222	1001	6711	13	5733	Sparker	35.69	
17-Aug-13	1146	48	14	042	1001	6709	14	5728	Sparker	35.68	
17-Aug-13	1805	49	15	222	1001	6746	15	5770	Sparker	35.91	
17-Aug-13	2131	50	16	042	1001	6639	16	5713	Sparker	35.24	
18-Aug-13	0215	56	17	222	1001	6107	17	5133	Sparker	31.92	
18-Aug-13	0618	57	18	042	1375	6496	18	5136	Sparker	32.01	
18-Aug-13	1034	58	19	222	1001	6454	19	5487	Sparker	34.09	
18-Aug-13	1518	59	20	042	1001	6277	20	5361	Sparker	32.98	Sparker Maintenance
18-Aug-13	1943	60	21	222	1001	5338	21	4367	Sparker	27.11	PSO Shutdown
18-Aug-13	2321	61	21	222	5591	6269	4368	5046	Sparker	4.24	
19-Aug-13	0013	62	22	042	1001	6226	22	5245	Sparker	32.66	
19-Aug-13	0428	63	23	222	1001	6166	23	5280	Sparker	32.29	
19-Aug-13	0859	64	24	042	1001	6064	24	5145	Sparker	31.65	Streamer leakage
19-Aug-13	1311	65	25	222	1001	5988	25	5031	Sparker	31.18	Streamer leakage
19-Aug-13	1717	66	26	042	1001	5724	26	4810	Sparker	29.53	
19-Aug-13	2117	67	27	222	1001	5134	27	4169	Sparker	25.84	NavPoint no triggers
20-Aug-13	0021	70	27	222	5217	5586	4170	4537	Sparker	2.31	Replace 1st Active; Install Bird 4 at tail; replace DS1010 with DS1007
20-Aug-13	0444	72	10	222	1001	6490	10	5519	Sparker	34.31	
20-Aug-13	0908	73	9	042	1001	1061	9	139	Sparker	0.38	PSO Shutdown
20-Aug-13	0914	74	9	042	1140	6433	140	5433	Sparker	33.09	
20-Aug-13	1351	75	8	222	1001	6526	8	5547	Sparker	34.54	
20-Aug-13	1818	76	7	042	1001	6484	7	5523	Sparker	34.28	
20-Aug-13	2248	77	6	222	1001	6263	6	5277	Sparker	32.89	
21-Aug-13	0307	78	5	042	1001	6072	5	5130	Sparker	31.70	
21-Aug-13	0720	80	4	222	1001	6153	4	5168	Sparker	32.21	
21-Aug-13	1135	81	3	042	1001	6208	3	5233	Sparker	32.55	
21-Aug-13	1608	82	2	222	1001	6330	2	5340	Sparker	33.31	

SONGS 2-D Survey Summary by Date/Sequence Number

Date(Local)	Time(Local)	Sequence	Line No	Azimuth	FSP	LSP	First FFID	Last FFID	Source	KM Shot	Brief Comments
21-Aug-13	2036	83	1	042	1001	6282	1	5312	Sparker	33.01	
22-Aug-13	0109	84	68	135	1001	2680	68	1781	Sparker	10.50	
22-Aug-13	0245	85	28	135	1001	6530	28	5575	Sparker	34.56	Personnel transfer
22-Aug-13	1036	86	29	135	1001	4621	29	3674	Sparker	22.63	PSO Shutdown
22-Aug-13	1320	87	29	135	4703	4808	3675	3780	Sparker	0.66	Source GPS not working
22-Aug-13	1330	88	29	135	4892	4990	3781	3879	Sparker	0.62	Numerous PSO shutdowns
22-Aug-13	1341	89	29	135	5104	9039	3880	7814	Sparker	24.59	
22-Aug-13	1646	90	29	135	9293	9532	7815	8000	Sparker	1.50	
22-Aug-13	1705	91	29	135	9681	10736	8056	9111	Sparker	6.60	
22-Aug-13	1853	92	30	315	1001	11570	30	10625	Sparker	66.06	Source GPS not working
23-Aug-13	0300	93	31	135	1001	5633	31	4688	Sparker	28.96	PSO Shutdown
23-Aug-13	0630	94	31	135	5866	11587	4689	10410	Sparker	35.76	Replace sparker tips
23-Aug-13	1113	95	32	315	1001	4866	32	3926	Sparker	24.16	PSO Shutdown
23-Aug-13	1411	96	32	315	4944	7373	3927	6355	Sparker	15.19	
23-Aug-13	1559	97	32	315	7481	8430	6356	7305	Sparker	5.94	Seismic Recording problem
23-Aug-13	1645	98	32	315	8850	11590	7307	10346	Sparker	17.13	
23-Aug-13	1921	99	33	135	1001	11591	33	10643	Sparker	66.19	
24-Aug-13	0328	100	34	315	1001	8325	34	7383	Sparker	45.78	PSO Shutdown
24-Aug-13	0849	101	34	315	8431	11262	7384	10215	Sparker	17.70	
24-Aug-13	1127	102	35	135	1001	11600	35	10653	Sparker	66.25	
24-Aug-13	1930	103	36	315	1001	11600	36	11590	Sparker	66.25	Sparker off SP 10346-11072
25-Aug-13	0322	104	37	135	1001	11602	37	10660	Sparker	66.26	
25-Aug-13	1128	106	38	315	1001	11607	38	10719	Sparker	66.29	
25-Aug-13	1927	107	39	135	1001	11608	39	10670	Sparker	66.30	
26-Aug-13	0326	108	40	315	1001	11611	40	10671	Sparker	66.32	
26-Aug-13	1128	109	41	135	1001	11614	41	10681	Sparker	66.34	
26-Aug-13	2239	110	160	312	1001	2881	1164	3180	Boomer	5.88	Reconfigure for Boomer
26-Aug-13	2342	111	158	132	1001	2968	1164	3180	Boomer	6.15	Repair streamer problem
27-Aug-13	0331	112	158	132	1001	5331	1158	5637	Boomer	13.53	
27-Aug-13	0538	113	156	312	1001	6091	156	5322	Boomer	15.91	

SONGS 2-D Survey Summary by Date/Sequence Number

Date(Local)	Time(Local)	Sequence	Line No	Azimuth	FSP	LSP	First FFID	Last FFID	Source	KM Shot	Brief Comments
27-Aug-13	0817	114	154	132	1001	4808	154	4027	Boomer	11.90	PSO Shutdown
27-Aug-13	0952	115	154	132	4947	4962	4028	4044	Boomer	0.05	PSO Shutdown
27-Aug-13	1047	118	152	312	1001	6582	152	5801	Boomer	17.44	
27-Aug-13	1339	119	150	132	1001	5911	150	5126	Boomer	15.35	
27-Aug-13	1615	120	148	312	1001	1867	148	1050	Boomer	2.71	PSO Shutdown
27-Aug-13	1641	121	148	312	1984	4886	1051	3953	Boomer	9.07	
27-Aug-13	1821	122	146	132	1001	3516	146	2761	Boomer	7.86	
27-Aug-13	2030	123	142	222	1001	1554	142	715	Boomer	1.73	
27-Aug-13	2103	124	140	042	1001	1582	140	780	Boomer	1.82	
27-Aug-13	2136	125	138	222	1001	1652	138	805	Boomer	2.04	
27-Aug-13	2204	126	136	042	1001	1679	143	863	Boomer	2.12	
27-Aug-13	2231	127	134	222	1001	1746	134	903	Boomer	2.33	
27-Aug-13	2300	128	132	042	1001	1789	132	968	Boomer	2.47	
27-Aug-13	2331	129	130	222	1001	1834	130	983	Boomer	2.61	
28-Aug-13	0005	130	128	042	1001	1860	128	1041	Boomer	2.69	
28-Aug-13	0045	131	126	222	1001	1923	126	1072	Boomer	2.88	
28-Aug-13	0123	132	124	042	1001	1950	124	1123	Boomer	2.97	
28-Aug-13	0205	133	122	222	1001	2013	122	1199	Boomer	3.17	
28-Aug-13	0244	134	120	042	1001	2033	120	1206	Boomer	3.23	
28-Aug-13	0323	135	118	222	1001	2102	118	1271	Boomer	3.44	
28-Aug-13	0405	136	116	042	1001	2120	116	1262	Boomer	3.50	
28-Aug-13	0448	137	114	222	1001	2183	114	1342	Boomer	3.70	
28-Aug-13	0532	138	112	042	1001	2176	112	1351	Boomer	3.68	
28-Aug-13	0618	139	110	222	1001	2251	110	1370	Boomer	3.91	
28-Aug-13	0704	140	108	042	1001	2240	108	1392	Boomer	3.88	
28-Aug-13	0750	141	106	222	1001	2318	106	1432	Boomer	4.12	
28-Aug-13	0834	142	104	042	1001	1816	104	na	Boomer	2.55	PSO Shutdown
28-Aug-13	0858	143	104	042	1977	2297	na	1206	Boomer	1.00	
28-Aug-13	0918	144	102	222	1001	2326	102	1403	Boomer	4.14	
28-Aug-13	1005	145	100	042	1104	2244	100	1240	Boomer	3.57	Late start -PSO shutdown

SONGS 2-D Survey Summary by Date/Sequence Number

Date(Local)	Time(Local)	Sequence	Line No	Azimuth	FSP	LSP	First FFID	Last FFID	Source	KM Shot	Brief Comments
28-Aug-13	1045	146	98	222	1001	2244	98	1349	Boomer	3.89	
28-Aug-13	1126	147	96	042	1001	2159	96	1306	Boomer	3.62	
28-Aug-13	1208	148	94	222	1001	2084	94	1228	Boomer	3.39	
28-Aug-13	1306	150	92b	042	1001	2125	1092	2238	Boomer	3.52	
28-Aug-13	1346	151	90	222	1001	2087	90	1210	Boomer	3.40	
28-Aug-13	1429	152	88	042	1001	2032	88	1183	Boomer	3.23	
28-Aug-13	1510	153	86	222	1001	1959	86	1092	Boomer	3.00	
28-Aug-13	1551	154	84	042	1001	1889	84	1029	Boomer	2.78	
28-Aug-13	1627	155	82	222	1001	1831	82	956	Boomer	2.60	
28-Aug-13	1659	156	80	042	1001	1730	80	863	Boomer	2.28	
28-Aug-13	1730	157	78	222	1001	1680	78	802	Boomer	2.13	
28-Aug-13	1758	158	76	042	1001	1552	76	638	Boomer	1.63	
28-Aug-13	1825	159	74	222	1001	1501	74	601	Boomer	1.57	
28-Aug-13	1946	160	4(104C)	042	1001	2297	113	1459	Boomer	4.05	
28-Aug-13	2104	161	12C	222	1001	5933	1204	3000	Boomer	15.42	Switch to sparker at EOL
29-Aug-13	0116	162	12D	042	3991	6598	2012	4619	Sparker	16.30	
29-Aug-13	0355	163	50	222	1001	3311	50	2365	Sparker	14.44	
29-Aug-13	0605	164	51	042	1001	1160	52	755	Sparker	1.00	PSO Shutdown
29-Aug-13	0616	165	51	042	1254	3234	764	2110	Sparker	12.38	
29-Aug-13	0808	166	52	222	1009	1545	52	1490	Sparker	3.36	PSO Shutdown
29-Aug-13	0835	167	52	222	1611	3393	1491	2371	Sparker	11.14	
29-Aug-13	1044	168	53	042	1001	3446	53	2527	Sparker	15.29	Remove kelp from Sparker
29-Aug-13	1311	169	54	222	1001	3547	54	2624	Sparker	15.92	
29-Aug-13	1520	170	55	042	1001	3491	55	2574	Sparker	15.57	
29-Aug-13	1733	171	56	222	1001	3514	56	2591	Sparker	15.71	
29-Aug-13	1945	172	57	042	1001	3391	57	2470	Sparker	14.94	
29-Aug-13	2129	173	58	222	1001	3381	58	2437	Sparker	14.88	
30-Aug-13	0045	174	59	042	1001	4046	59	3085	Sparker	19.04	
30-Aug-13	0349	175	60	222	1001	4017	60	3082	Sparker	18.86	
30-Aug-13	0625	176	61	042	1001	3805	61	2875	Sparker	17.53	

SONGS 2-D Survey Summary by Date/Sequence Number


Date(Local)	Time(Local)	Sequence	Line No	Azimuth	FSP	LSP	First FFID	Last FFID	Source	KM Shot	Brief Comments
30-Aug-13	0857	177	62	222	1001	1147	62	214	Sparker	0.92	PSO Shutdown
30-Aug-13	0906	178	62	222	1213	3896	215	2898	Sparker	16.78	
30-Aug-13	1126	179	63	042	1017	3785	63	2831	Sparker	17.31	
30-Aug-13	1352	180	64	222	1001	1370	64	410	Sparker	2.31	Crew member evacuated
30-Aug-13	1533	181	64	222	1001	3770	1064	3853	Sparker	17.31	
30-Aug-13	1754	182	65	042	1001	3587	65	2680	Sparker	16.17	
30-Aug-13	2012	183	66	222	1001	3483	66	2557	Sparker	15.52	
30-Aug-13	2221	184	67	042	1001	3209	67	2301	Sparker	13.81	
31-Aug-13	0034	185	161	222	1001	5341	161	4504	Sparker	27.13	
31-Aug-13	0409	186	162	042	1001	5105	162	4273	Sparker	25.66	
31-Aug-13	0733	187	163	222	1001	3447	163	2617	Sparker	15.29	PSO Shutdown
31-Aug-13	0922	188	163	222	3559	4883	2618	3942	Sparker	8.28	
31-Aug-13	1047	189	164	042	1001	4514	164	3700	Sparker	21.96	Remove kelp from streamer
31-Aug-13	1345	190	165	222	1001	4252	165	3417	Sparker	20.33	Remove kelp from streamer
31-Aug-13	1648	191	170	315	1001	3379	170	2574	Sparker	14.87	
31-Aug-13	1905	192	169	135	974	982	168	177	Sparker	NA	
31-Aug-13	1907	193	169	135	1017	3377	178	2538	Sparker	14.76	
31-Aug-13	2129	194	168	315	1001	3379	168	2577	Sparker	14.87	
31-Aug-13	2352	195	167	135	1001	3319	167	2498	Sparker	14.49	
1-Sep-13	0225	196	166	315	1001	2609	166	1783	Sparker	10.06	End of survey, Sequence 196

APPENDIX A

NCS-SUBSEA Final Report

SONGS 2-D High Resolution Seismic Survey Offshore Southern California


August - September 2013

<p>JOB DOCUMENTS</p>	<p>J00520-FR-001-002</p> <p>Final Report – SONGS 2D Hi</p> <p>Res 2013</p>	
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Final Report – SONG 2D High Resolution Survey – Aug. 2013

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Executive Summary

Route/Site Name: *SONGS 2D High Resolution*

Route/Site Location: *South California Coast*

Water Depth: *85m – 850m.*


Streamer Configuration: *1 x 300m x 6.25m and 1 x 75m x 3.125m*

Navigation Acquisition Software: *NCS SubSea NavPoint Longliner*

Navigation Processing Software: *FGPS SeisPos*

Navigation QC Software: *FGPS PITools*


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1 Introduction

On August 16th 2013, under contract Subsea Systems Inc., NCS-Subsea Inc. (NCS) began operations for the 2D high-resolution streamer survey off southern California (Figure 1). The purpose of this survey was to characterize the shallow subsurface proximal to the San Onofre Nuclear Generating Station. The entirety of the survey was conducted in US federal waters, no production within the 3mile boundary of California state waters. NCS SubSea's role in this survey was to provide precise and accurate positioning of the streamer cable and also the seismic energy source. This document reports the details of this survey.

1.1 Location

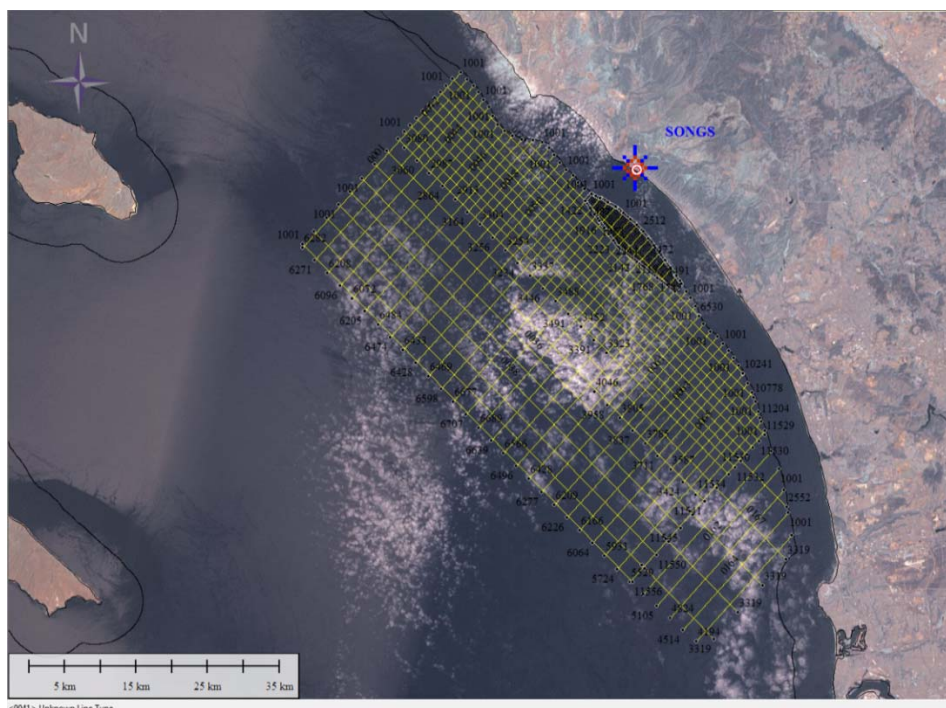



Figure 1. – Scaled map of the pre-plotted survey area.

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1.2 Geodetic Parameters

The following parameters (Table 1) were used during the acquisition of this survey. All navigation systems, preplots, and data logging were set to utilize this datum.

Table 1 - Survey Datum Parameters

PARAMETER	VALUE
GEODETIC DATUM	WGS84
PROJECTION	UTM
ZONE	ZONE 11 NORTH
UNITS	METERS

2 Operational Summary


On August 16th 2013 at 15:15 UTC the research vessel New Horizon departed the San Diego Harbor in San Diego, California. After an approximately 5 hour transit, the vessel arrived on site for the first deployment of the 300m streamer and source (sparker). Testing and refinement of the deployment process continued on until approximately 03:30 UTC on August 17th. The first acquisition line begun at 04:27 UTC on August 17th. Sequences 1-43 were null and used during testing, so the first production sequence was 44. The initial configuration was a 300m, 48 channel streamer, and a sparker source fired at 6.25m intervals. The sparker had weight added after the first sequence (44) to stabilize the GPS (Global Positioning System) pod. Production continued with no problems until sequence 49. It was decided that it would be better to get the sparker out of the prop wash by moving its towpoint as far starboard as possible, and moving the

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streamer's towpoint to the original position of the sparker. The new offsets were updated in the configuration files for NavPoint, and new offset diagrams were created. Production continued to sequence 109 with interruptions only for removing kelp from both the streamer birds and the sparker. Short gaps in acquisition due to PSO (protected species observer) shutdowns were experienced. On 20 August 2013, sequence 67, the NavPoint computer froze and the line ended early. The system was re-started and the line was continued as sequence 68. From sequence 72 forward a tail stretch and an additional bird was added to the streamer. Offset diagrams were updated. Sequence 110 began our acquisition with a 75m streamer and different source (boomer). Sequence 110 and 111 was acquired using a streamer head buoy (equipped with GPS pod) but was removed due to the prop wash pushing the streamer starboard and into the Boomer. Sequences 110 through sequences 161 were shot using the 75m, 24 channel streamer and boomer source with 3.125m shotpoint (SP) and group spacing. Sequence 111 was stopped early due to a streamer fault. New offset diagrams were completed for both configurations. Beginning with sequence 162, we configured using the sparker and 300m 48 channel streamer with 6.25m SP and group spacing. We continued production with minimal delays due to kelp on outboard gear and the occasional PSO shutdown. Sequence 196 was our final line and ended at 10:33 UTC on 01 September 2013. We returned to San Diego Harbor at 19:20 UTC on 01 September 2013 and began demobilization.

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3 Field and Professional Personnel

Table 2 - Survey personnel.

Name	Position	Company
Matthew Grey	Chief Navigator	NCS SubSea
Parker Williams	Nav. Processor	NCS SubSea
Chris Blakeway	Nav. Processor	NCS SubSea
Micah Hall	Navigator	NCS SubSea
Matthew Christie	Navigator	NCS SubSea
Jesus Gaytan	Commissioning Engineer	NCS SubSea

4 System Information

Please refer to the Mobilization Report provided in Appendix B.

5 Operational Procedures and Conditions

NCS SubSea personnel commenced each new survey day by completing a *Start of Acquisition Day Checklist* (Figure 2). In addition, a *Prestart of Line Checklist* and *End of Line Checklist* (Figure 3) were completed for every shooting sequence. These checklists were utilized in order to ensure the consistent functionality and use of the navigation system. Detailed shooting and production logs were also maintained with all of the pertinent information relating to each sequence (Appendix A). The Navigation Line Logs were delivered with the processed data shipment.

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Start of Acquisition Day Checklist

- ☐ 1) Turn on the NavPoint Main, Display, Longliner, and Logging software installed on the navigation computers.
- ☐ 2) Check that the GPS units and heading sensors installed on the survey vessel are turned on and that data is being received by the navigation system.
- ☐ 3) Check that the GPS units located on the source buoy are turned on and that data is being received by the navigation system.
- ☐ 4) Ensure that all GPS units are receiving differential corrections.
- ☐ 5) Check that the echosounder is turned on and that depth data is being received by the navigation system.
- ☐ 6) Check that the Streamer Cable compasses data is being received by the NavPoint Longliner program.
- ☐ 7) Check to make sure the correct P1/90 preplot file is loaded into the NavPoint Display program.
- ☐ 8) Perform Geodetic Check and capture screen shot.

Date _____ Signed _____

Figure 2. – Example Start of Acquisition Day Checklist.

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Seq. : _____ SOL SP: _____ EOL SP: _____ Line: _____

Prestart of Line Checklist

- ☐ 1) Consult the party chief and seismic observer to determine the next survey line for acquisition.
- ☐ 2) Select the desired survey line in the NavPoint Display window.
- ☐ 3) Instruct the wheelhouse to navigate the vessel to a point 300 m before the start of the survey line.
- ☐ 4) When the vessel has reached the point 300m before the start of the survey line instruct the wheelhouse to begin steering the survey line.
- ☐ 5) When the vessel has stabilized on a course along the survey line instruct the wheelhouse to switch the autopilot into Nav mode.
- ☐ 6) When the nominal CMP offset has reached a point 100 m from the start of the survey line check the Active box on the NavPoint Display window.
- ☐ 7) Check that the NavPoint Logging program shows a green Recording On indicator.
- ☐ 8) Record the following information in the survey line log for this survey line:
 - a.) Sequence number (from the NavPoint Main program)
 - b.) First shot point number and time
 - c.) Direction of travel


End of Line Checklist

- ☐ 1.) When the nominal CMP offset has reached a point 100 m past the end of the survey line, uncheck the Active box on the NavPoint Display window.
- ☐ 2.) Record the following information in the survey line log for this survey line:
 - a.) Last shot point number
 - b.) Status of the survey line (i.e. – complete, partial or do not process)
- ☐ 3.) Make an archive copy of the log, P1/90 and P2/94 files on the network drive.
- ☐ 4.) Deliver copies of the P1/90 and P2/94 files to the navigation data processor.

Date _____ Signed _____

Figure 3. – Example Prestart of Line and End of Line Checklists.

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Beyond the operation of the navigation system, and the performance of the typical duties expected of a surveyor, NCS SubSea personnel took an active role in deck operations. With guidance from the geophysical data acquisition manager, NCS personnel actively participated in the deployment and recovery of the streamer cable and source systems. NCS SubSea personnel also made themselves available, where appropriate, to assist in the troubleshooting of broader hardware and software issues experienced by the onboard team.

5.1 Line Naming Convention

Due to a restriction of only incrementing shot points and the expansion of the survey past 99 preplotted lines, there are 2 line naming conventions, as below. All line names for the survey are 4 digits and a letter suffix.

For lines acquired WITH a leading zero:

0XYYZ, where:

X is the direction line acquired (1 as preplotted, 2 reversed endpoints)

YY is the preplot line number (01-99)


Z is the attempt (A-Z incrementing)

Examples:

Line 0125A = Line acquired with preplot endpoints (01), line number 25, First attempt (A).

Line 0209B = Line acquired opposite preplot endpoints (02), line number 09, Second attempt (B)

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For lines acquired WITHOUT a leading zero:

RSSST, where:

R is the direction line acquired (1 as preplotted, 2 reversed endpoints)

SSS is the preplot line number (001-999)

T is the attempt (A-Z incrementing)

Examples:

Line 1154D = Line acquired with preplot endpoints (1), line number 154, Fourth attempt (D).

Line 2160A – Line acquired opposite preplot endpoints (2), line number 160, First attempt (A).


6 Data Processing

For the survey NCS SubSea provided FGPS SeisPos ver. 19.48. The Navigation Data processor imported a P2/94 for each sequence that was acquired and output the best available position for the vessel, source array, and streamer in a UKOAA (United Kingdom Offshore Operators Association) format P1/90 file. A First Line QC was performed on the first sequence of the survey and once issues resolved updated. The report is found in Appendix E.

Navigation data processing is an in-depth multistep process. Before the file can be imported into SeisPos, a header check is run against a previous sequence; this ensures that the newest sequence does not contain any major differences. In the event of a difference in the header, the difference must be confirmed to be intentional or accidental. If the difference is by accident, an amended copy of the P2/94 is produced with the appropriate corrections. Any issues resulting in inconsistent or incorrect P2/94 files have to be addressed in the NavPoint navigation system.

Once the sequence is imported into SeisPos, the processor performs Precondition processing,

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where they remove any disruptive “spikes” in the data and adjust filtering lengths and thresholds if necessary.

After the Precondition step, the sequence is then run through a “Network Adjustment”. This step is where SeisPos solves a position for the vessel, source array, and streamer for each shot taken. The Network Adjustment is a step of processing that involves statistically weighting the observed data for each node included in the adjustment, and results in a position. While performing the Network Adjustment, SeisPos will automatically disable observations that statistically don’t mesh well with the rest of the data. Since SeisPos may remove observations from a network, this can result in position spikes elsewhere in the network. These position spikes are most often seen as jumps in the distance from Center of Source (COS) to Center Near Group (CNG). If the processor identifies any spikes, they use various tools within SeisPos to remove or reduce the spikes resulting in the smoothest solution possible.

Once the processor is satisfied with the results, a processing report is created along with multiple statistical plots and comments. Finally, a UKOOA P1/90 formatted file is exported.

7 Data Quality

Receiver positioning data quality was generally good. Receiver positioning was achieved by using a layback offset from the towpoint to the tail of the streamer, based on the data from the tail compass installed. Source positioning data collected from the Subsea Systems GPS unit was generally good to excellent, with only very isolated loss on 4 sequences due to faulty units needing to be repaired. The Subsea Systems GPS unit was mounted above the COS so no offset was required. For complete offset diagrams used for all configurations, see Appendix D.

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8 Production Statistics

Table 3 below and Figure 4 show the production statistics and the postplot map of acquired sequences. The full PDF of postplot map is also available in Appendix F.

Table 3. – Production statistics.

Total Sequences	141
Sail Line Kilometers (excluding DNP sequences)	2508.05

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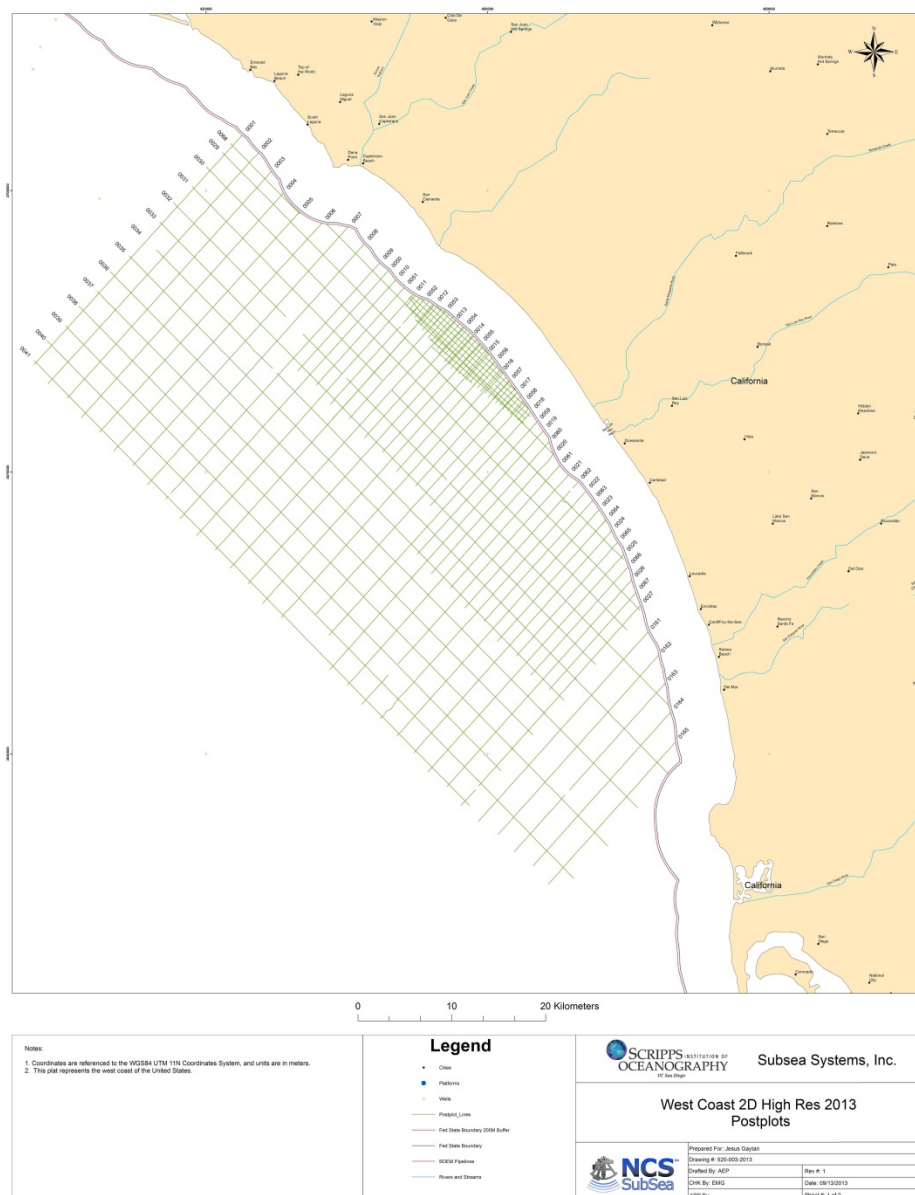


Figure 4. – Postplot map of acquired sequences – 6.25m and 3.125m

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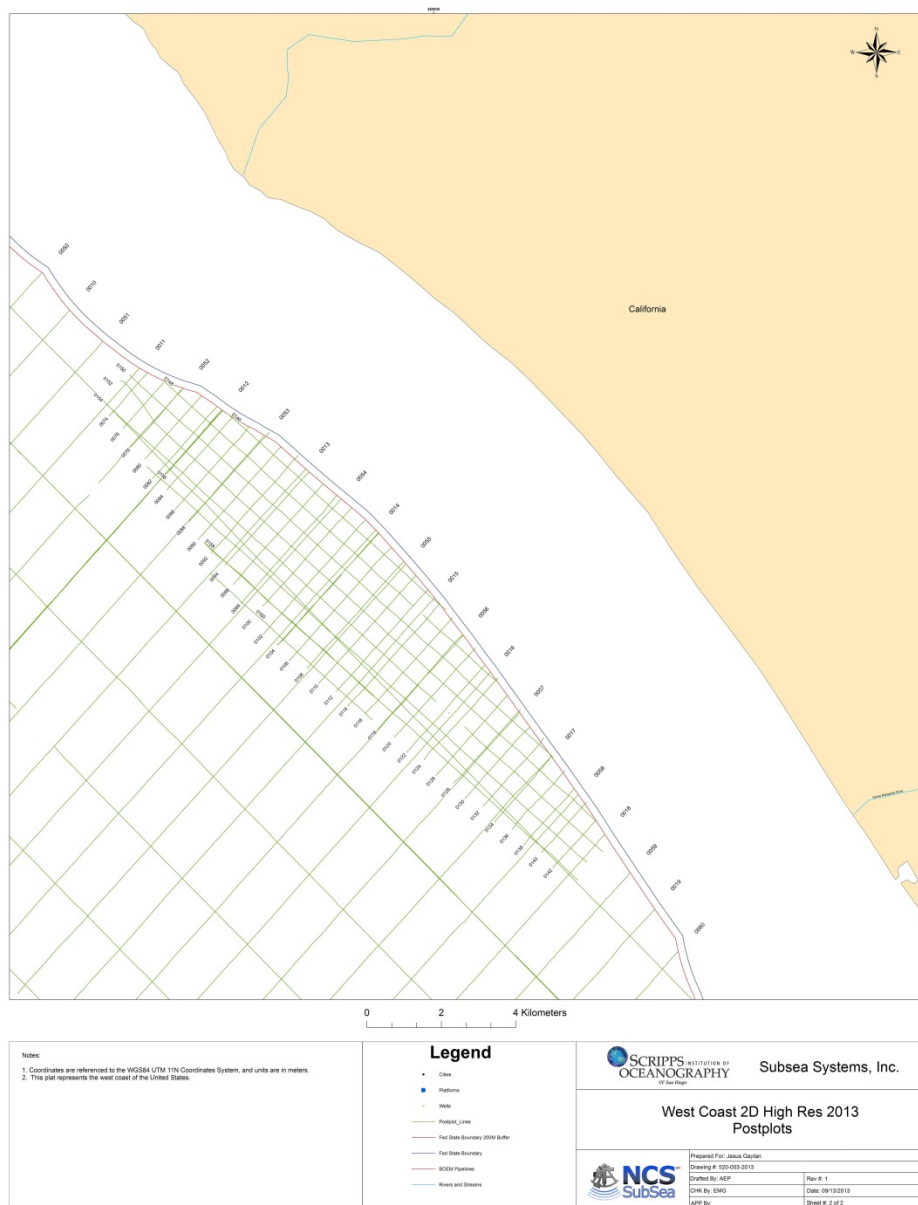


Figure 5. – Postplot map of acquired sequences –3.125m

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APPENDIX B

NCS-Subsea Production Log

SONGS 2-D High Resolution Seismic Survey Offshore Southern California

August - September 2013

SONGS 2D 2013 Daily Production Kilometers											
SEQ:	LINE:	FGSP	LGSP	SPS	INTERVAL:	JD:	DATE:	KILOMETERS:	AREA		
44	0111A	1001	6495	5495	6.25	229	8/17/2013	34.34375	1		
45	0212A	1001	6061	5061	6.25	229	8/17/2013	31.63125	1		
46	0212B	6258	6598	341	6.25	229	8/17/2013	2.13125	1		
47	0113A	1001	6711	5711	6.25	229	8/17/2013	35.69375	1		
48	0214A	1001	6709	5709	6.25	229	8/17/2013	35.68125	1		
49	0115A	1001	1805	805	6.25	229	8/17/2013	5.03125	1	Daily Total:	144.5125
		1806	6746	4941	6.25	230	8/18/2013	30.88125	1		
50	0216A	1001	6639	5639	6.25	230	8/18/2013	35.24375	1		
56	0117A	1001	6107	5107	6.25	230	8/18/2013	31.91875	1		
57	0218A	1375	6496	5122	6.25	230	8/18/2013	32.0125	1		
58	0119A	1001	6454	5454	6.25	230	8/18/2013	34.0875	1		
59	0220A	1001	3284	2284	6.25	230	8/18/2013	14.275	1	Daily Total:	178.41875
		3285	6277	2993	6.25	231	8/19/2013	18.70625	1		
60	0121A	1001	5338	4338	6.25	231	8/19/2013	27.1125	1		
61	0121B	5591	6269	679	6.25	231	8/19/2013	4.24375	1		
62	0222A	1001	6226	5226	6.25	231	8/19/2013	32.6625	1		
63	0123A	1001	6166	5166	6.25	231	8/19/2013	32.2875	1		
64	0224A	1001	6064	5064	6.25	231	8/19/2013	31.65	1		
65	0125A	1001	5988	4988	6.25	231	8/19/2013	31.175	1	Daily Total:	177.8375
66	0226A	1001	5724	4724	6.25	232	8/20/2013	29.525	1		
67	0127A	1001	5134	4134	6.25	232	8/20/2013	25.8375	1		
70	0127B	5217	5586	370	6.25	232	8/20/2013	2.3125	1		
72	0110A	1001	6490	5490	6.25	232	8/20/2013	34.3125	1		
73	0209A	1001	1061	61	6.25	232	8/20/2013	0.38125	1		
74	0209B	1140	6433	5294	6.25	232	8/20/2013	33.0875	1		
75	0108A	1001	5367	4367	6.25	232	8/20/2013	27.29375	1	Daily Total:	152.75
		5368	6526	1159	6.25	233	8/21/2013	7.24375	1		
76	0207A	1001	6484	5484	6.25	233	8/21/2013	34.275	1		
77	0106A	1001	6263	5263	6.25	233	8/21/2013	32.89375	1		
78	0205A	1001	6072	5072	6.25	233	8/21/2013	31.7	1		
80	0104A	1001	6153	5153	6.25	233	8/21/2013	32.20625	1		
81	0203A	1001	6208	5208	6.25	233	8/21/2013	32.55	1		
82	0102A	1001	2137	1137	6.25	233	8/21/2013	7.10625	1	Daily Total:	177.975
		2138	6330	4193	6.25	234	8/22/2013	26.20625	1		
83	0201A	1001	6282	5282	6.25	234	8/22/2013	33.0125	1		
84	0168A	1001	2680	1680	6.25	234	8/22/2013	10.5	1		
85	0128A	1001	6530	5530	6.25	234	8/22/2013	34.5625	1		

SONGS 2D 2013 Daily Production Kilometers											
SEQ:	LINE:	FGSP	LGSP	SPS	INTERVAL:	JD:	DATE:	KILOMETERS:	AREA		
86	0129A	1001	4621	3621	6.25	234	8/22/2013	22.63125	1		
87	0129A	4703	4808	106	6.25	234	8/22/2013	0.6625	1		
88	0129C	4892	4990	99	6.25	234	8/22/2013	0.61875	1		
89	0129D	5104	9038	3935	6.25	234	8/22/2013	24.59375	1		
90	0129E	9293	9532	240	6.25	234	8/22/2013	1.5	1	Daily Total:	154.2875
91	0129A	9681	10736	1056	6.25	235	8/23/2013	6.6	1		
92	0230A	1001	11570	10570	6.25	235	8/23/2013	66.0625	1		
93	0131A	1001	5633	4633	6.25	234	8/22/2013	28.95625	1		
94	0131B	5866	11587	5722	6.25	235	8/23/2013	35.7625	1		
95	0232A	1001	4866	3866	6.25	235	8/23/2013	24.1625	1		
96	0232B	4944	7373	2430	6.25	235	8/23/2013	15.1875	1		
97	0232C	7481	8430	950	6.25	235	8/23/2013	5.9375	1		
98	0232D	8850	8881	32	6.25	235	8/23/2013	0.2	1	Daily Total:	182.86875
		8882	11590	2709	6.25	236	8/24/2013	16.93125	1		
99	0133A	1001	11591	10591	6.25	236	8/24/2013	66.19375	1		
100	0234A	1001	8325	7325	6.25	236	8/24/2013	45.78125	1		
101	0234B	8431	11262	2832	6.25	236	8/24/2013	17.7	1		
102	0135A	1001	8850	7850	6.25	236	8/24/2013	49.0625	1	Daily Total:	195.66875
		8851	11600	2750	6.25	237	8/25/2013	17.1875	1		
103	0236A	1001	11600	10600	6.25	237	8/25/2013	66.25	1		
104	0137A	1001	11602	10602	6.25	237	8/25/2013	66.2625	1		
106	0238A	1001	8770	7770	6.25	237	8/25/2013	48.5625	1	Daily Total:	198.2625
		8771	11607	2837	6.25	238	8/26/2013	17.73125	1		
107	0139A	1001	11608	10608	6.25	238	8/26/2013	66.3	1		
108	0240A	1001	11611	10611	6.25	238	8/26/2013	66.31875	1		
109	0141A	1001	8747	7747	6.25	238	8/26/2013	48.41875	1	Daily Total:	198.76875
		8748	11614	2867	6.25	239	8/27/2013	17.91875	1		
110	2160A	1001	2881	1881	3.125	239	8/27/2013	5.878125	2		
111	1158A	1001	2968	1968	3.125	239	8/27/2013	6.15	2		
112	1158B	1001	5331	4331	3.125	239	8/27/2013	13.534375	2		
113	2156A	1001	6091	5091	3.125	239	8/27/2013	15.909375	2		
114	1154A	1001	4808	3808	3.125	239	8/27/2013	11.9	2		
115	1154B	4947	4962	16	3.125	239	8/27/2013	0.05	2		
116	1154C	5136	5613	478	3.125	239	8/27/2013	1.49375	2		
117	1154C	5696	6737	1042	3.125	239	8/27/2013	3.25625	2		
118	2152A	1001	6582	5582	3.125	239	8/27/2013	17.44375	2		

SONGS 2D 2013 Daily Production Kilometers											
SEQ:	LINE:	FGSP	LGSP	SPS	INTERVAL:	JD:	DATE:	KILOMETERS:	AREA		
119	1150A	1001	5911	4911	3.125	239	8/27/2013	15.346875	2		
120	2148A	1001	1867	867	3.125	239	8/27/2013	2.709375	2		
121	2148B	1984	2701	718	3.125	239	8/27/2013	2.24375	2	Daily Total:	113.834375
		2702	4886	2185	3.125	240	8/28/2013	6.828125	2		
122	1146A	1001	3516	2516	3.125	240	8/28/2013	7.8625	2		
123	1142A	1001	1554	554	3.125	240	8/28/2013	1.73125	2		
124	2140A	1001	1582	582	3.125	240	8/28/2013	1.81875	2		
125	1138A	1001	1652	652	3.125	240	8/28/2013	2.0375	2		
126	2136A	1001	1679	679	3.125	240	8/28/2013	2.121875	2		
127	1134A	1001	1746	746	3.125	240	8/28/2013	2.33125	2		
128	2132A	1001	1789	789	3.125	240	8/28/2013	2.465625	2		
129	1130A	1001	1834	834	3.125	240	8/28/2013	2.60625	2		
130	2128A	1001	1860	860	3.125	240	8/28/2013	2.6875	2		
131	1126A	1001	1923	923	3.125	240	8/28/2013	2.884375	2		
132	2124A	1001	1950	950	3.125	240	8/28/2013	2.96875	2		
133	1122A	1001	2013	1013	3.125	240	8/28/2013	3.165625	2		
134	2120A	1001	2033	1033	3.125	240	8/28/2013	3.228125	2		
135	1118A	1001	2102	1102	3.125	240	8/28/2013	3.44375	2		
136	2116A	1001	2120	1120	3.125	240	8/28/2013	3.5	2		
137	1114A	1001	2183	1183	3.125	240	8/28/2013	3.696875	2		
138	2112A	1001	2176	1176	3.125	240	8/28/2013	3.675	2		
139	1110A	1001	2251	1251	3.125	240	8/28/2013	3.909375	2		
140	2108A	1001	2240	1240	3.125	240	8/28/2013	3.875	2		
141	1106A	1001	2318	1318	3.125	240	8/28/2013	4.11875	2		
142	2104A	1001	1816	816	3.125	240	8/28/2013	2.55	2		
143	2104B	1977	2297	321	3.125	240	8/28/2013	1.003125	2		
144	1102A	1001	2326	1326	3.125	240	8/28/2013	4.14375	2		
145	2100A	1104	2244	1141	3.125	240	8/28/2013	3.565625	2		
146	1198A	1001	2244	1244	3.125	240	8/28/2013	3.8875	2		
147	2096A	1001	2159	1159	3.125	240	8/28/2013	3.621875	2		
148	1094A	1001	2084	1084	3.125	240	8/28/2013	3.3875	2		
150	2092B	1001	2125	1125	3.125	240	8/28/2013	3.515625	2		
151	1090A	1001	2087	1087	3.125	240	8/28/2013	3.396875	2		
152	2088A	1001	2032	1032	3.125	240	8/28/2013	3.225	2		
153	1086A	1001	1959	959	3.125	240	8/28/2013	2.996875	2		
154	2084A	1001	1889	889	3.125	240	8/28/2013	2.778125	2		

SONGS 2D 2013 Daily Production Kilometers											
SEQ:	LINE:	FGSP	LGSP	SPS	INTERVAL:	JD:	DATE:	KILOMETERS:	AREA		
155	1082A	1001	1831	831	3.125	240	8/28/2013	2.596875	2		
		1001	1030	30	3.125	240	8/28/2013	0.09375	2	Daily Total:	111.71875
156	2080A	1031	1730	700	3.125	241	8/29/2013	2.1875	2		
157	1078A	1001	1680	680	3.125	241	8/29/2013	2.125	2		
158	2076A	1001	1522	522	3.125	241	8/29/2013	1.63125	2		
159	1074A	1001	1501	501	3.125	241	8/29/2013	1.565625	2		
160	2104C	1001	2297	1297	3.125	241	8/29/2013	4.053125	2		
161	0112A	1001	5933	4933	3.125	241	8/29/2013	15.415625	2		
162	0212C	3991	6598	2608	6.25	241	8/29/2013	16.3	1		
163	0150A	1001	3311	2311	6.25	241	8/29/2013	14.44375	1		
164	0251A	1001	1160	160	6.25	241	8/29/2013	1	1		
165	0251A (B)	1254	3234	1981	6.25	241	8/29/2013	12.38125	1		
166	0152A	1009	1545	537	6.25	241	8/29/2013	3.35625	1		
167	0152B	1611	3393	1783	6.25	241	8/29/2013	11.14375	1		
168	0253A	1001	3446	2446	6.25	241	8/29/2013	15.2875	1		
169	0154A	1001	3547	2547	6.25	241	8/29/2013	15.91875	1		
		1001	3297	2297	6.25	241	8/29/2013	14.35625	1	Daily Total:	131.165625
170	0255A	3298	3491	194	6.25	242	8/30/2013	1.2125	1		
171	0156A	1001	3514	2514	6.25	242	8/30/2013	15.7125	1		
172	0257A	1001	3391	2391	6.25	242	8/30/2013	14.94375	1		
173	0158A	1002	3381	2380	6.25	242	8/30/2013	14.875	1		
174	0259A	1001	4046	3046	6.25	242	8/30/2013	19.0375	1		
175	0160A	1001	4017	3017	6.25	242	8/30/2013	18.85625	1		
176	0261A	1001	3805	2805	6.25	242	8/30/2013	17.53125	1		
177	0162A	1001	1147	147	6.25	242	8/30/2013	0.91875	1		
178	0162B	1213	3896	2684	6.25	242	8/30/2013	16.775	1		
179	0263A	1017	3785	2769	6.25	242	8/30/2013	17.30625	1		
180	0164A	1001	1370	370	6.25	242	8/30/2013	2.3125	1		
		1001	2923	1923	6.25	242	8/30/2013	12.01875	1	Daily Total:	151.5
181	0164B	2924	3770	847	6.25	243	8/31/2013	5.29375	1		
182	0265A	1001	3587	2587	6.25	243	8/31/2013	16.16875	1		
183	0166A	1001	3483	2483	6.25	243	8/31/2013	15.51875	1		
184	0267A	1001	3209	2209	6.25	243	8/31/2013	13.80625	1		
185	1161A	1001	5341	4341	6.25	243	8/31/2013	27.13125	1		
186	2162A	1001	5105	4105	6.25	243	8/31/2013	25.65625	1		
187	1163A	1001	3447	2447	6.25	243	8/31/2013	15.29375	1		


SONGS 2D 2013 Daily Production Kilometers											
SEQ:	LINE:	FGSP	LGSP	SPS	INTERVAL:	JD:	DATE:	KILOMETERS:	AREA		
188	1163B	3559	4883	1325	6.25	243	8/31/2013	8.28125	1		
189	2164A	1001	4514	3514	6.25	243	8/31/2013	21.9625	1		
190	1165A	1001	4252	3252	6.25	243	8/31/2013	20.325	1		
191	2170A	1001	1263	263	6.25	243	8/31/2013	1.64375	1	Daily Total:	171.08125
		1264	3379	2116	6.25	244	9/1/2013	13.225	1		
193	1169A	1017	3377	2361	6.25	244	9/1/2013	14.75625	1		
194	2168A	1001	3379	2379	6.25	244	9/1/2013	14.86875	1		
195	1167A	1001	3319	2319	6.25	244	9/1/2013	14.49375	1		
196	2166A	1001	2609	1609	6.25	244	9/1/2013	10.05625	1	Daily Total:	67.4
									Sail Line KMs		
									2508.05		

APPENDIX C

NCS-Subsea Mobilization Report

SONGS 2-D High Resolution Seismic Survey Offshore Southern California

August - September 2013


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Mobilization Report – R/V New Horizon

San Diego, CA – August 2013


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1 Introduction

On August 13, 2012 NCS-Subsea Inc. (NCS), under contract with Subsea Systems Inc, began work pertinent to the mobilization of the current SONG 2D High Resolution survey. The mobilization was done in conjunction with Subsea Systems (geophysical equipment) at the Nimitz Marine facility in San Diego, California. This report details the equipment and personnel mobilization that occurred prior to the commencement of survey operations. Calibration and verification results are also presented.

2 Mobilization Timeline

12-Aug-2013 – Matt Grey, Chris Blakeway, and Jesus Gaytan arrive San Diego, CA. Equipment arrives Nimitz facility.

13-Aug-2013 – Mobilization starts onboard. Monuments established and data logged. Antennas mounted, machines and racks placed.


14-Aug -2013 – Mobilization continues. Heading Sensor calibrations and DGPS (Differential Global Positioning System) verifications. Bridge PC mounted and working, echosounder interfaced and working on autopilot interface. Nearby parks scouted for open area for compass calibrations and verifications. Best option found to be in Shelter Island.

15-Aug-2013 – Mobilization continues. Vessel DGPS verifications redone. AutoPilot interface complete and tested. Setup and perform compass calibrations and verification at Shelter Island park. Micah Hall, Matt Christie, and Parker Williams arrive and sign-on to vessel. Mobilization complete.

16-Aug-2013 – Vessel departs San Diego Harbor for survey area.

21-Aug-2013 – Between production sequences 78 and 80, systems timing test conducted.

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3 Field and Professional Personnel

Table 1 - Survey personnel.

Name	Position	Company
Matt Grey	Chief Navigator	NCS SubSea
Micah Hall	Navigator	NCS SubSea
Matt Christie	Navigator	NCS SubSea
Chris Blakeway	Nav Processor	NCS SubSea
Parker Williams	Nav Processor	NCS SubSea
Jesus Gaytan	Commissioning Engineer	NCS SubSea

4 System Information


4.1 NavPoint Integrated Navigation System

The NavPoint integrated navigation system is used to provide positioning for the survey vessel and 2D seismic equipment. This system consisted of both online and offline components. The online components are the NavPoint Main, Longliner, Survey Display, and Logging programs. The offline components are the FGPS SeisPos and FGPS P1Tools programs, used for processing and QC of the final data sets.

4.1.1 NavPoint Main

The NavPoint Main program is used to provide real-time positions for the survey vessel, energy source, and streamer. This system receives data inputs from the various GPS (Global Positioning System) units, heading sensors, and echosounder. Position data is transformed into the survey datum and used to calculate projected coordinates for the survey nodes. This program also records the relevant survey information into UKOOA (United Kingdom Offshore Operators Association) P1/90 and P2/94 formats. An additional interface to the vessel's autopilot allows

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the online surveyor to steer the vessel along the survey line to ensure that adequate cross line distances are achieved.

4.1.2 NavPoint Longliner

The NavPoint Longliner program is used to calculate a position solution for each receiver group in the streamer. Information from digital compasses and depth sensors attached to the streamer are received by the Longliner program and used as inputs to the positioning calculation. The program uses a traverse method to model the streamer for each shotpoint (single compass mode). After determining the coordinates for the streamer towpoint on the vessel, the program then calculates a position for each seismic receiver group. The streamer position information and raw sensor data are then transmitted to the Main program for further use by the NavPoint system.


4.1.3 NavPoint Survey Display

The NavPoint Survey Display program is used to display the horizontal position of the survey vessel, source, and streamer during survey operations. This program also provides survey line functionality, line steering QC (Quality Control) displays, and other plotting and visualization functions. Preplotted survey files in UKOOA P1/90 format are loaded into the Survey Display and used as steering references. The Survey Display is run in slave mode in the wheelhouse and at the observer station.

4.1.4 NavPoint Logging

The NavPoint Logging program runs in support of the Main program. This program receives UKOOA formatted data from the Main program and stores those data in an SQL database. At the completion of the survey line, the Logging program retrieves the data and creates the P1/90 and P2/94 data files for that survey line.

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4.1.5 FGPS SeisPos

The FGPS SeisPos program is used to QC, edit, and process the data stored in the UKOOA P2/94 files into the final P1/90 files delivered to the client. This program provides a variety of graphical displays for use by the processor to analyze the survey data. A number of editing tools are available to remove erroneous sensor information and noise from the sensor signals. After the raw data are edited, the program uses the survey geodetic transformations to calculate new coordinates for each survey node at each shotpoint time.

4.1.6 FGPS P1 Tools

The FGPS P1Tools program is used to perform QC of the final P1/90 files prior to delivery. This program provides graphic and tabular analysis of the P1/90 files including format integrity checks, offset analysis, positioning trends, raw versus processed file comparison, and replay.


4.2 Vessel Positioning Hardware

The survey vessel is positioned using differentially-corrected GPS data. A Trimble SPS361 GPS receiver was used as the primary GPS system. A separate Trimble SPS361 GPS receiver was used as the secondary GPS system. The Trimble systems also provide true heading data. All position and heading data from the systems are logged in the P2/94 raw data files. WAAS (Wide Area Augmentation System) differential corrections were utilized during this survey, station 133 for primary and 138 for secondary.

4.3 Source Positioning Hardware

Source positioning is accomplished via SubSea Systems proprietary DGPS units. The units are configured to receive WAAS corrections for this survey and transmit data wirelessly via a 2.4GhZ network. Alternatively, an NCS proprietary SourcePoint DGPS pod is provided, also configured to receive WAAS corrections. With SourcePoint, data is transmitted back to the

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vessel via hardwire through the source umbilical string. The SourcePoint unit is towed atop an A6 buoy in a custom fitted “tophat” cradle (Figure 1). SubSea Systems units are mounted atop the F4 buoys used to float the source (Figure 2).




Figure 1 – SourcePoint positioning system.



Figure 2 – SubSea Systems DGPS unit.

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5 Offset Diagrams

5.1 R/V New Horizon

New Horizon vessel offsets were measured using a tape measure to all relevant survey instruments and offset positions on the vessel. The origin for all offset measurements was the Navigation Reference Point, which was located at the center of the stern at the waterline. Offset measurements are presented in tabular and graphical format in Appendix A.

5.2 Streamer

Streamer offsets, including the tow line extension piece, were measured on the deck prior to deployment of the system. Measurements to the compass and tow line were made relative to the center of the first receiver group. These results are presented in tabular and graphical format in Appendix A.

5.3 Source

Source offsets, including the source umbilical, were measured on the deck prior to deployment of the systems. These results are presented in tabular and graphical format in Appendix A.

6 Calibrations and Verifications

6.1 Geodetic Datum

The following datum (Table 2) will be used during the acquisition of this survey. All navigation systems, preplots, and data logging will be set to utilize this datum.

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Table 2 - Survey datum parameters.

PARAMETER	VALUE
GEODETIC DATUM	WGS84
PROJECTION	UTM
ZONE	ZONE 11 NORTH
UNITS	METERS

6.2 DGPS Verification

Verifications were performed on all DGPS units to verify that their positioning systems were functioning properly. The check compared the DGPS antenna position to that of an independently verified monument. For the in water DGPS units, this was accomplished by placing the antenna directly over the established monument position and logging data for a minimum of 15 minutes. For the onboard DGPS units, a Sokkia Total station was used to shift the monument position to the antenna position while the units were logging (Figure 3). Two GPS monuments were established quayside at the Nimitz facility using a dual frequency C-Nav 2050R GPS receiver. SD1 (occupied) and SD2 (backsight) were surveyed on 13 August 2013 (Figures 4-7). Raw GPS data collected at the site were converted to RINEX format and sent to the Online Positioning User Service (OPUS) of the National Geodetic Survey for post-processing. The OPUS results are presented in Appendix B. All DGPS units were within acceptable tolerances for units utilizing WAAS differential corrections. Graphical representations of the verification results are presented in Appendix B.

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Figure 3 - Total Station over Monument SD1.



Figure 4 – Monument SD1.

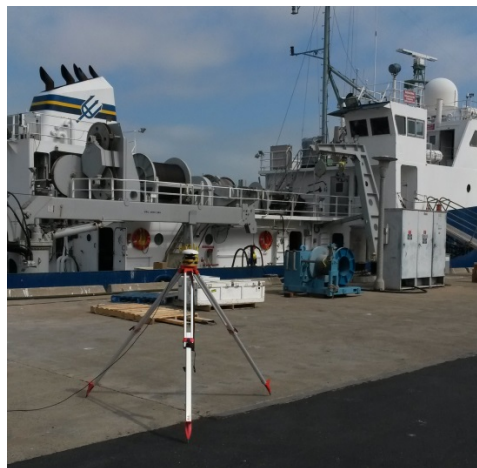


Figure 5 – C-Nav over SD1.

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Approved by	Jesus Gaytan	Issue Date	30 August 2013
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Figure 6 – Monument SD2.




Figure 7 – C-Nav over SD2.

Table 3 - GPS monument position.

Monument	Latitude	Longitude
SD1 (Occupied)	32° 42' 26.52473" N	117° 14' 12.91821" W
SD2 (Backsight)	32° 42' 24.74042" N	117° 14' 13.28614" W

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Approved by	Jesus Gaytan	Issue Date	30 August 2013
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6.3 Gyro Calibration

A gyro (gyrocompass) calibration was conducted onboard the New Horizon on 14 August 2013. The calibration was used to determine a calculated minus observed (C-O) value for each of the Trimble SPS 361 heading sensors installed. To accomplish this, a third Trimble, model SPS461 GPS heading sensor, was set out on a long baseline across the stern of the vessel. Heading data from the Trimble systems were interfaced to the NavPoint navigation system and the Vessel Gyro Calibration routine was used to log heading data from all three heading sensors. Data were recorded at 1 second intervals for 20 minutes (Figures 8-9). Following the sample period, the data were entered into a spreadsheet program and reduced to calculate the C-O value for the Trimble SPS 461 heading sensor (Table 4). The C-O value was then entered into the NavPoint Main utility running on the vessel.

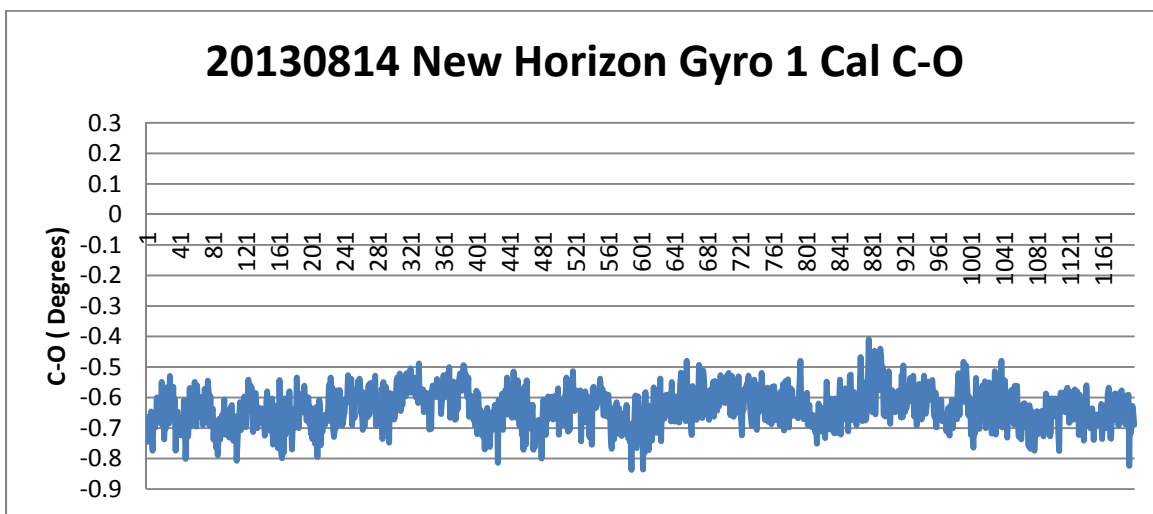



Figure 8 - Graph of C-O values calculated for the Trimble SPS 361 primary heading sensor.

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Approved by	Jesus Gaytan	Issue Date	30 August 2013
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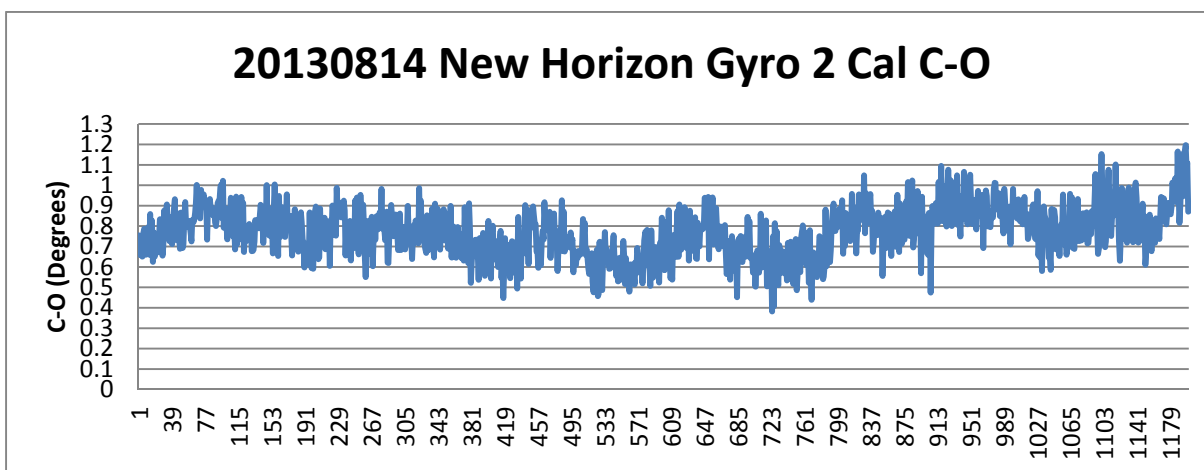


Figure 9 - Graph of C-O values calculated for the Trimble SPS 361 secondary heading sensor.

Table 4. - C-O statistics calculated for the SPS 361 heading sensor.


Heading Sensor	Calculated C-O	St. Dev.
Trimble SPS 461 Primary	-0.63°	0.06°
Trimble SPS 361 Secondary	0.77°	0.12°

6.4 Tail Compass Calibration and Verification

6.4.1 Sparton Tail Compass Calibration

A 3D calibration of the Sparton tail compasses was accomplished by following NCS procedure *QP-010CAL-035-003 P-Cable Compass (SP3004D) Calibration Procedure*. These calibrations and verifications were conducted on 15 August 2013 in a park at Shelter Island, San Diego, California. Using a Trimble SPS 461, a pair of baselines was established running exactly North-South and East-West (Figure 10). Each compass was oriented to point north at the intersection of the NS and EW running baselines. While in this general orientation, the compass was pitched

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a full 360° and back over a period of no less than 10 seconds. The compass was then rotated 90° (to point East). While in this general orientation, the compass was rolled a full 360°. The above stated process was carried out in sequence twice in its entirety: once while the compass was set to manual calibration mode; and once while the compass was set to automatic calibration mode. Compass calibration results are presented in Table 5. All 3 compasses calibrated produced an acceptable adaption error.

Table 5. – Compass calibration results.

IP Address	Compass S/N	Calibration Adaption Error	UTC Date Calibrated
<i>Tail Compass Assembly</i>			
192.168.1.241	241	4	16-Aug-13
192.168.1.243	243	2	16-Aug-13
192.168.1.244	244	1	16-Aug-13

6.4.2 Compass Verifications

In order to verify the calibration, a third baseline at 30° was made (Figure 10) and data logged for 15 minutes (Figure 11). The straight (forward) edge of each compass was oriented exactly along the calibration baseline such that the compass was pointing at an exactly known azimuth (Figure 12). Data were logged for each compass for 10 minutes while along this controlled azimuth. These data were compared to the known azimuth direction, after adding the magnetic declination for the area (Figure 13), and an average C-O was generated. Compasses were not accepted if the average C-O value was greater than 3°. Verification results are presented in Table 6, and full graphical representations of the verification data for each compass are presented in Appendix C.

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Approved by	Jesus Gaytan	Issue Date	30 August 2013
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Figure 10. – Aerial view of baselines established for compass calibrations and verifications.

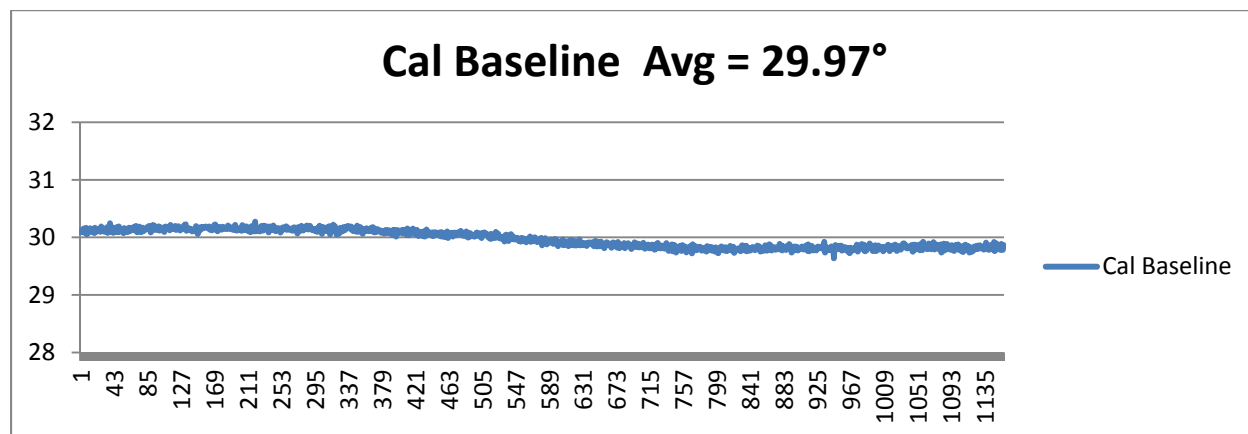


Figure 11 – Compass calibration baseline.

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Figure 12 – Tail compass on calibration baseline.

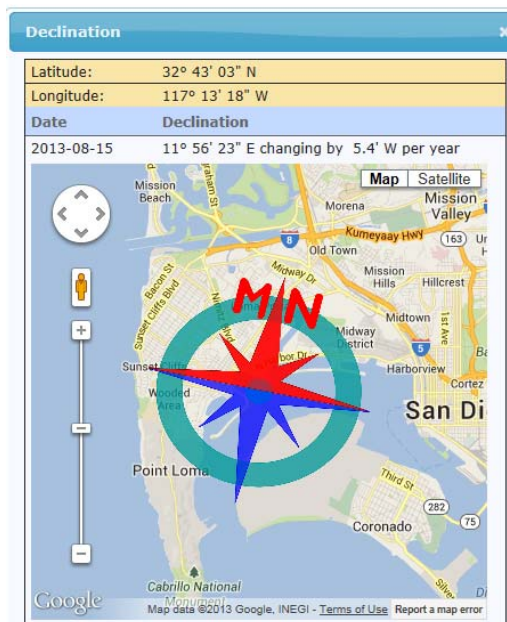


Figure 13 – Shelter Island, San Diego, CA magnetic declination

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Table 6. – Compass verification results.

IP Address	Compass S/N	UTC Date Verified	UTC Start Verification n	UTC End Verification	Avg · C-O	StDe v
<i>Tail Compass Assembly</i>						
192.168.1.24 1	241	16-Aug-13	03:40	03:51	0.93	0.05
192.168.1.24 3	243	16-Aug-13	03:24	03:35	- 1.12	0.08
192.168.1.24 4	244	16-Aug-13	03:56	04:06	2.16	0.05

6.5 Echosounder Draft Verification

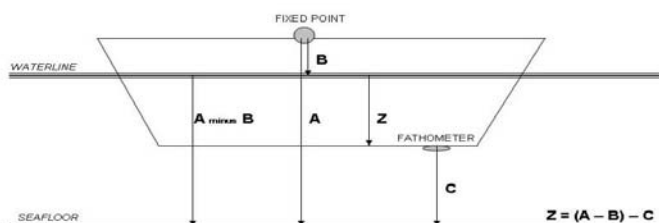
Lead-line checks were conducted for the vessel to verify the actual draft of the echosounder transducer. Water depths were measured using a tape measure with a weight attached to the end. These measurements were compared to echosounder readings taken during the same time as the lead-line measurements (Figure 14). The difference between the two readings should be equal to the draft of the echosounder transducer. However, due to a significant slope of the water bottom (greater than 1.5m difference), the lead-line draft will not be used. ResTech employees confirmed the Captain calculations of 3.0m draft, which is what was put into the system. This is close to the lead-line measurement on the starboard side.

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Approved by	Jesus Gaytan	Issue Date	30 August 2013
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Date	16 August 2013
Client	SCRIPPS/Subsea Systems
Crew	NCS 1127
Prospect	SONGS 2D Hi Res 2013
Vessel	RV New Horizon
Location of Test	Dockside, Nimitz, San Diego, CA, USA
Description of fixed points	Both vessel edges, 90 ° to echosounder Y axis
Units used	meters
Water velocity used	1500 m/sec
Draft Correction Value	3.0 m



	Starboard	Port	Average
Measured Water Depth (A)	7.15	8.74	7.95
Waterline (B)	2.17	2.1	2.135
Echosounder Reading (C)	2.03	2.03	2.03
Draft Correction Value (Z) *	2.95	4.61	3.78
Mean from hull draft marks	--	--	--


Test Performed by NCS SubSea navigators on rotation: Blakeway, Hall, Christie

Note:

Due to high slope of bottom, 3.0m used as draft on system based on ResTech and Captain advise.

Figure 14 – Lead-line draft verification

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Approved by	Jesus Gaytan	Issue Date	30 August 2013
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6.6 Systems Timing Verification

A full system timing verification was conducted on 21 August 2013, during a line change between production sequences 78 and 80. A test line was set up in the NavPoint system so that everything was running as if in production. BNC splitters were installed and run to a PicoScope PC Oscilloscope between the navigation trigger pulse to recorder system start (Ch.A,Blue), and recorder to source system start (Ch. B,Red). Multiple triggers were checked to verify timing consistency. As desired, there was zero delay between the triggers. Figures 15 and 16 (below) show captures of the timing as displayed in the PicoScope. A timing diagram can be found in Appendix A.

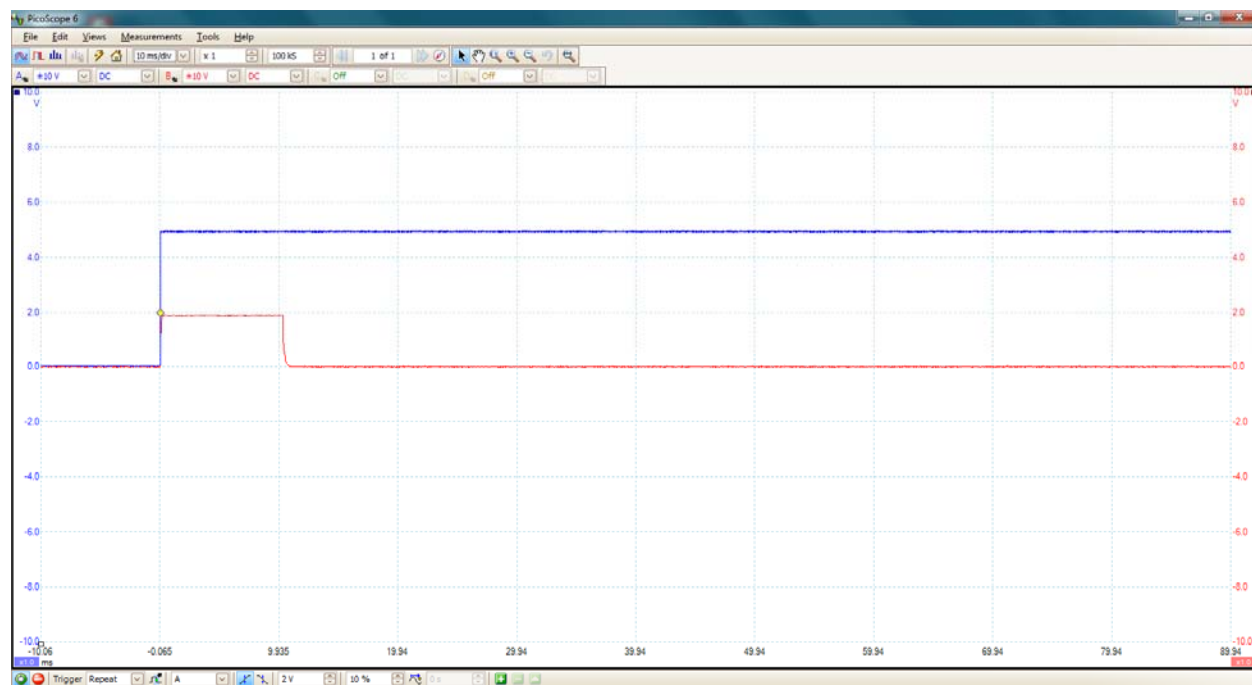



Figure 15 – Timing test capture, zoom out.

Reviewed by	Brian Brookshire	Issue Number	1
Approved by	Jesus Gaytan	Issue Date	30 August 2013
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<p>JOB DOCUMENTS</p>	<p>J00520-JD-001-001</p> <p>Mobilization Report –</p> <p>SONGS 2D Hi Res 2013</p>	
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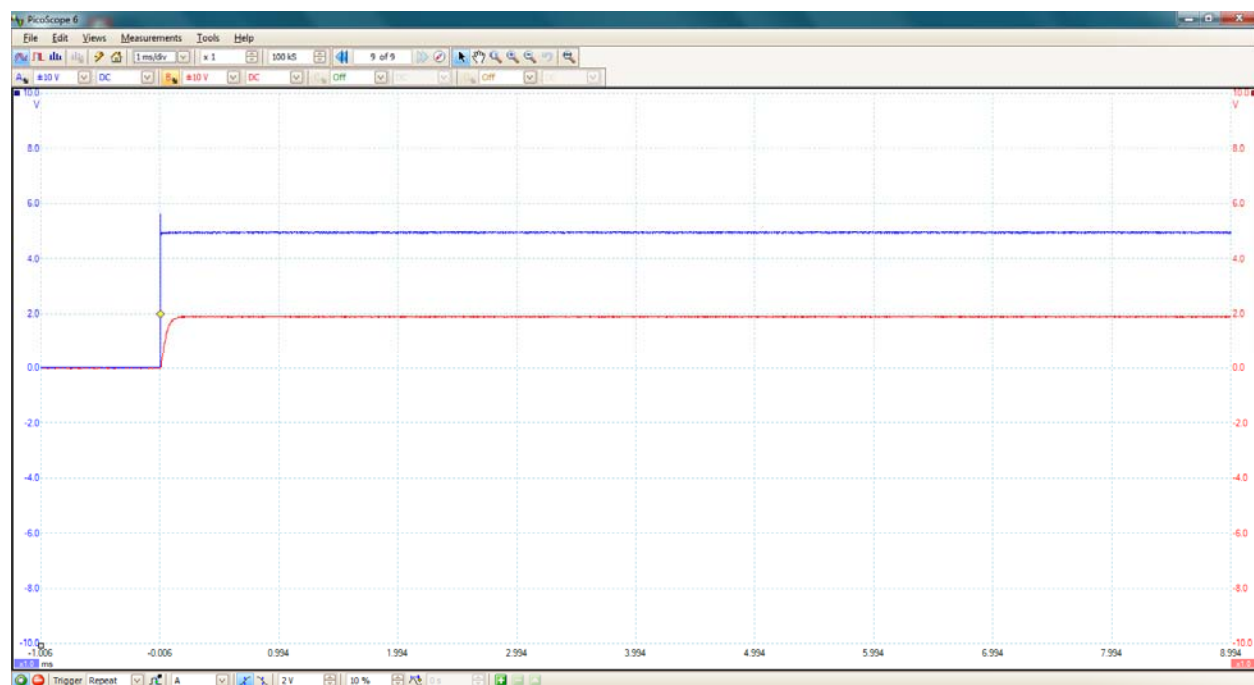


Figure 16 – Timing test capture, zoom in

Reviewed by	Brian Brookshire	Issue Number	1
Approved by	Jesus Gaytan	Issue Date	30 August 2013
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7 Appendix A: New Horizon Offsets and Diagrams

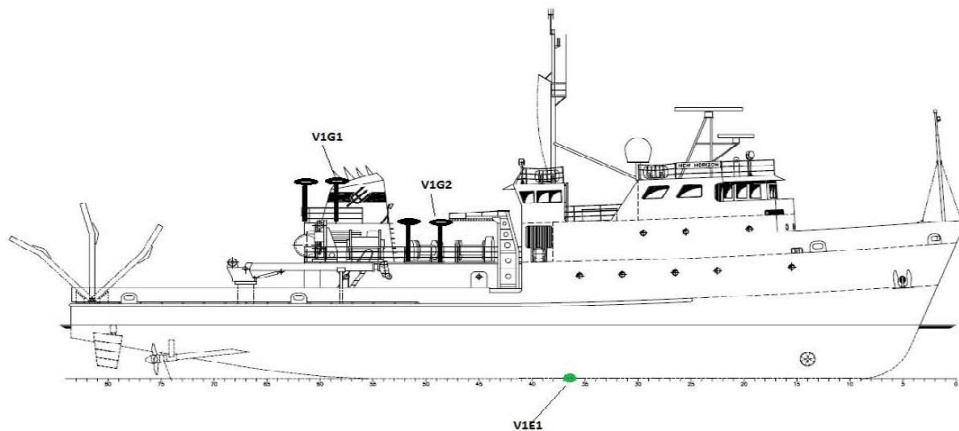
Vessel : R/V New Horizon
 Client : Subsea Systems/SCRIPPS
 Project : 2D Hi Res SONGS
 Area : Southern California
 Start Date : 16 August 2013



Vessel Sensor Offsets
 Towing Offsets
 Towing Configuration
 Compass Offsets
 Timing
 Revision History



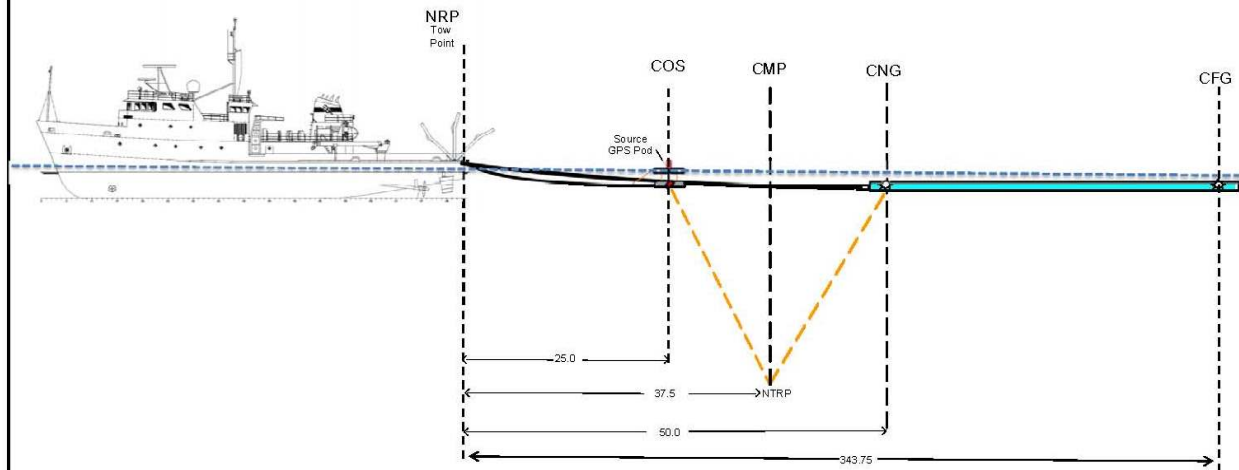
R/V New Horizon - Vessel Sensor Offsets



All measurements in meters

		STBD/PORT (X)	FORE/AFT (Y)	UP/DOWN (Z)
NRP	NAVIGATION REFERENCE POINT (Stern Center, waterline)	0.00	0.00	0.00
V1G1, V1GY1	Trimble SPS 361 - Primary	-2.34	16.07	8.35
V1G2, V1GY2	Trimble SPS 361 - Secondary	2.80	20.29	5.65
V1E1	Knudsen 3260 12KHz	0.60	29.00	-3.00

R/V New Horizon - Towing Offsets

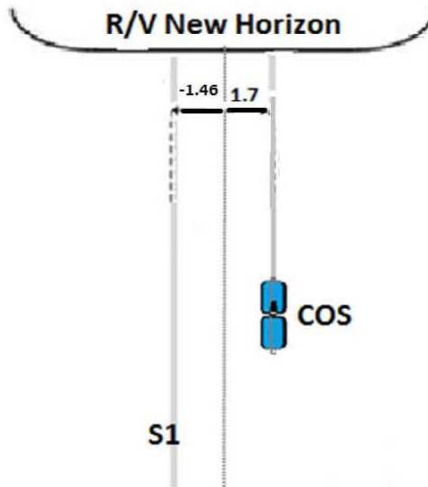


Principal Distances		Principal Offsets		Used as	Acronyms	
NRP-Stem	0.00	COS-CNG	25.00	Calculated	NRP	Near Reference Point (centre of mast at sea level)
Stem-COS	25.00	NRP-NTRP	37.50	Offset from NRP	COS	Centre of Source
Stem-CNG	50.00	NRP-CNG	75.00	Layback	CNG	Centre of Near Group (Trace #001)
Stem-CFG	343.75				CMP	Common Mid-Point
					NTRP	Near Trace Reflection Point
					CFG	Center of Far Group (Trace #004)

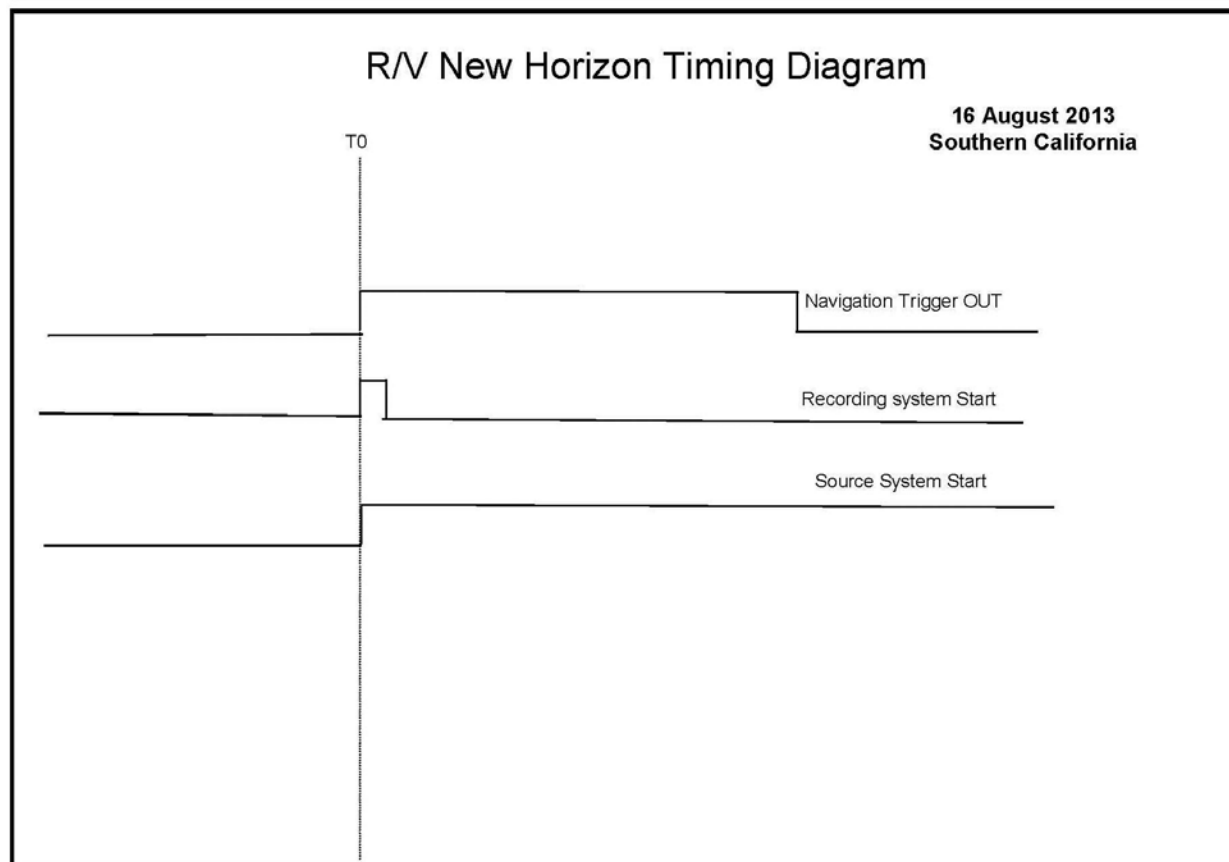
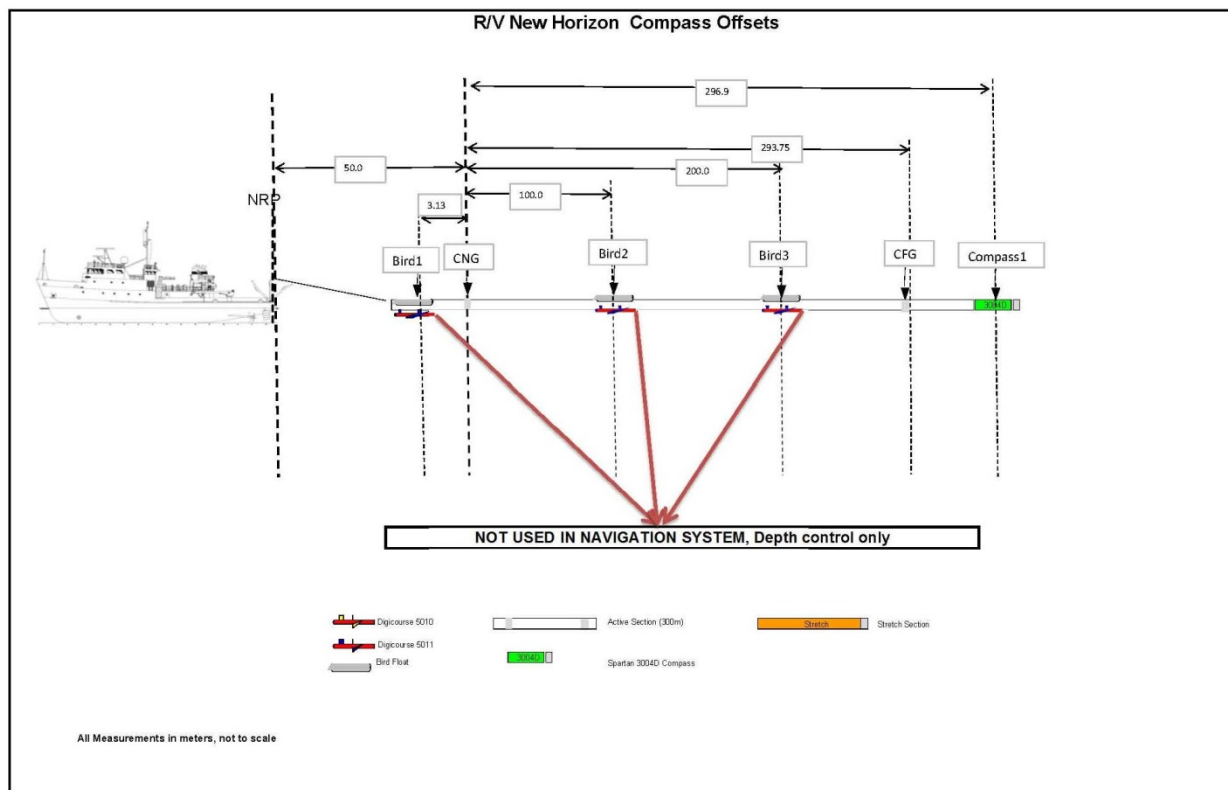
All measurements in meters

R/V New Horizon - Towing Configuration

Object	From NRP		
	X	Y	Z
S1 TowPoint	-1.46	0.00	1.10
COS TowPoint	1.70	0.00	1.10
COS Nominal	1.70	-25.00	-2.00
CMP Nominal	0.12	-37.50	-2.00
CNG Nominal	-1.46	-50.00	-2.00



All measurements in meters



Revision	Date Applied	Seq applied	Changes made
rev0	16-Aug-13	Seq044 onward	original configuration

8 Appendix B: OPUS Results and DGPS Verification Plots

FILE: SD1.bin OP1377619900431

1009 WARNING! No antenna type was selected. No antenna offsets or
1009 pattern will be applied. Coordinates with reduced accuracy
1009 will be returned for the antenna phase center.
1009

NGS OPUS SOLUTION REPORT =====

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.isp#accuracy>

USER: jesus.gaytan@ncs-subsea.com DATE: August 27, 2013
RINEX FILE: sd1_225s.13o TIME: 16:12:49 UTC

SOFTWARE: page5 1209.04 master42.pl 072313 START: 2013/08/13 18:12:00
EPHEMERIS: igr17532.eph [rapid] STOP: 2013/08/13 22:52:00
NAV FILE: brdc2250.13n OBS USED: 10090 / 10932 : 92%
ANT NAME: NONE NONE # FIXED AMB: 70 / 73 : 96%
ARP HEIGHT: 1.44 OVERALL RMS: 0.015(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2013.6160)

X: -2458631.790(m) 0.004(m)	-2458632.667(m) 0.004(m)
Y: -4776409.824(m) 0.007(m)	-4776408.379(m) 0.007(m)
Z: 3426678.066(m) 0.008(m)	3426678.040(m) 0.008(m)

LAT: 32 42 26.50994 0.005(m)	32 42 26.52473 0.005(m)
E LON: 242 45 47.13712 0.001(m)	242 45 47.08179 0.001(m)
W LON: 117 14 12.86288 0.001(m)	117 14 12.91821 0.001(m)
EL HGT: -32.262(m) 0.009(m)	-33.019(m) 0.009(m)
ORTHO HGT: 3.076(m) 0.027(m)	[NAVD88 (Computed using GEOID12A)]

	UTM COORDINATES	STATE PLANE COORDINATES
	UTM (Zone 11)	SPC (0406 CA 6)
Northing (Y) [meters]	3618870.839	560403.026
Easting (X) [meters]	477796.400	1907467.299
Convergence [degrees]	-0.12801251	-0.54232239
Point Scale	0.99960608	1.00001351
Combined Factor	0.99961114	1.00001858

US NATIONAL GRID DESIGNATOR: 11SMS779618870(NAD 83)

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DH4102	P472 CAMPELLIOTCS2004 CORS ARP	N325321.139	W1170616.854	23666.6
DM7581	SIO5 SCRIPPS 5-MT SOLE CORS ARP	N325026.632	W1171458.834	14840.6
DG8350	P478 VALLEYCNTRCS2004 CORS ARP	N331408.560	W1170417.677	60602.6

NEAREST NGS PUBLISHED CONTROL POINT			
DC0821	J 722	N324228.	W1171421. 216.7

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

FILE: SD2_2250.130 OP1377619929084

1009 WARNING! No antenna type was selected. No antenna offsets or
1009 pattern will be applied. Coordinates with reduced accuracy
1009 will be returned for the antenna phase center.
1009

NGS OPUS SOLUTION REPORT
=====

All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: jesus.gaytan@ncs-subsea.com DATE: August 27, 2013
RINEX FILE: sd2_226a.13o TIME: 16:18:23 UTC

SOFTWARE: page5 1209.04 master13.pl 072313 START: 2013/08/14 00:00:00
EPHEMERIS: igr17533.eph [rapid] STOP: 2013/08/14 02:36:00
NAV FILE: brdc2260.13n OBS USED: 4913 / 5145 : 95%
ANT NAME: NONE NONE # FIXED AMB: 31 / 33 : 94%
ARP HEIGHT: 1.53 OVERALL RMS: 0.014(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2013.6166)

X: -2458653.963(m) 0.025(m) -2458654.840(m) 0.025(m)
Y: -4776431.962(m) 0.035(m) -4776430.517(m) 0.035(m)
Z: 3426631.899(m) 0.027(m) 3426631.873(m) 0.027(m)

LAT: 32 42 24.72563 0.008(m) 32 42 24.74042 0.008(m)
E LON: 242 45 46.76919 0.007(m) 242 45 46.71386 0.007(m)
W LON: 117 14 13.23081 0.007(m) 117 14 13.28614 0.007(m)
EL HGT: -32.106(m) 0.050(m) -32.864(m) 0.050(m)
ORTHO HGT: 3.234(m) 0.088(m) [NAVD88 (Computed using GEOID12A)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (0406 CA 6)
Northing (Y) [meters] 3618815.916 560348.152
Easting (X) [meters] 477786.699 1907457.197
Convergence [degrees] -0.12806601 -0.54237855
Point Scale 0.99960608 1.00001360
Combined Factor 0.99961112 1.00001864

US NATIONAL GRID DESIGNATOR: 11SMS778618815(NAD 83)

BASE STATIONS USED
PID DESIGNATION LATITUDE LONGITUDE DISTANCE(m)
UCLP 188127.2
DN5628 CRHS CRHS_SCGN_CS1999 CORS ARP N334924.603 W1181621.910 156997.3
AF9714 TORP TORRANCE AIRPORT CORS ARP N334752.061 W1181950.125 158184.1

NEAREST NGS PUBLISHED CONTROL POINT
AE8655 SHELTER ISLAND WEST END LIGHT2 N324228.281 W1171406.174 214.0

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

DGPS Verification Report

SourceOEM_2.135



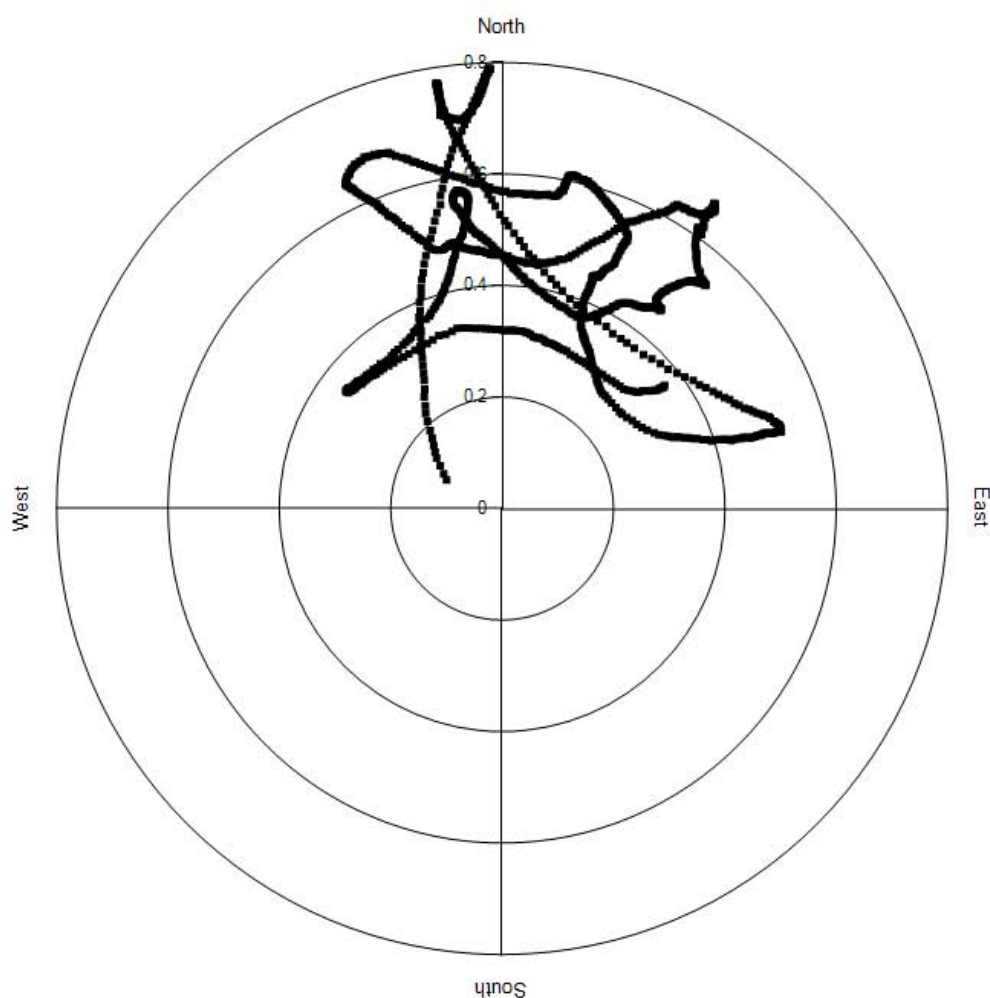
Survey: J0520

Client: SIO/Subsea Systems

Vessel: RV New Horizon

Avg. Error: 0.50 m

St. Dev.: 0.14 m



Report Issued: 08/15/2013 13:00:28

Surveyor: J. Gaytan

DGPS Verification Report

SourcePoint 001759



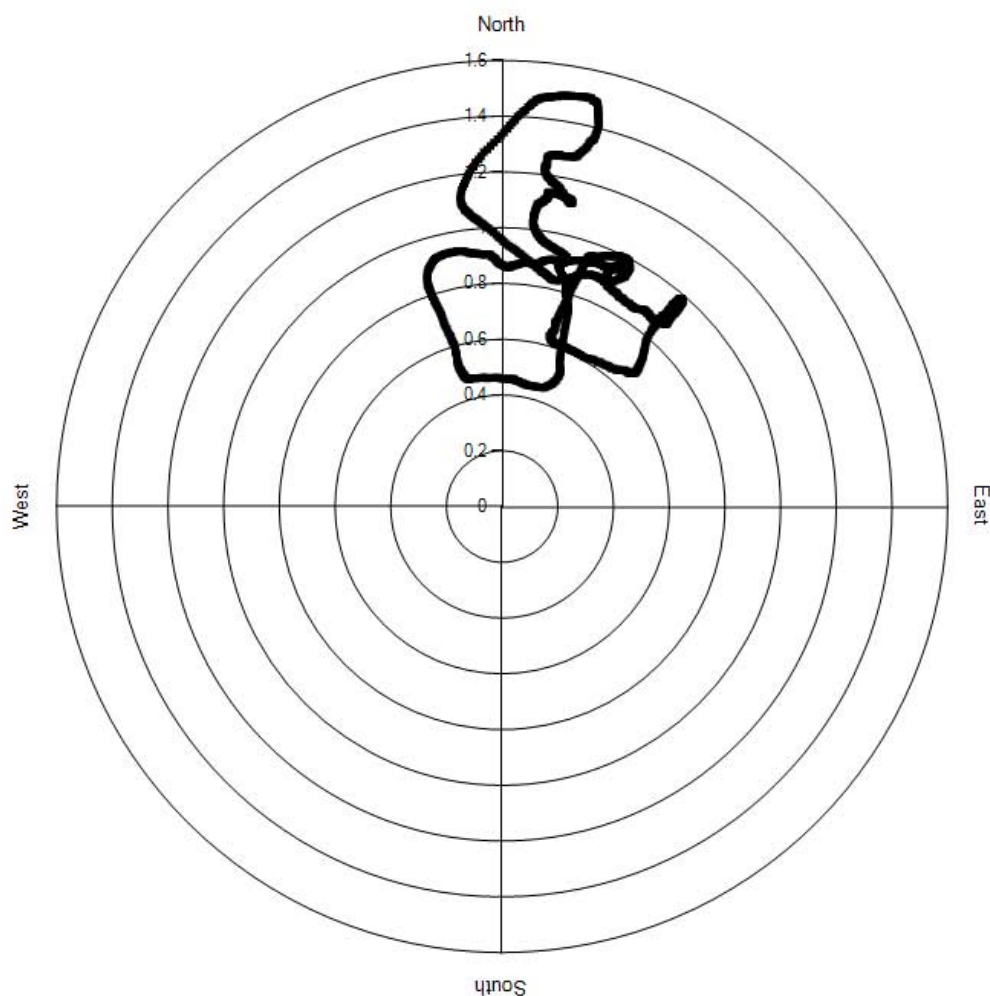
Survey: J0520

Client: SIO/Subsea Systems

Vessel: RV New Horizon

Avg. Error: 0.92 m

St. Dev.: 0.24 m



Report Issued: 08/15/2013 11:08:56

Surveyor: J. Gaytan

DGPS Verification Report

SourcePoint 001760



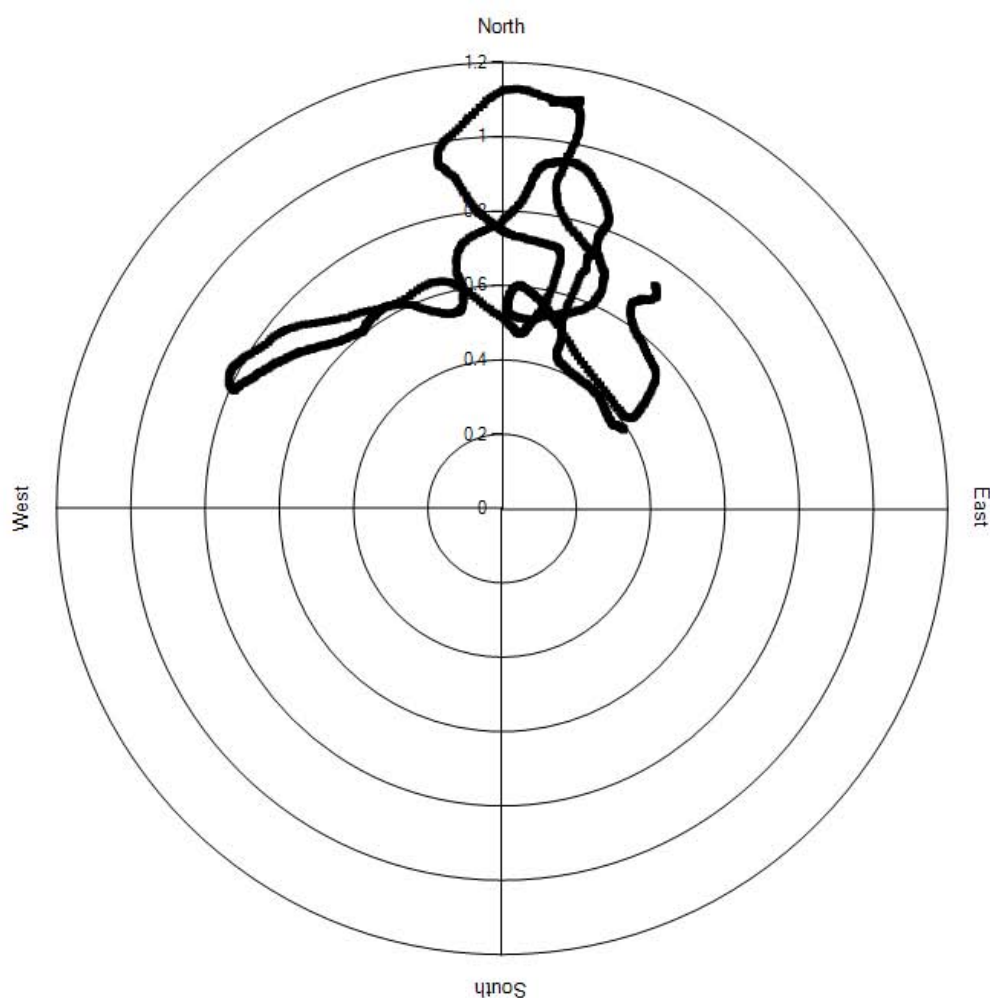
Survey: J0520

Client: SIO/Subsea Systems

Vessel: RV New Horizon

Avg. Error: 0.70 m

St. Dev.: 0.20 m



Report Issued: 08/15/2013 11:05:39

Surveyor: J. Gaytan

DGPS Verification Report

Trimble1-78196



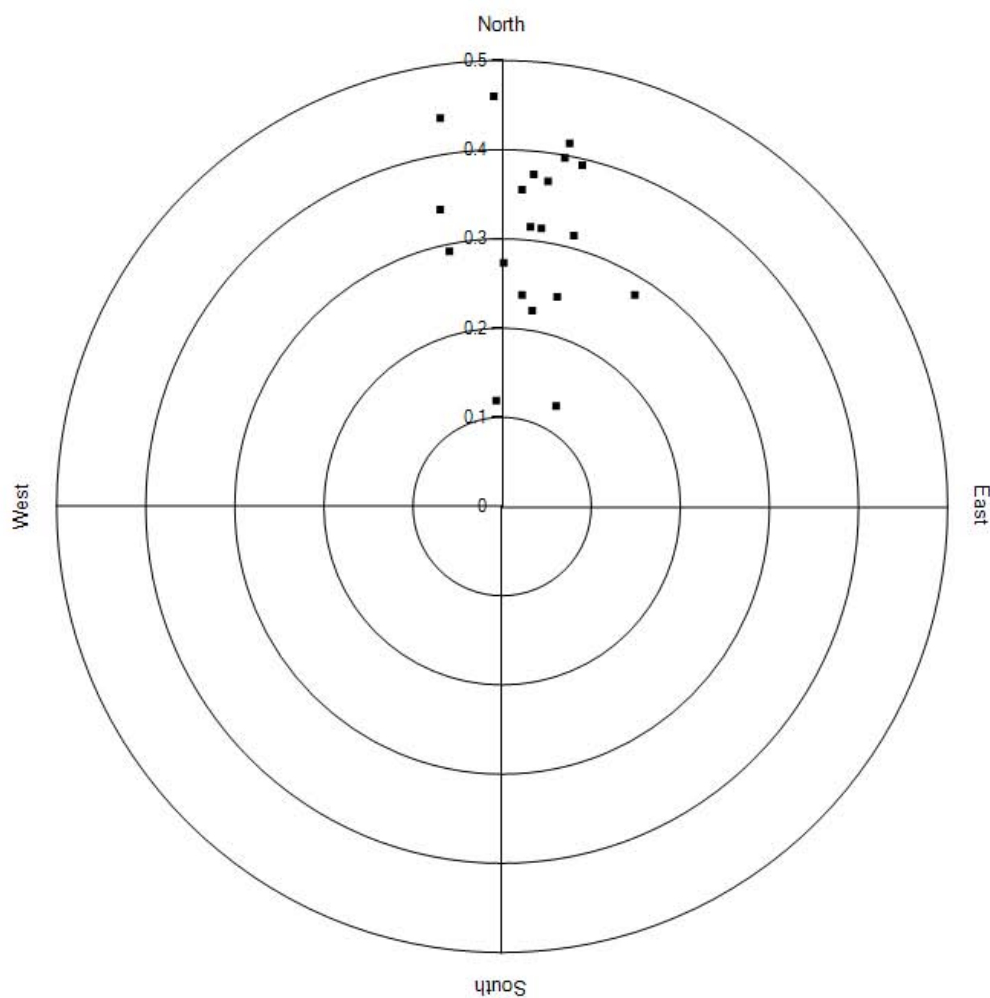
Survey: J0520

Client: SIO/Subsea Systems

Vessel: RV New Horizon

Avg. Error: 0.31 m

St. Dev.: 0.09 m



Report Issued: 08/15/2013 18:07:07

Surveyor: J. Gaytan

DGPS Verification Report

Trimble2-78198



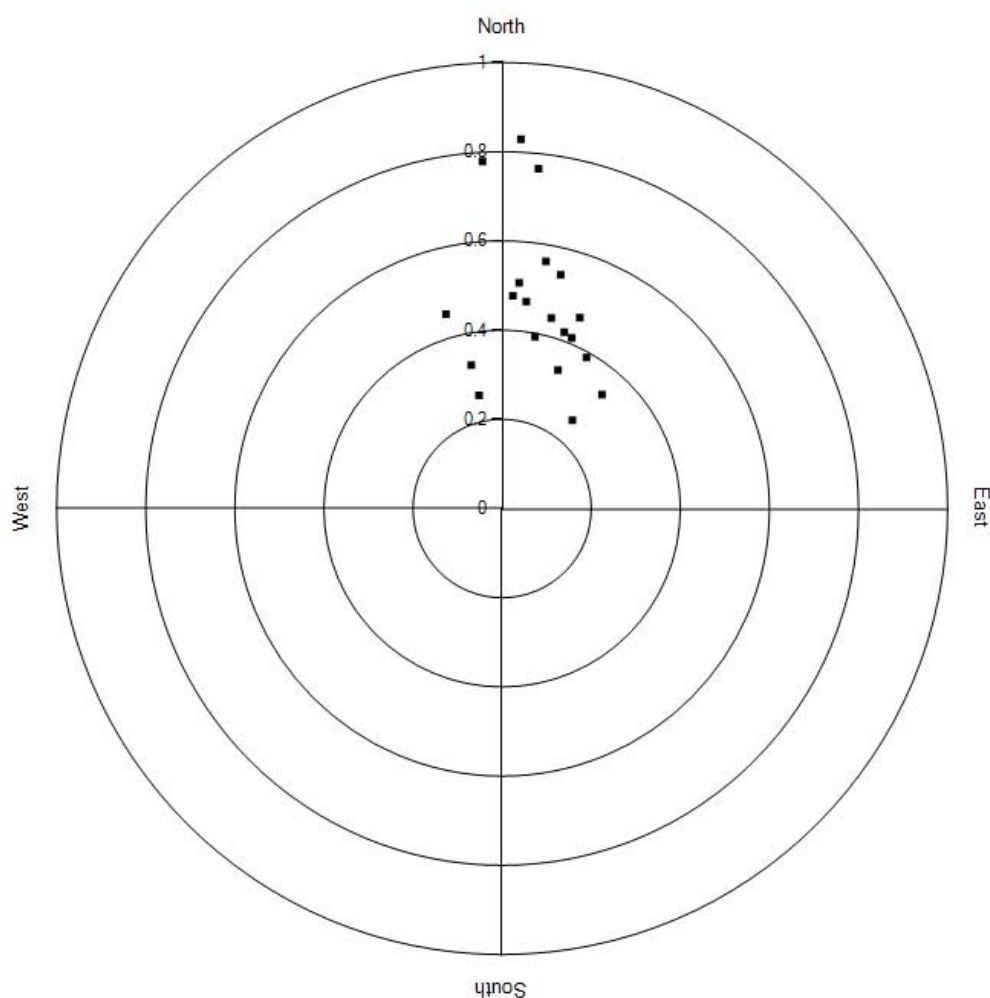
Survey: J0520

Client: SIO/Subsea Systems

Vessel: RV New Horizon

Avg. Error: 0.47 m

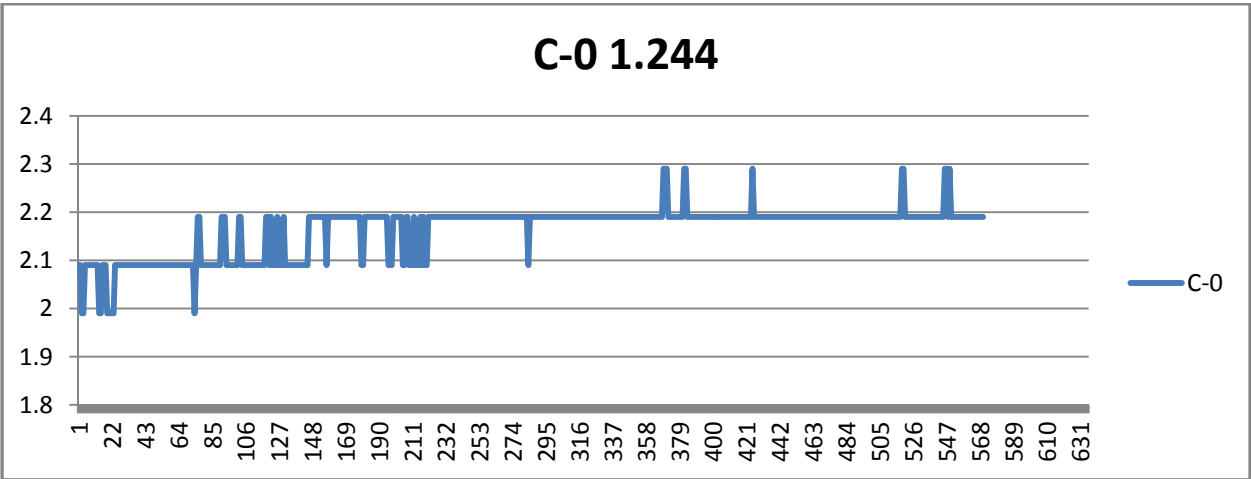
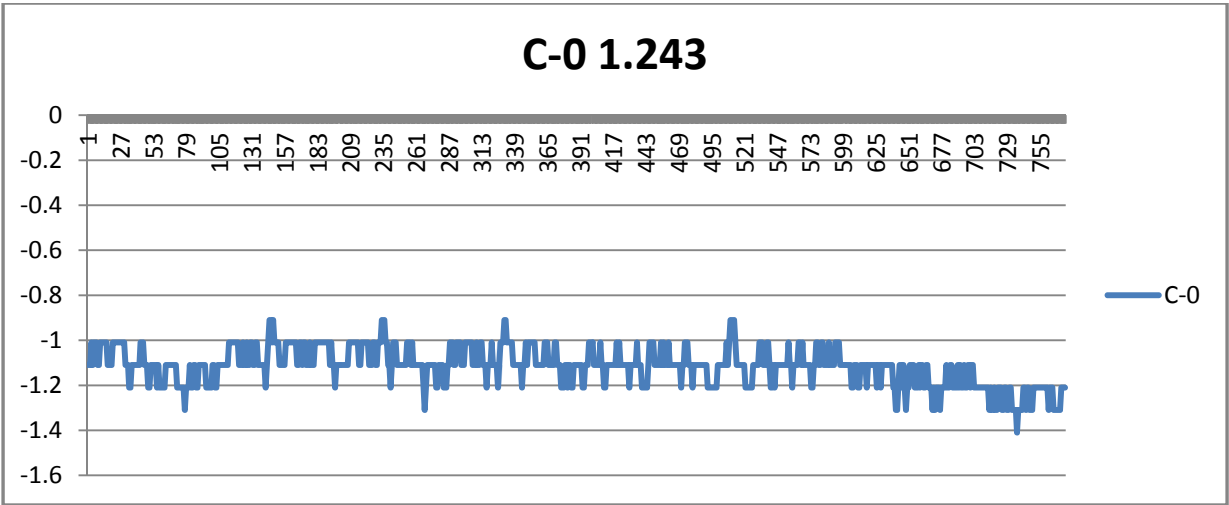
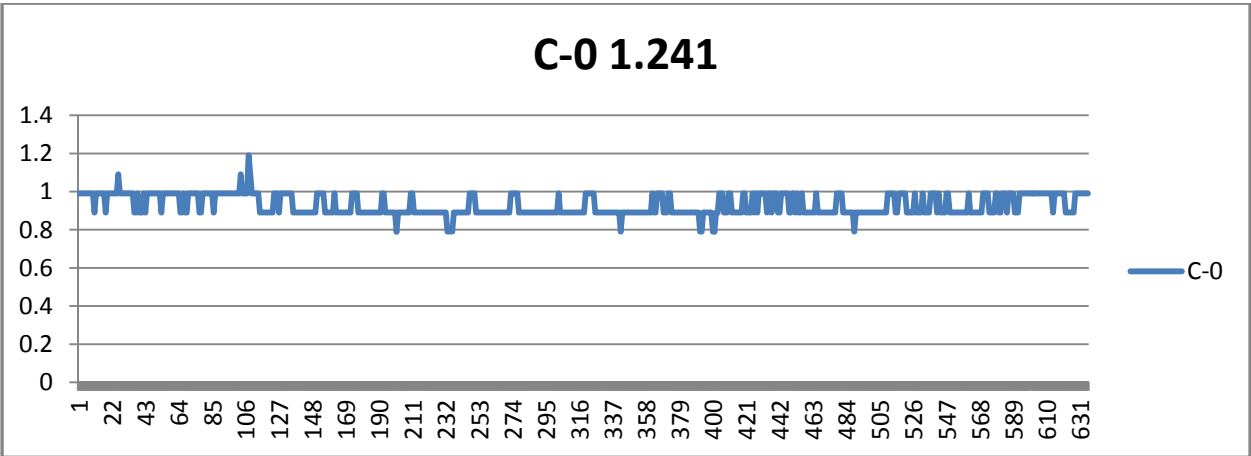
St. Dev.: 0.16 m



Report Issued: 08/15/2013 17:38:07

Surveyor: J. Gaytan

9 Appendix C: Tail Compass Verification Graphs



APPENDIX D

NCS-Subsea Daily Production Reports

SONGS 2-D High Resolution Seismic Survey Offshore Southern California

August - September 2013

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	9-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	0	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	0	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	0

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	0	0%	Standby
Chief Navigator	Matthew Grey	0	0%	Standby
Navigator	Micah Hall	0	0%	Standby
Navigator	Matthew Christie	0	0%	Standby
Navigation Processor	Christopher Blakeway	0	0%	Standby
Navigation Processor	Parker Williams	0	0%	Standby

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	In Transit	1	Yes	Status
SourcePoint DGPS System	In Transit	1	Yes	Off Rate= No billing
Navigation Processing System	In Transit	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

[illegible]

Operations Summary (UTC)

[illegible]

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	10-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	0	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	0	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	0

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	0	0%	Standby
Chief Navigator	Matthew Grey	0	0%	Standby
Navigator	Micah Hall	0	0%	Standby
Navigator	Matthew Christie	0	0%	Standby
Navigation Processor	Christopher Blakeway	0	0%	Standby
Navigation Processor	Parker Williams	0	0%	Standby

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	In Transit	1	Yes	Status
SourcePoint DGPS System	In Transit	1	Yes	Off Rate= No billing
Navigation Processing System	In Transit	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

[illegible]

Operations Summary (UTC)

[illegible]

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	11-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	0	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	0	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	0

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	0	0%	Standby
Chief Navigator	Matthew Grey	0	0%	Standby
Navigator	Micah Hall	0	0%	Standby
Navigator	Matthew Christie	0	0%	Standby
Navigation Processor	Christopher Blakeway	0	0%	Standby
Navigation Processor	Parker Williams	0	0%	Standby

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	In Transit	1	Yes	Status
SourcePoint DGPS System	In Transit	1	Yes	Off Rate= No billing
Navigation Processing System	In Transit	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

[illegible]

Operations Summary (UTC)

[illegible]

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	12-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	0	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	0	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	0

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	0	100%	In Transit
Chief Navigator	Matthew Grey	0	100%	In Transit
Navigator	Micah Hall	0	0%	Standby
Navigator	Matthew Christie	0	0%	Standby
Navigation Processor	Christopher Blakeway	0	100%	In Transit
Navigation Processor	Parker Williams	0	0%	Standby

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	In Transit	1	Yes	Status
SourcePoint DGPS System	In Transit	1	Yes	Off Rate= No billing
Navigation Processing System	In Transit	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

[illegible]

Operations Summary (UTC)

[illegible]

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

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Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	13-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	1	0	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	0	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	0

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
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Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	24	100%	On Location
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	0	0%	Standby
Navigator	Matthew Christie	0	0%	Standby
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	0	0%	Standby

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Mobilization	1	Yes	Status
SourcePoint DGPS System	Mobilization	1	Yes	Off Rate= No billing
Navigation Processing System	Mobilization	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
08:30	Blakeway, Grey, Gaytan arrive RV New Horizon and start mobilization.
10:00	Equipment loaded onto R/V New Horizon.
11:15	Logging data on Monument SD1.
15:50	End Logging Monument SD1.
16:05	Logging data on Monument SD2.
19:35	End Logging Monument SD2.
19:45	NCS personnel depart vessel for hotel. Antennas mounted, machines and racks placed.

Operations Summary (UTC)

[illegible]

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

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Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	14-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	1	0	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	0	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	0

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
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Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	24	100%	On Location
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	0	0%	Standby
Navigator	Matthew Christie	0	0%	Standby
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	0	0%	Standby

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Mobilization	1	Yes	Status
SourcePoint DGPS System	Mobilization	1	Yes	Off Rate= No billing
Navigation Processing System	Mobilization	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
08:30	Blakeway, Grey, Gaytan continue mobilization
11:00	Start Azimuth Calibration
11:20	Complete Azimuth Calibration
15:00	Start DGPS Verifications
20:30	Mobilization continues. Bridge PC interface complete. Echosounder interface complete, AutoPilot Interface continues. Trimble, SourcePoints, and Boomer GPS verifications complete. Area located for compass calibrations.

Operations Summary (UTC)

[illegible]

Daily Production Report

Offshore Survey Operations

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Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	15-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	1	0	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	0	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	0

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
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Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	24	100%	On Location
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Mobilization	1	Yes	Status
SourcePoint DGPS System	Mobilization	1	Yes	Off Rate= No billing
Navigation Processing System	Mobilization	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
08:30	Blakeway, Grey, Gaytan continue mobilization
09:00	Verify and redo Total Station shots for DGPS verifications
11:00	DGPS verifications complete and AutoPilot tested and interfaces
11:45	mGrey, cBlakeway, and jGaytan sign on to vessel
15:00	Setup markers in shelter island park for Compass calibrations
16:30	mHall, mChristie, and pWilliams arrive crew, sign on to vessel
20:30	Compass calibrations and verifications complete, offsets measured.
	Mobilization complete

Operations Summary (UTC)

[illegible]

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	16-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	2	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	1	1	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	0

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	24	100%	On Location
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
08:15	Vessel departs San Diego Harbor for prospect
09:00	Abandon Ship Drill and orientation conducted
13:30	In prospect area, deploying/retrieving Streamer for testing.and final assembly
15:15	Deploying/retrieving Sparker for testing and final assembly
20:30	Sparker and Source fully deployed , on approach to Line 0111A
21:27	SOL Line 0111A Seq 044, FGSP 1001
23:59	In Production, Line 0111A Seq44

Operations Summary (UTC)

[illegible]

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	17-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	1	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	0

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
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Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	24	100%	On Location
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In Production, Line 0111A Seq44
01:45	Sparker recovered to adjust ropes and add weight
02:33	SOL Line 0212A SEQ 45, FGSP 1001
06:26	SOL Line 0212B SEQ 46, FGSP 6258
07:11	SOL Line 0113A SEQ 47, FGSP 1001
11:46	SOL Line 0214A SEQ 48, FGSP 1001
16:27	SOL 0115A SEQ 49, FGSP 1001
21:31	SOL Line 0216A SEQ 50, FGSP 1001
23:59	In Production, Line 0216A Seq050

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0111A	Sparker	44	1001	6495	34.3438
0212A	Sparker	45	1001	6061	31.6313
0212B	Sparker	46	6258	6598	2.1313
0113A	Sparker	47	1001	6711	35.6938
0214A	Sparker	48	1001	6709	35.6813
0115A	Sparker	49-1	1001	1805	5.0313
			Daily KM		144.5125

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

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Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	18-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	1	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	0

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
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Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	24	100%	On Location
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In Production, Line 0216A Seq050
02:15	SOL Line 0117A SEQ 56, FGSP 1001
06:18	SOL Line 0218A SEQ 57, FGSP 1375
10:34	SOL Line 0119A SEQ 58, FGSP 1001
14:45	Retrieved and Deployed Sparker for maintenance
15:18	SOL Line 0220A SEQ 59, FGSP 1001
19:43	SOL Line 0121A SEQ 60, FGSP 1001
23:21	SOL Line 0121B SEQ 61, FGSP 5591
23:59	In Transit to Line 0222A

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0115A	Sparker	49-2	1806	6746	30.8813
0216A	Sparker	50	1001	6639	35.2438
0117A	Sparker	56	1001	6107	31.9188
0218A	Sparker	57	1375	6496	32.0125
0119A	Sparker	58	1001	6454	34.0875
0220A	Sparker	59	1001	3284	14.2750
			Daily KM		178.4188

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

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Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	19-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	1	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	0

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
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Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	24	100%	On Location
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:13	SOL In Production Line 0222A SEQ 62, FGSP 1001
04:28	SOL Line 0123A SEQ 63, FGSP 1001
08:59	SOL Line 0224A SEQ 64, FGSP 1001
13:11	SOL Line 0125A SEQ 65, FGSP 1001
17:17	SOL Line 0226A SEQ 66, FGSP 1001
21:17	SOL Line 0127A SEQ 67, FGSP 1001
23:59	In production on line 0127A SEQ 67 (32 52.85N; 117 31.7W)

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0220A	Sparker	59-2	3285	6277	18.7063
0121A	Sparker	60	1001	5338	27.1125
0121B	Sparker	61	5591	6269	4.2438
0222A	Sparker	62	1001	6226	32.6625
0123A	Sparker	63	1001	6166	32.2875
0224A	Sparker	64	1001	6064	31.6500
0125A	Sparker	65	1001	5988	31.1750
			Daily KM		177.8375

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

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Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	20-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	1	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	1	1

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	24	100%	On Location
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In production on line 0127A SEQ 67 (32 52.85N; 117 31.7W)
00:15	EEOL Line 0127A SEQ 67, LGSP 5134, d/t NavPoint no triggers
00:21	SOL Line 0127B Seq 70, FGSP 5217
00:45	Retrieve all in water gear for section replace and add tail stretch
04:44	SOL Line 0110A Seq 72, FGSP 1001
09:08	SOL Line 0209A Seq. 73, FGSP 1001
09:14	SOL Line 0209B Seq 74, FGSP 1140
13:51	SOL Line 0108A Seq. 75, FGSP 1001
18:18	SOL Line 0207A Seq. 76, FGSP 1001
22:48	SOL Line 0106A Seq. 77, FGSP 1001
23:59	In production on line 0106A SEQ 77, 33 19.972N 117 48.369W

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0226A	Sparker	66	1001	5724	29.5250
0127A	Sparker	67	1001	5134	25.8375
0127B	Sparker	70	5217	5586	2.3125
0110A	Sparker	72	1001	6490	34.3125
0209A	Sparker	73	1001	1061	0.3813
0209B	Sparker	74	1140	6433	33.0875
0108A	Sparker	75-1	1001	5367	27.2938
			Daily KM		152.7500

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	21-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	1	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	1

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	24	100%	On Location
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In production on line 0106A SEQ 77, 33 19.972N 117 48.369W
03:07	SOL Line 0205A Seq. 78, FGSP 1001
06:50	Timing Test conducted, used Seq079
07:20	SOL Line 0104A Seq. 80, FGSP 1001
11:35	SOL Line 0203A Seq. 81, FGSP 1001
16:08	SOL Line 0102A Seq. 82, FGSP 1001
20:15	Online and Spare NIU Trigger pulse changed to 50ms
20:36	SOL Line 0201A, Seq. 83, FGSP 1001
23:59	In production on line 0201A SEQ 83, 33 28.03N 117 50.6W

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0108A	Sparker	75-2	5368	6526	7.2438
0207A	Sparker	76	1001	6484	34.2750
0106A	Sparker	77	1001	6263	32.8938
0205A	Sparker	78	1001	6072	31.7000
0104A	Sparker	80	1001	6153	32.2063
0203A	Sparker	81	1001	6208	32.5500
0102A	Sparker	82-1	1001	2137	7.1063
			Daily KM		177.9750

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	22-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	1	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	1

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Field Engineer	Jesus Gaytan	24	100%	On Location
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	Status
2D NavPoint Longliner	Installed	1	Yes	Off Rate= No billing
SourcePoint DGPS System	Installed	1	Yes	In transit/Mobilization=100% rate
Navigation Processing System	Installed	1	Yes	Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In production on line 0201A SEQ. 83, 33 28.03N 117 50.6W
00:22	EOL line 0201A Seq. 83, LGSP 6282
01:09	SOL line 0168A Seq. 84, FGSP 1001
02:19	EOL Line 0168A Seq. 84, LGSP 2680
02:45	SOL line 0128A Seq. 85, FGSP 1001
06:39	EOL Line 0128A Seq. 85, LGSP 6530
06:55	Retrieved streamer and sparker
07:10	Head to personnel transfer point
09:18	Personnel transfer complete, Jesus off and student on
10:35	Streamer and sparker deployed
10:37	SOL line 0129A Seq. 86, FGSP
11:05	Source GPS stopped working SP 1639
13:15	EEOL line 0129A Seq. 86, LGSP 4621 D/T PSO shutdown
13:20	SOL line 0129A Seq. 87, FGSP 4703, source GPS down for line, line name should have been 0129B
13:25	EEOL line 0129A Seq. 87, LGSP 4808 D/T PSO shutdown
13:30	SOL line 0129C Seq. 88, FGSP 4892, source GPS down for line
13:34	EEOL line 0129C Seq. 88, LGSP 4990 D/T PSO shutdown
13:41	SOL line 0129D Seq. 89, FGSP 5104, source GPS down for line
16:31	EEOL line 0129D Seq. 89, LGSP 9038 D/T PSO shutdown
16:46	SOL line 0129E Seq. 90, FGSP 9293, source GPS down for line
16:57	EEOL Line 0129E Seq. 90, LGSP 9532 D/T PSO shutdown
17:05	SOL line 0129A Seq. 91, FGSP 9681 repeated "A" NavPoint only allows "A-E", source GPS down for line
17:51	EEOL line 0129A Seq. 91, LGSP 10736 D/T PSO shutdown
18:01	Retrieved Sparker to remove GPS for repair
18:16	Deployed source without GPS
18:53	SOL Line 0230A Seq. 92, FGSP 1001, source GPS down for line
23:59	In production on line 0230A SEQ. 92 33 19.759N 117 42.418W

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0102A	Sparker	82-2	2138	6330	26.2063
0201A	Sparker	83	1001	6282	33.0125
0168A	Sparker	84	1001	2680	10.5000
0128A	Sparker	85	1001	6530	34.5625
0129A	Sparker	86	1001	4621	22.6313
0129A	Sparker	87	4703	4808	0.6625
0129C	Sparker	88	4892	4990	0.6188
0129D	Sparker	89	5104	9038	24.5938
0129E	Sparker	90	9293	9532	1.5000
			Daily KM		154.2875

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	23-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	2	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	2

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In production on line 0230A SEQ. 92 33 19.865N 117 42.542W
02:13	EOL Line 0230 Seq. 92, LGSP 11570
02:15	Retrieve Sparker to reattach GPS unit
02:37	Deploy Sparker, GPS working
03:00	SOL 0131A Seq. 93, FGSP 1001
06:21	EEOL Line 0131A Seq. 93, LGSP 5634 D/T PSO shutdown
06:30	SOL 0131B Seq. 94, FGSP 5866
10:35	EOL Line 0131B Seq. 94, LGSP 11587
10:40	Retrieve Sparker to replace tips
10:55	Deploy Sparker, head to line 0232A
11:13	SOL 0232A Seq. 95, FGSP 1001
14:06	EEOL Line 0232A Seq. 95, LGSP 4866 D/T PSO shutdown
14:11	SOL 0232B Seq. 96, FGSP
15:53	EEOL Line 0232B Seq. 96, LGSP 7373 D/T PSO shutdown
15:59	SOL 0232C Seq. 97, FGSP 7481
16:40	EEOL Line 0232C Seq. 97, LGSP 8430 D/T header problem on recorder
16:45	SOL 0232D Seq. 98, FGSP
18:56	EOL Line 0232D Seq. 98, LGSP 11590
19:21	SOL 0133A Seq. 99, FGSP 1001
23:59	In production on line 0133A Seq. 99. Midnight position - 33 08.76N, 117 36.231W

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0129A	Sparker	91	9681	10736	6.6000
0230A	Sparker	92	1001	11570	66.0625
0131A	Sparker	93	1001	5633	28.9563
0131B	Sparker	94	5866	11587	35.7625
0232A	Sparker	95	1001	4866	24.1625
0232B	Sparker	96	4944	7373	15.1875
0232C	Sparker	97	7481	8430	5.9375
0232D	Sparker	98-1	8850	8881	0.2000
			Daily KM		182.8688

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	24-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	2	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	2

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In production on line 0133A Seq. 99
02:55	EOL Line 0133A Seq. 99, LGSP 11591
03:28	SOL Line 0234A Seq. 100, FGSP 1001
08:42	EEOL Line 0234A Seq. 100, LGSP 8325 D/T PSO shutdown
08:49	SOL Line 0234B Seq. 101, FGSP 8431
10:48	EEOL Line 0234B Seq. 101, LGSP 11262 D/T PSO shutdown
11:27	SOL Line 0135A Seq. 102, FGSP 1001
18:58	EOL Line 0135A Seq. 101, LGSP 11600
19:30	SOL Line 0236A Seq. 103, FGSP 1001
23:59	In production on line 0236A Seq. 103

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0232D	Sparker	98-2	8882	11590	16.9313
0133A	Sparker	99	1001	11591	66.1938
0234A	Sparker	100	1001	8325	45.7813
0234B	Sparker	101	8431	11262	17.7000
0135A	Sparker	102-1	1001	8850	49.0625
			Daily KM		195.6688

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	25-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	2	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	2

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In production on line 0236A Seq. 103
02:04	Sparker stopped firing at SP 10346 but NavPoint kept eventing
02:33	Sparker started firing again at SP 11072
02:55	EOL Line 0236A Seq. 103, LGSP 11600
03:22	SOL Line 0137A Seq. 104, FGSP 1001
10:52	EOL Line 0137A Seq. 104, LGSP 11602
10:55	Retrieved Sparker for maintenance.
11:07	Deploy Sparker after maintenance.
11:28	Sequence 105 is null, only 5 SPs due to stop and restart of line 0238A
11:28	SOL Line 0238A Seq. 106, FGSP 1001
19:01	EOL Line 0238A Seq. 106, LGSP 11607
19:27	SOL Line 0139A Seq. 107, FGSP 1001
23:59	In production on line 0139A Seq. 107 33 03.06N, 117 43.154

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0135A	Sparker	102-2	8851	11600	17.1875
0236A	Sparker	103	1001	11600	66.2500
0137A	Sparker	104	1001	11602	66.2625
0238A	Sparker	106-1	1001	8770	48.5625
			Daily KM		198.2625

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	26-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	2	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	2

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
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Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In Production on line 0139A Seq. 107 33 02.605N 117 42.600W
02:58	EOL Line 0139A Seq. 107, LGSP 11608
03:26	SOL Line 0240A Seq. 108, FGSP 1001
10:59	EOL Line 0240A Seq. 108, LGSP 11611
11:28	SOL Line 0141A Seq. 109, FGSP 1001
19:00	EOL Line 0141A Seq. 109, LGSP 11614
19:10	Retrieved streamer and Sparker for re-config
22:00	75 mtr streamer and Boomer deployed
22:39	SOL Line 2160A Seq. 110, FGSP 1001
23:21	EOL Line 2160A Seq. 110, LGSP 2881
23:42	SOL Line 1158A Seq. 111, FGSP 1001
23:59	In production on line 1158A Seq. 111, 33 17 48.32N 117 36 17.63W

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0238A	Sparker	106-2	8771	11607	17.7313
0139A	Sparker	107	1001	11608	66.3000
0240A	Sparker	108	1001	11611	66.3188
0141A	Sparker	109-1	1001	8747	48.4188
			Daily KM		198.7688

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	27-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	2	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	2

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
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Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

[illegible]

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0141A	Sparker	109-2	8748	11614	17.9188
2160A	Boomer	110	1001	2881	5.8781
1158A	Boomer	111	1001	2968	6.1500
1158B	Boomer	112	1001	5331	13.5344
2156A	Boomer	113	1001	6091	15.9094
1154A	Boomer	114	1001	4808	11.9000
1154B	Boomer	115	4947	4962	0.0500
1154C	Boomer	116	5136	5613	1.4938
1154C	Boomer	117	5696	6737	3.2563
2152A	Boomer	118	1001	6582	17.4438
1150A	Boomer	119	1001	5911	15.3469
2148A	Boomer	120	1001	1867	2.7094
2148B	Boomer	121-1	1984	2701	2.2438
			Daily KM		113.8344

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	28-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	2	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	2

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	Status
2D NavPoint Longliner	Installed	1	Yes	Off Rate= No billing
SourcePoint DGPS System	Installed	1	Yes	In transit/Mobilization=100% rate
Navigation Processing System	Installed	1	Yes	Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In transit to line 2128A seq. 130 3314.215 11731.925
00:05	SOL Line 2128A Seq. 130, FGSP 1001 331411.77N 1173157.19W
00:28	EOL Line 2128A Seq. 130, LGSP 1860 331520.16N 1173042.76W
00:45	SOL line 1126A Seq. 131, FGSP 1001. 331533.45N 1173055.50W
01:08	EOL Line 1126A Seq. 131, LGSP 1923. 331423.37N 1173209.34W
01:23	SOL Line 2124A Seq. 132, FGSP 1001. 331435.31N 1173222.59W
01:48	EOL Line 2124A Seq. 132, LGSP 1950. 331547.23N 1173106.41W
02:05	SOL Line 1122A Seq. 133, FGSP 1001. 331600.28N 1173118.86W
02:30	EOL Line 1122A Seq. 133, LGSP 2013. 331443.41N 1173239.94W
02:44	SOL Line 2120A Seq. 134, FGSP 1001. 331455.50N 1173253.48W
03:09	EOL Line 2020A Seq. 134, LGSP 2033. 331613.17N 1173129.87W
03:23	SOL Line 1118A Seq. 135, FGSP 1001. 331626.47N 1173142.13W
03:51	EOL Line 1118A Seq. 135, LGSP 2102. 331502.97N 1173310.46W
04:05	SOL Line 2116A Seq. 136, FGSP 1001. 331515.50N 1173324.04W
04:34	EOL Line 2116A Seq. 136, LGSP 2120. 331639.87N 1173153.65W
04:48	SOL Line 1114A Seq. 137, FGSP 1001. 331653.10N 1173206.34W
05:21	EOL Line 1114A Seq. 137, LGSP 2183. 331523.52N 1173341.26W
05:32	SOL Line 2112A Seq. 138, FGSP 1001. 331535.06N 1173354.09W
06:03	EOL Line 2112A Seq. 138, LGSP 2176. 331703.97N 1173219.56W
06:18	SOL Line 1110A Seq. 139, FGSP 1001. 331717.82N 1173231.07W
06:50	EOL Line 1110A Seq. 139, LGSP 2251. 331543.23N 1173411.67W
07:04	SOL Line 2108A Seq. 140, FGSP 1001. 331554.95N 1173424.55W
07:35	EOL Line 2108A Seq. 140, LGSP 2240. 331728.69N 1173244.82W
07:50	SOL Line 1106A Seq. 141, FGSP 1001. 331742.20N 1173256.66W
08:22	EOL Line 1106A Seq.141, LGSP 2318. 331602.50N 1173442.63W
15:34	SOL 2104A Seq. 142, FGSP 1001. 331615.25N 1173455.65W
08:54	EEOL Line 2104A Seq. 142 d/t PSO shutdown , LGSP 1816. 331716.51N1173349.52W
08:58	SOL Line 2104B Seq. 143, FGSP 1977. 331728.93N 1173336.87W
09:06	EOL Line 2104B Seq. 143, LGSP 2297. 331753.04N 1173310.97W
09:18	SOL Line 1102A Seq. 144, FGSP 1001. 331806.11N1173323.65W
09:51	EOL Line 1102A Seq. 144, LGSP 2326. 331625.52N 1173509.90W
10:05	SOL Line 2100A Seq. 145 Late start d/t PSO shutdown , FGSP 1104. 331648.93N 1173511.11W
10:34	EOL Line 2100A Seq. 145, LGSP 2244. 331815.18N 1173339.22W
10:45	SOL Line 1198A Seq. 146, FGSP 1001. 331827.17N 1173353.56W
11:16	EOL Line 1198A Seq. 146, LGSP 2244. 331652.55N 1173532.87W
11:26	SOL Line 2096A Seq. 147, FGSP 1001. 331707.85N 1173541.77W
11:54	EOL Line 2096A Seq. 147, LGSP 2159. 331834.66N 1173410.22W
12:08	SOL Line 1094A Seq. 148, FGSP 1001. 331847.66N, 1173422.63W
12:35	EEOL Line 1094A Seq. 148 d/t PSO shutdown , LGSP 2084. 331725.80N, 1173549.92W
12:51	SOL Line 2092A Seq. 149, FGSP 1001. 331707.85N 1173541.77W DNP
12:51	EEOL Line 2092A Seq. 149 DNP, d/t PSO shutdown
13:06	SOL Line 2092B Seq. 150, FGSP 1001. 331734.94N, 1173604.66W
13:32	EOL Line 2092B Seq. 150, LGSP 2125. 331900.63N, 1173435.14W
13:46	SOL Line 1090A Seq. 151, FGSP 1001. 331909.49N, 1173452.16W
14:14	EOL Line 1090A Seq. 151, LGSP 2087. 331746.83N, 1173619.03W
14:29	SOL Line 2088A Seq. 152, FGSP 1001. 331802.37N, 1173628.26W
14:56	EOL Line 2088A Seq. 152, LGSP 2032. 331920.39N, 1173505.29W
15:10	SOL Line 1086A Seq. 153, FGSP 1001. 331926.81N, 1173525.44W

Comments: General Cont. (Local Time)

Time	Comments
15:37	EOL Line 1086A Seq. 153, LGSP 1959. 331813.84N, 1173641.87W
15:51	SOL Line 2084A Seq. 154, FGSP 1001. 331829.62N, 1173651.42W
16:13	EOL Line 2084A Seq. 154, LGSP 1889. 331936.91N, 1173540.11W
16:27	SOL Line 1082A Seq. 155, FGSP 1001. 331944.13N, 1173558.63W
16:47	EOL Line 1082A Seq. 155, LGSP 1831. 331841.28N, 1173705.41W
16:59	SOL Line 2080A Seq. 156, FGSP 1001. 331856.61N, 1173714.36W
16:59	LSOD 1030 @ 23:59 LAT 331858.84N, LONG 1173712.07W
17:17	EOL Line 2080A Seq. 156, LGSP 1730. 331951.99N, 1173615.97W
17:30	SOL Line 1078A Seq. 157, FGSP 1001. 331959.76N, 1173633.80W
17:47	EOL Line 1078A Seq. 157, LGSP 1680. 331908.33N, 1173728.37W
17:58	SOL Line 2076A Seq. 158, FGSP 1001. 331923.56N, 1173737.24W
18:11	EEOL Line 2076A Seq. 158 d/t PSO shutdown , LGSP 1522. 332003.29N, 1173655.72W
18:25	SOL Line 1074A Seq. 159, FGSP 1001. 332013.22N, 1173711.35W
18:37	EOL Line 1074A Seq. 159, LGSP 1501. 331935.13N, 1173751.08W
19:46	SOL Line 2104C Seq. 160, FGSP 1001. 331615.07N, 1173455.36W
20:21	EOL Line 2104C Seq. 160, LGSP 2297. 331753.37N, 1173311.35W
21:04	SOL Line 0112A Seq. 161, FGSP 1001. 331941.06N, 1173553.24W
23:22	EOL Line 0112A Seq. 161, LGSP 5933. 331325.66N, 1174227.24W
23:35	Retrieve streamer and boomer to reconfigure to 300mtr/Sparker
23:59	In transit to line 0212C seq. 162 LAT 33 12.056 N, LONG 117 43.902 W
23:59	Midnight position LAT 33 12.056 N, LONG 117 43.902 W

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
2148B	Boomer	121-2	2702	4886	6.8281
1146A	Boomer	122	1001	3516	7.8625
1142A	Boomer	123	1001	1554	1.7313
2140A	Boomer	124	1001	1582	1.8188
1138A	Boomer	125	1001	1652	2.0375
2136A	Boomer	126	1001	1679	2.1219
1134A	Boomer	127	1001	1746	2.3313
2132A	Boomer	128	1001	1789	2.4656
1130A	Boomer	129	1001	1834	2.6063
2128A	Boomer	130	1001	1860	2.6875
1126A	Boomer	131	1001	1923	2.8844
2124A	Boomer	132	1001	1950	2.9688
1122A	Boomer	133	1001	2013	3.1656
2120A	Boomer	134	1001	2033	3.2281
1118A	Boomer	135	1001	2102	3.4438
2116A	Boomer	136	1001	2120	3.5000
1114A	Boomer	137	1001	2183	3.6969
2112A	Boomer	138	1001	2176	3.6750
1110A	Boomer	139	1001	2251	3.9094
2108A	Boomer	140	1001	2240	3.8750
1106A	Boomer	141	1001	2318	4.1188
2104A	Boomer	142	1001	1816	2.5500
2104B	Boomer	143	1977	2297	1.0031
1102A	Boomer	144	1001	2326	4.1438

Operations Summary Cont. (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
2100A	Boomer	145	1104	2244	3.5656
1198A	Boomer	146	1001	2244	3.8875
2096A	Boomer	147	1001	2159	3.6219
1094A	Boomer	148	1001	2084	3.3875
2092A	Boomer	149	DNP		
2092B	Boomer	150	1001	2125	3.5156
1090A	Boomer	151	1001	2087	3.3969
2088A	Boomer	152	1001	2032	3.2250
1086A	Boomer	153	1001	1959	2.9969
2084A	Boomer	154	1001	1889	2.7781
1082A	Boomer	155	1001	1831	2.5969
2080A	Boomer	156-1	1001	1030	0.0938
			Daily KM		111.7188

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	29-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	2	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	2

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	Status
2D NavPoint Longliner	Installed	1	Yes	Off Rate= No billing
SourcePoint DGPS System	Installed	1	Yes	In transit/Mobilization=100% rate
Navigation Processing System	Installed	1	Yes	Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In transit to line 0212C seq. 162 LAT 33 12.056 N, LONG 117 43.902 W
00:45	Deployed Sparker with new floatation and 48 channel streamer
01:16	SOL Line 0212C Seq. 162, FGSP 3991
03:05	EOL Line 0212C Seq. 162, LGSP 6598
03:55	SOL Line 0150A Seq. 163, FGSP 1001
05:33	EOL Line 0150A Seq. 163, LGSP 3311
06:05	SOL Line 0251A Seq. 164, FGSP 1001
06:12	EEOL Line 0251A Seq. 164, LGSP 1160 d/t PSO shutdown
06:16	SOL Line 0251A (should be 0251B) Seq. 165, FGSP 1254
07:39	EOL Line 0251A (should be 0251B) Seq. 165, LGSP 3234
08:08	SOL Line 0152A Seq. 166, FGSP 1009
08:32	EEOL Line 0152A Seq. 166, LGSP 1545 d/t PSO shutdown
08:35	SOL Line 0152B Seq. 167, FGSP 1611
08:53	GSP went out d/t total submersion at SP 2023
09:15	Seq. 167 Line 0152A, missed SP 2512
09:54	EOL Line 0152B Seq. 167, LGSP 3393
10:00	Pulled sparker up to remove kelp and install larger floats
10:44	SOL Line 0253A Seq. 168, FGSP 1001
12:32	EOL Line 0253A Seq. 168, LGSP 3446
13:11	SOL Line 0154A Seq. 169, FGSP 1001
14:57	EOL Line 0154A Seq. 169, LGSP 3547
15:20	SOL Line 0255A Seq. 170, FGSP 1001
16:59	LSOD 3297 331657.65N, 1173313.20W
17:07	EOL Line 0255A Seq. 170, LGSP 3491
17:33	SOL Line 0156A Seq. 171, FGSP 1001
19:18	EOL Line 0156A Seq. 171, LGSP 3514
19:45	SOL Line 0257A Seq. 172, FGSP 1001
21:29	EOL Line 0257A Seq. 172, LGSP 3391
21:55	SOL Line 0158A Seq. 173, FGSP 1002
23:37	EOL Line 0158A Seq. 173, LGSP 3381
23:59	In transit to line 0259A seq. 174 LAT 33 06.472 N, LONG 117 37.262 W
23:59	Midnight position LAT 33 06.472 N, LONG 117 37.262 W

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
2080A	Boomer	156-2	1031	1730	2.1875
1078A	Boomer	157	1001	1680	2.1250
2076A	Boomer	158	1001	1522	1.6313
1074A	Boomer	159	1001	1501	1.5656
2104C	Boomer	160	1001	2297	4.0531
0112A	Boomer	161	1001	5933	15.4156
0212C	Sparker	162	3991	6598	16.3000
0150A	Sparker	163	1001	3311	14.4438
0251A	Sparker	164	1001	1160	1.0000
0251A	Sparker	165	1254	3234	12.3813
0152A	Sparker	166	1009	1545	3.3563
0152B	Sparker	167	1611	3393	11.1438
0253A	Sparker	168	1001	3446	15.2875

Operations Summary Cont. (UTC)

0154A	Sparker	169	1001	3547	15.9188
0255A	Sparker	170	1001	3297	14.3563
			Daily KM		131.1656

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	30-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	3	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	4

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In transit to line 0259A seq. 174 LAT 33 06.472 N, LONG 117 37.262 W
00:45	SOL Line 0259A Seq. 174, FGSP 1001
02:58	EOL Line 0259A Seq. 174, LGSP
03:49	SOL Line 0160A Seq. 175, FGSP 1001 Delayed start due to commercial fishing vessel
05:58	EOL Line 0160A Seq. 175, LGSP 4017
06:00	Partially pulled up streamer to get kelp off the first bird
06:09	Redeployed streamer
06:25	SOL Line 0261A Seq. 176, FGSP 1001
08:27	EOL Line 0261A Seq. 176, LGSP 3805
08:57	SOL Line 0162A Seq. 177, FGSP 1001
09:03	EEOL Line 0162A Seq. 177 d/t PSO Shutdown , LGSP 1147
09:06	SOL Line 0162B Seq. 178, FGSP 1213
11:04	EOL Line 0162B Seq. 178, LGSP 3896
11:26	SOL Line 0263A Seq. 179, FGSP 1017
13:26	EOL Line 0263A Seq. 179, LGSP 3785
13:52	SOL Line 0164A Seq. 180, FGSP 1001
14:00	Boat drill
14:10	EEOL Line 0164A Seq. 180 d/t sick crew member being med evacuated , LGSP 1370
14:15	Bringing streamer and sparker on board
14:23	Harbor police picked up sick crew member for shore transfer
14:25	Deploying streamer and sparker
15:33	SOL Line 0164B Seq. 181, FGSP 1001
16:59	LSOD 2923 330227.64N, 1172910.44W
17:34	EOL Line 0164B Seq. 181, LGSP 3770
17:54	SOL Line 0265A Seq. 182, FGSP 1001
19:46	EOL Line 0265A Seq. 182, LGSP 3587
20:12	SOL Line 0166A Seq. 183, FGSP 1001
21:55	EOL Line 0166A Seq. 183, LGSP 3483
22:21	SOL Line 0267A Seq. 184, FGSP 1001
23:54	EOL Line 0267A Seq. 184, LGSP 3209
23:59	Midnight position LAT 33 03.374 N, LONG 117 21.532 W
23:59	In transit to line 1161A seq. 185 LAT 33 03.374 N, LONG 117 21.532 W

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0255A	Sparker	170-2	3298	3491	1.2125
0156A	Sparker	171	1001	3514	15.7125
0257A	Sparker	172	1001	3391	14.9438
0158A	Sparker	173	1002	3381	14.8750
0259A	Sparker	174	1001	4046	19.0375
0160A	Sparker	175	1001	4017	18.8563
0261A	Sparker	176	1001	3805	17.5313
0162A	Sparker	177	1001	1147	0.9188
0162B	Sparker	178	1213	3896	16.7750
0263A	Sparker	179	1017	3785	17.3063
0164A	Sparker	180	1001	1370	2.3125
0164B	Sparker	181-1	1001	2923	12.0188
			Daily KM		151.5000

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	31-Aug-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	3	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	4

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	Installed	1	Yes	Status
SourcePoint DGPS System	Installed	1	Yes	Off Rate= No billing
Navigation Processing System	Installed	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	In transit to line 1161A seq. 185 LAT 33 03.374 N, LONG 117 21.532 W
00:34	SOL Line 1161A Seq. 185, FGSP 1001
03:40	EOL Line 1161A Seq. 185, LGSP 5341
04:09	SOL Line 2162A Seq. 186, FGSP 1001
07:06	EOL Line 2162A Seq. 186, LGSP 5105
07:33	SOL Line 1163A Seq. 187, FGSP 1001
08:58	>20m offline due to floating mass of kelp, SPs 3000-3035
09:17	EEOL Line 1163A, LGSP 3447 d/t PSO shutdown
09:22	SOL Line 1163B Seq. 188, FGSP 3559
10:18	EOL Line 1163B Seq. 188, LGSP 4883
10:20	Pulled up streamer to 2nd bird to remove kelp
10:35	Redeployed streamer
10:47	SOL Line 2164A Seq. 189, FGSP 1001
13:13	EOL Line 2164A Seq. 189, LGSP 4514
13:45	SOL Line 1165A Seq. 190, FGSP 1001
16:04	EOL Line 1165A Seq. 190, LGSP
16:15	Picking up streamer and sparker to clean off kelp
16:35	Deploying streamer and sparker
16:48	SOL Line 2170A Seq. 191, FGSP 1001
16:59	LSOD 1263 324717.44N, 1172652.45W
18:29	EOL Line 2170A Seq. 191, LGSP 3379
19:06	Seq 192 DNP d/t mammal at SOL
19:07	SOL Line 1169A Seq. 193, FGSP 1017
20:49	EOL Line 1169A Seq. 193, LGSP 3378
21:29	SOL Line 2168A Seq. 194, FGSP 1001
23:11	EOL Line 2168A Seq. 194, LGSP 3379
23:52	SOL Line 1167A Seq. 195, FGSP 1001
23:59	Midnight position LAT 32 57.881 N, LONG 117 25.745 W
23:59	In production line 1167A Seq. 195

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
0164B	Sparker	181-2	2924	3770	5.2938
0265A	Sparker	182	1001	3587	16.1688
0166A	Sparker	183	1001	3483	15.5188
0267A	Sparker	184	1001	3209	13.8063
1161A	Sparker	185	1001	5341	27.1313
2162A	Sparker	186	1001	5105	25.6563
1163A	Sparker	187	1001	3447	15.2938
1163B	Sparker	188	3559	4883	8.2813
2164A	Sparker	189	1001	4514	21.9625
1165A	Sparker	190	1001	4252	20.3250
2170A	Sparker	191-1	1001	1263	1.6438
			Daily KM		171.0813

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	1-Sep-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	3	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	4

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	24	100%	On Location
Navigator	Micah Hall	24	100%	On Location
Navigator	Matthew Christie	24	100%	On Location
Navigation Processor	Christopher Blakeway	24	100%	On Location
Navigation Processor	Parker Williams	24	100%	On Location

Equipment & Services

Description	Status	Supplied	Invoice	Status
2D NavPoint Longliner	Installed	1	Yes	Off Rate= No billing
SourcePoint DGPS System	Installed	1	Yes	In transit/Mobilization=100% rate
Navigation Processing System	Installed	1	Yes	Installed = 100% rate

Comments: General (Local Time)

Time	Comments
01:30	EOL Line 1167A Seq. 195, LGSP 3319
02:25	SOL Line 2166A Seq. 196, FGSP 1001
03:33	EOL Line 2166A Seq. 196, LGSP 2609
03:45	Pulled up streamer and sparker for trip back to port
06:30	Start taking the system apart for demob.
07:20	Along side SCRIPPS dock. End of cruise.
12:00	Packing complete, End of demob.

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
2170A	Sparker	191-2	1264	3379	13.2250
1169A	Sparker	193	1017	3377	14.7563
2168A	Sparker	194	1001	3379	14.8688
1167A	Sparker	195	1001	3319	14.4938
2166A	Sparker	196	1001	2609	10.0563
			Daily KM		67.4000

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	2-Sep-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	3	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	4

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	0	100%	Traveling
Navigator	Micah Hall	0	100%	Traveling
Navigator	Matthew Christie	0	100%	Traveling
Navigation Processor	Christopher Blakeway	0	100%	Traveling
Navigation Processor	Parker Williams	0	100%	Traveling

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	In transit	1	Yes	Status
SourcePoint DGPS System	In transit	1	Yes	Off Rate= No billing
Navigation Processing System	In transit	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	Equipment standing by for pick-up
04:00	Grey, Williams, Hall, Blakeway leaves hotel for airport, Christie to leave on the 3rd on own expense
12:20	Grey, Williams, Hall, Blakeway arrive home

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
			Daily KM		0.0000

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	3-Sep-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	3	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	4

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
Brian Brookshire	Survey Manager	NCS SubSea	1 832 715 1181	brian.brookshire@ncs-subsea.com
Eddie Majzlik	Technical Manager	NCS SubSea	1 832 528 7813	eddie.majzlik@ncs-subsea.com
Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	0	0%	Off
Navigator	Micah Hall	0	0%	Off
Navigator	Matthew Christie	0	0%	Traveling
Navigation Processor	Christopher Blakeway	0	0%	Off
Navigation Processor	Parker Williams	0	0%	Off

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	In transit	1	Yes	Status
SourcePoint DGPS System	In transit	1	Yes	Off Rate= No billing
Navigation Processing System	In transit	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
00:01	Equipment standing by for pick-up
17:00	Christie arrives home

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
			Daily KM		0.0000

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	4-Sep-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	3	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	4

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
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Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	0	0%	Off
Navigator	Micah Hall	0	0%	Off
Navigator	Matthew Christie	0	0%	Off
Navigation Processor	Christopher Blakeway	0	0%	Off
Navigation Processor	Parker Williams	0	0%	Off

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	In transit	1	Yes	Status
SourcePoint DGPS System	In transit	1	Yes	Off Rate= No billing
Navigation Processing System	In transit	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
	Equipment picked up at Nimitz Facility - San Diego, CA USA for shippment to NCS Stafford Texas.

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
			Daily KM		0.0000

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	5-Sep-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	3	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	4

Contacts Information

Name	Position	Company	Phone	Email
Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
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Jennifer Jimenez	HR Manager	NCS SubSea	1 713 857 6608	jennifer.jimenez@ncs-subsea.com
Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	0	0%	Off
Navigator	Micah Hall	0	0%	Off
Navigator	Matthew Christie	0	0%	Off
Navigation Processor	Christopher Blakeway	0	0%	Off
Navigation Processor	Parker Williams	0	0%	Off

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	In transit	1	Yes	Status
SourcePoint DGPS System	In transit	1	Yes	Off Rate= No billing
Navigation Processing System	In transit	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
	Equipment enrout to NCS Stafford Texas. Expected delivery Monday or Tuesday.

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
			Daily KM		0.0000

Daily Production Report

Offshore Survey Operations

NCS SubSea, Inc.

3928 Bluebonnet Dr. Stafford, TX 77477

Phone: 1 281-491-3123 Fax: 1 281-491-3105 Email: info@ncs-subsea.com



Job Information

Client	Subsea Systems, Inc.	NCS Job #	520
Client Job #	NH1320	NCS Crew #	1127
Job Description	2D High Resolution	Location	San Diego, California
Project Name	SONGS 2D Hi Res	Crew Phone #	
Report Date	6-Sep-13		

QHSE

Event	Today	Job Total	Event	Today	Job Total
Safety/Tailgate/ Meetings	0	3	Hazard, Near Miss or Suggestion Report	0	0
Drills	0	3	Incident	0	0
JSA's Reviewed	0	0	CPAR's Submitted	0	4

Contacts Information

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Jesus Gaytan	Product Line Manager	NCS SubSea	1 832 528 7815	jesus.gaytan@ncs-subsea.com
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Al Hise	President	NCS SubSea	1 832 495 2018	al.hise@ncs-subsea.com

Personnel

Position	Name	Exposure Hours	Day Rate	Status
Chief Navigator	Matthew Grey	0	0%	Off
Navigator	Micah Hall	0	0%	Off
Navigator	Matthew Christie	0	0%	Off
Navigation Processor	Christopher Blakeway	0	0%	Off
Navigation Processor	Parker Williams	0	0%	Off

Equipment & Services

Description	Status	Supplied	Invoice	
2D NavPoint Longliner	In transit	1	Yes	Status
SourcePoint DGPS System	In transit	1	Yes	Off Rate= No billing
Navigation Processing System	In transit	1	Yes	In transit/Mobilization=100% rate
				Installed = 100% rate

Comments: General (Local Time)

Time	Comments
	Equipment enrout to NCS Stafford Texas. Expected delivery Monday or Tuesday.

Operations Summary (UTC)

Line	Operation	Seq	SOL SP	EOL SP	KM Shot
			Daily KM		0.0000

APPENDIX E

NCS-Subsea First Line Report

SONGS 2-D High Resolution Seismic Survey Offshore Southern California

August - September 2013



First Line QC

Area: Southern California, 2D

Client: SCRIPPS

Vessel: R/V New Horizon

Report prepared by: Elizabeth Gant

Date: 3th September 2013

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1. Overview

The crew on board the R/V New Horizon supplied the onshore data QC group with a P294 file, offset diagrams, a line log, and the raw P190 file for SEQ 044 to process and verify the integrity of the positioning product that NCS SubSea is delivering to the client, SCRIPPS.

The offsets and parameters in the P2 header were checked against the offset diagrams and reports.

Processing of the data was performed using SeisPos version 19.48. The software checks the P2 for format and data errors and at each stage of the processing produces a statistical summary that can be used to check the quality of the processing.

Further QC of the processed data and a position comparison was conducted using P1Tools version 12.63.

1.1 Summary of Findings

Data quality is good.

The GPS at the head of the streamer was not used so manual observations had to be created to position it. On this sequences the gun GPS dropped out close to the SOL so manual observations were created to position it from SP2119-EOL. The actual gun GPS data was usable from SOL thru SP2118. No tailbuoys are being used on this job.

The comparison between the two vessel positioning systems is very good. The max positioning difference is 0.87m. Both systems are being used for the final positioning.

A couple format violations were found in the P2 header, and are documented in Section 2.2. A couple warnings were also noted and were verified to be inconsequential with the FGPS software developers.

A gyro calibration report is available in the mobilization report, the C-O values of Gyro 1 C-O= - 0.63° & Gyro 2 C-O=0.77°.

2. P2 Compliance

2.1 General

There are a couple format violations and warnings that have been found to be inconsequential to the processing. Manual observations were created for the Gun GPS since the GPS pod went out shortly after the SOL, as well as for positioning the head of the streamer. Both sets of observations were linked to their associated towpoint instead of the center of stern.

2.2 Format violations

FORMAT VIOLATION: line 96 col [62,62]
T6202004110332019.676N1173716.804W 8.6110 0133 20426060
-The program is reading that the reference station used is 0 instead of 138. Normally they start at 1. FGPS has verified that this will not affect the processing in any way.

FORMAT VIOLATION: line 200 col [42,43]
T6202004330332020.239N1173716.324W -0.6100 60426150
- The program is reading that the satellites used is 00. This should have been left blank. FGPS has verified that this will not affect the processing in any way.

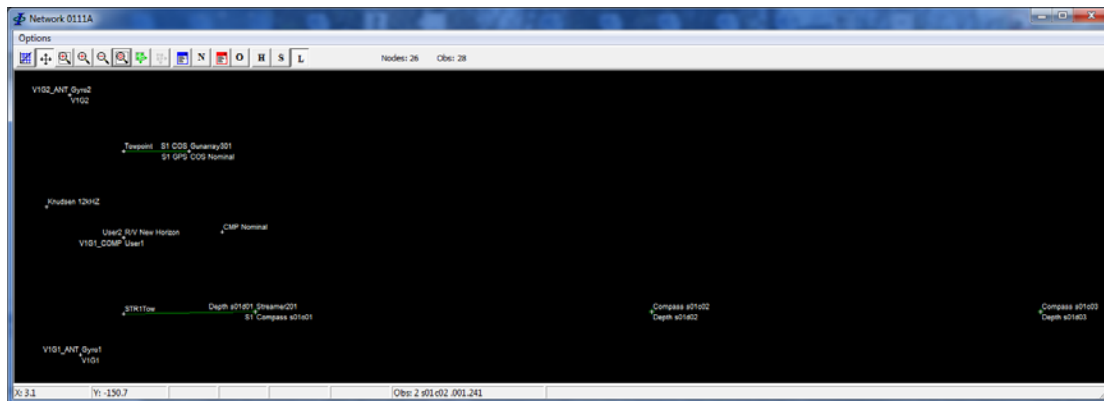
2.3 Warnings

WARNING: survey datum transformation is not from satellite datum
WARNING: shotpoint 3039 to 3039 missing
-The survey datum transformation is of no issue since the two datums defined are identical.

2.4 Offsets

A visual check of the Network diagram generated from the P2 was carried out before checking the offsets in the P2 against the diagrams provided.

2.4.1 SeisPos Network



2.4.2 Offset Discrepancies

Vessel

None

Streamer

None

Source

None

Tailbuoys

None

2.5 Header

The following were verified:

- Geodetics – Verified parameters using Blue Marble Geographic Calculator
- Gyro correction – Gyro 1 C-O= -0.63° & Gyro 2 C-O= 0.77° as outlined in the Mobilization report under the Gyro Calibration section.
- Line Calculations mode – Not Listed in Header, Should be a Comment after the Line Parameters.
- Magnetic Variation – correct, checked using the NOAA online calculator.
- SOL / EOL coordinates – correct per preplots titled “520 West Coast 2D Hi Res 2013 Preplot SOLEOL_V_rev2”
- Speed of Sound – no TSdip taken 1500m/s used for the echsounder.

3.0 Data Quality

Seispos preconditioning reports: [Report_files\precon.00.txt](#) and [Report_files\procparm.00.txt](#)

3.1 Echosounders

- One unit, echosounder lost bottom for entire line is stated in the Nav Line Log. The data has sharp jumps that are inconsistent with historic data for the area. Historical data shows the preplot line should start at approximately 65m depth and the EOL should be approximately 630m depth. While the SOL is believable, most of the line is considerably deeper than 630m. The echosounder data for this line should be rejected, but for the FLQC it has been repaired to the best of our ability and used.

3.2 Compasses

- Data is good.
- All compass biases $< 1^{\circ}$, see [Report_files\compbias.00.txt](#)

3.3 Depth sensors

- Depth sensors are not functional.

3.4 Acoustics

- None

3.5 Gyro

- 2 Gyros, data looks good. Gyro 1 used for final data.
- See plots [Report_files\seq0044_0_Gyro_Comparison_rv1.pdf](#)

3.6 Vessel Position

- Two DGPS system, no drop-outs. V1G1 & V1G2 used for final processing.
- Position differences between the two systems are up to 0.87m (mean 0.25m). Looking at the DGPS height plots, it would appear that V1G2 gets a little jumpy towards the EOL.
- See plots [Report_files\seq0044_0_DGPS_Comparison_rv1.pdf](#)

3.7 Gun DGPS

- Only 1 gun present.
- Data drops out at SP2220, but data starts getting bad at SP2118. Manual observations created to the Gun array were used after SP2118.

3.8 Head of Streamer DGPS

- None
- 2D nodes and observations to the Streamer head were used for processing.

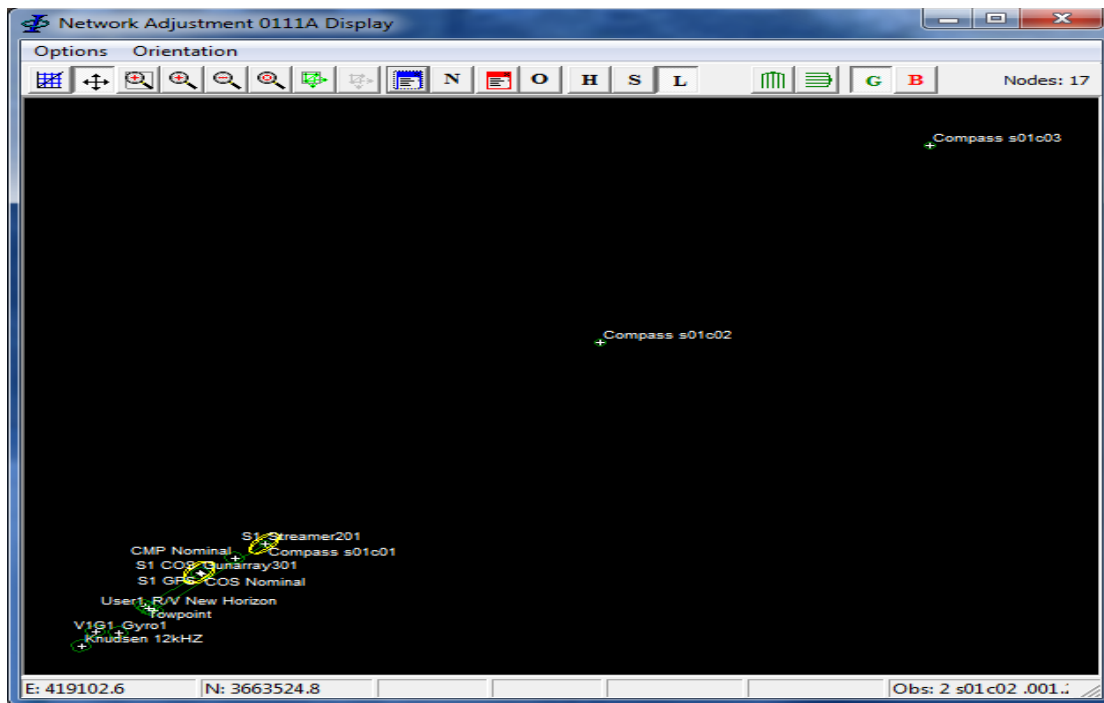
4.0 Network Processing

4.1 Network Map

The Gun GPS dropped out at approximately SP2220, but the data showed inconsistency starting before that. To process the line manual observations were used to position the gun after SP2118.

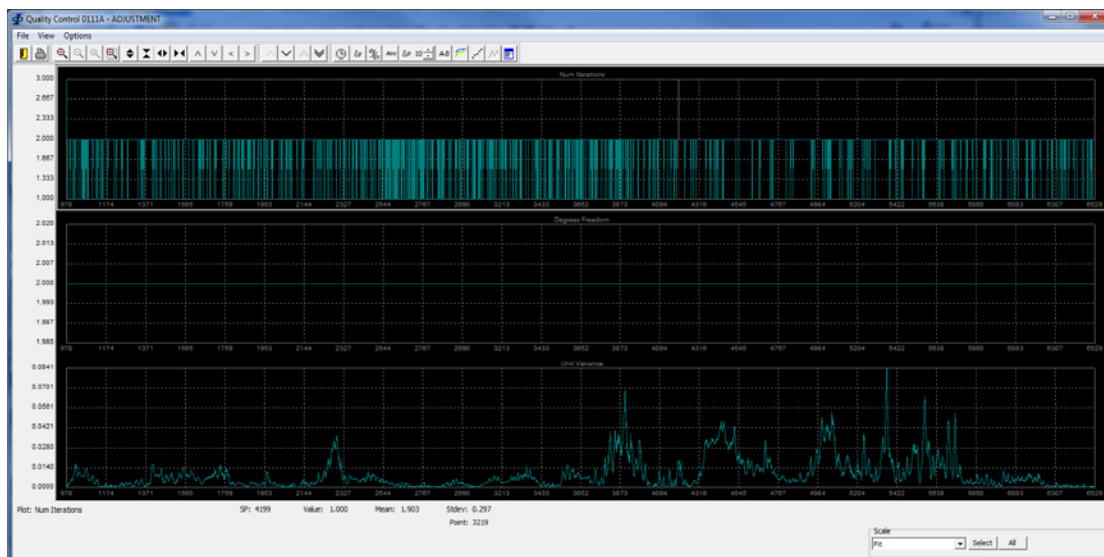
There is no GPS on the head of the streamers so manual observations were used to position the head of the streamer for the entire line.

V1G1 & V1G2 were used for vessel positioning. The max deviation between the two systems was .87m.



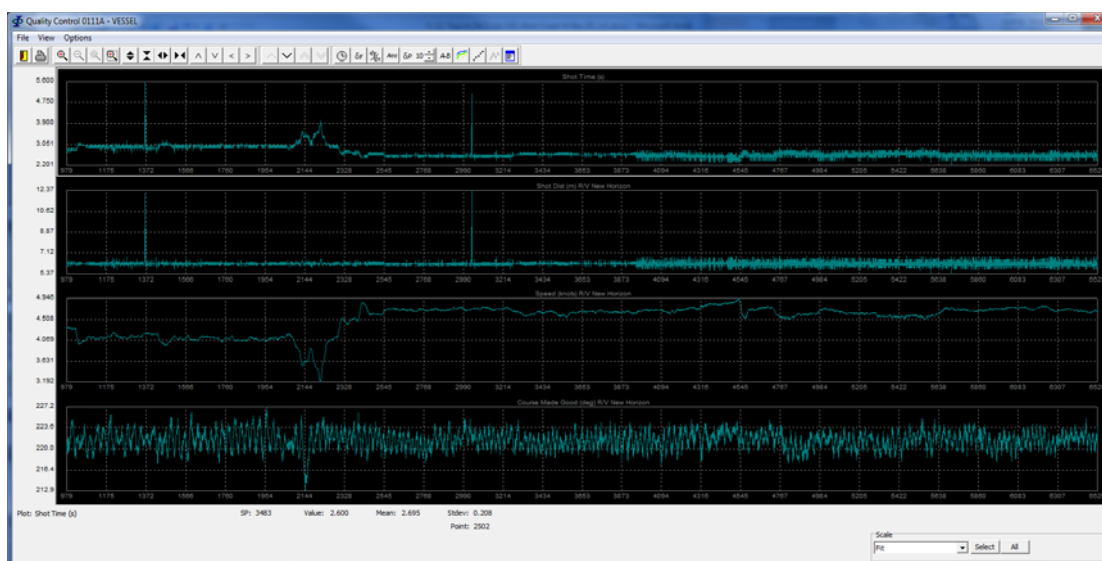
4.2 QC Adjustment

The UV is good, with a max of 0.08 and a mean of 0.009.



4.3 QC Vessel

Shot distance is fairly steady with a mean of 6.26m. Two spikes are noticeable at SP 1367 & 3042; which can be attributed to the 2 missed shotpoints from the line log.



4.4 Semi-major Axes

SMA's are acceptable.

line: 0111A

Num	Name	Mean	Min	Max	Stdev
0	R/V New Horizon	2.601	2.601	2.601	0.000
1	Knudsen 12kHz	2.613	2.613	2.613	0.000
2	Streamer201	5.548	5.548	5.548	0.000
9	Gunarray301	5.541	5.540	5.542	0.000
10	Gyrol	2.613	2.613	2.613	0.000
11	Towpoint	2.613	2.613	2.613	0.000
12	COS Nominal	2.613	2.613	2.613	0.000
13	CMP Nominal	2.613	2.613	2.613	0.000
14	User1	2.613	2.613	2.613	0.000
15	User2	2.613	2.613	2.613	0.000
17	STR1Tow	2.613	2.613	2.613	0.000
18	S1	5.922	5.851	5.990	0.026
19	S1 COS	5.472	5.453	5.497	0.004
20	S1 GPS	6.107	5.998	6.202	0.036
21	V1G1	2.601	2.601	2.601	0.000
22	V1G2	2.601	2.601	2.601	0.000
28	V1SC	2.613	2.613	2.613	0.000

4.5 Offsets

Offset QC plot FLQC P190: [Report files\P190 Offsets Seq044 0111A EMG rv1.pdf](#)

The calculated offsets were checked against the nominal values:

0111A-Seq044

From	To	Mean dist	Min dist	Max dist	Nominal
V1	S11	-24.9	-25.3	-24.4	25.0
V1	R0001S1	-49.8	-50.0	-49.2	50.0



S11	R0001S1	-24.9	-25.5	-24.3	25.0
R0001S1	R0048S1	-293.3	-293.8	-288.8	293.75

All calculated offsets are good when compared with the nominal values.

4.6 Node Stability

Node positions were checked for positioning errors. Node positioning was ok for the whole line.

Node QC plot FLQC P190: [Report files\P190 Nodes Seq044 0111A EMG rv1.pdf](#)

5.0 P190 Compliance

5.1 Integrity Checks

The Crew P190 was checked for the following:

- No. Vessels
- No. Streamers
- No. Receivers/Streamer
- Source Sequence
- Shot No. Increment
- Format checking of the header and each shot of the line

Format exceptions:

Header line 35 col [33,36]
H1800PROJECTION TYPE 001 UTM North

These records are mandatory even if "N/A". No other exceptions were found.

SP Interval Exceptions:

Missing between shots 1364 and 1366
Missing between shots 3038 and 3040

Depth reference in the P190 is Sea Level.

6.0 P190 Comparison

A compare was done between the Office processed P190 and the Crew processed P190. The two files compared very well for all nodes and receivers. All mean values are less than 0.7m.

Compare QC plot FLQC P190: [Report files\P190 Compare Seq044 Office Vs Crew.pdf](#)

APPENDIX F

NCS-Subsea Vessel Offset Diagrams

SONGS 2-D High Resolution Seismic Survey Offshore Southern California

August - September 2013

Vessel : R/V New Horizon
Client : Subsea Systems/SCRIPPS
Project : 2D Hi Res SONGS
Area : Southern California
Start Date : 16 August 2013



[Vessel Sensor Offsets](#)

[Towing Offsets](#)

[Towing Configuration](#)

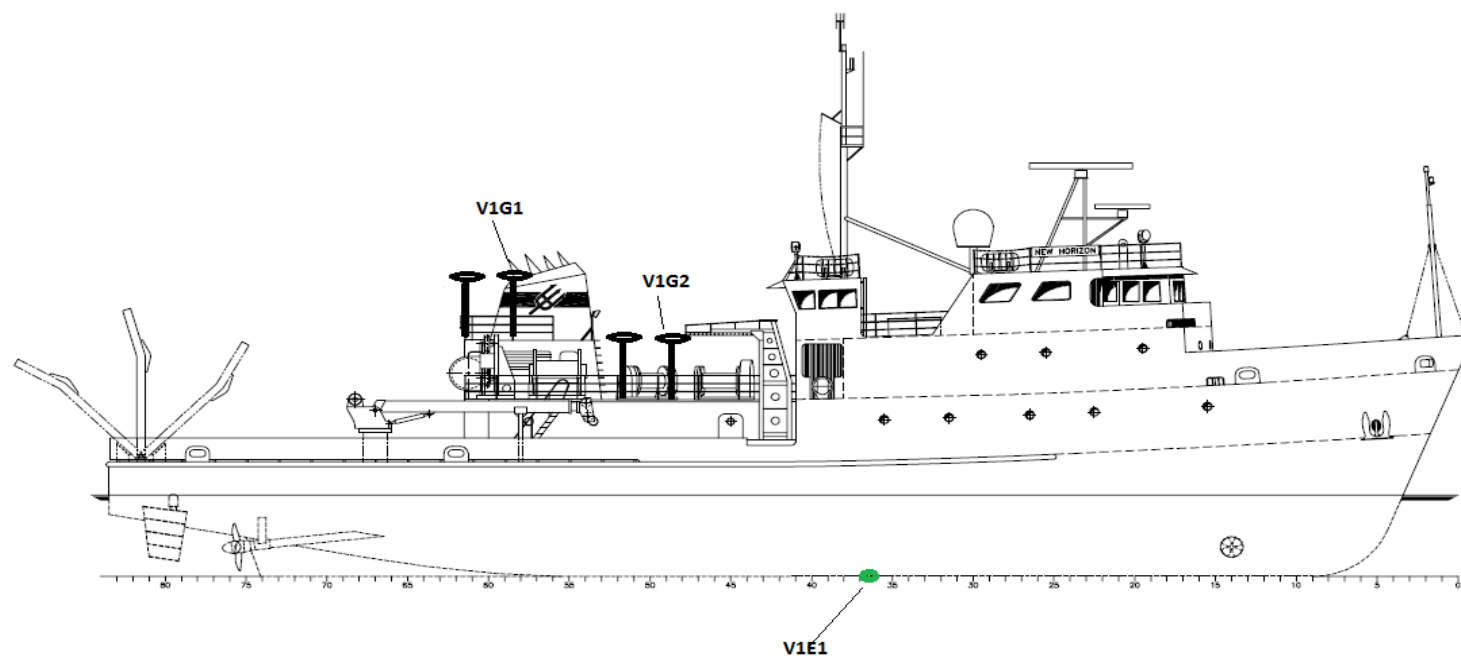
[Compass Offsets](#)

[Timing](#)

[Revision History](#)



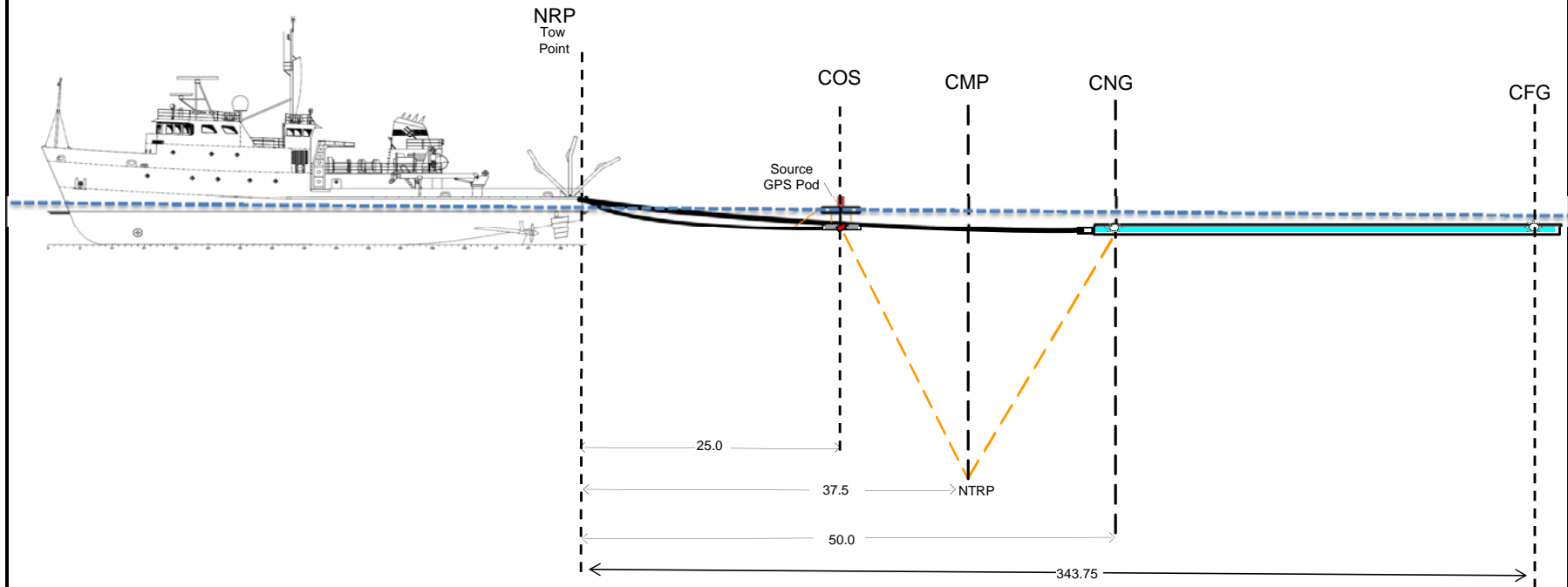
R/V New Horizon - Vessel Sensor Offsets



All measurements in meters

		STBD/PORT (X)	FORE/AFT (Y)	UP/DOWN (Z)
NRP	NAVIGATION REFERENCE POINT (Stern Center, waterline)	0.00	0.00	0.00
V1G1, V1GY1	Trimble SPS 361 - Primary	-2.34	16.07	8.35
V1G2, V1GY2	Trimble SPS 361 - Secondary	2.80	20.29	5.85
V1E1	Knudsen 3260 12KHz	0.60	29.00	-3.00

R/V New Horizon - Towing Offsets

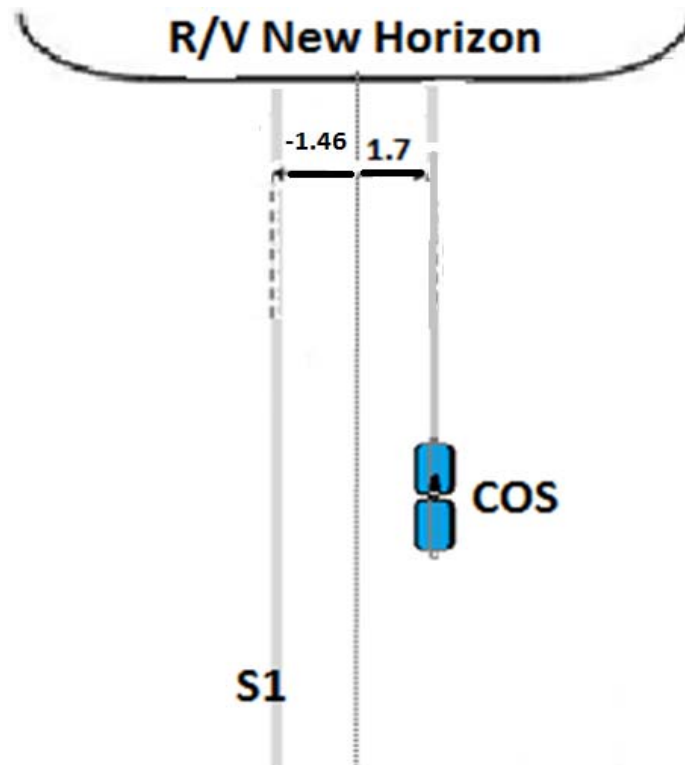


Principal Distances		Principal Offsets		Used as	Acronyms	
NRP-Stern	0.00	COS-CNG	25.00	Calculated	NRP	Nav Reference Point (centre of mast at sea level)
Stern-COS	25.00	NRP-NTRP	37.50	Offset from NRP	COS	Centre of Source
Stern-CNG	50.00	NRP-CNG	75.00	Layback	CNG	Centre of Near Group (Trace # 001)
Stern-CFG	343.75				CMP	Common Mid-Point
					NTRP	Near Trace Reflection Point
					CFG	Center of Far Group (Trace #004)

All measurements in meters

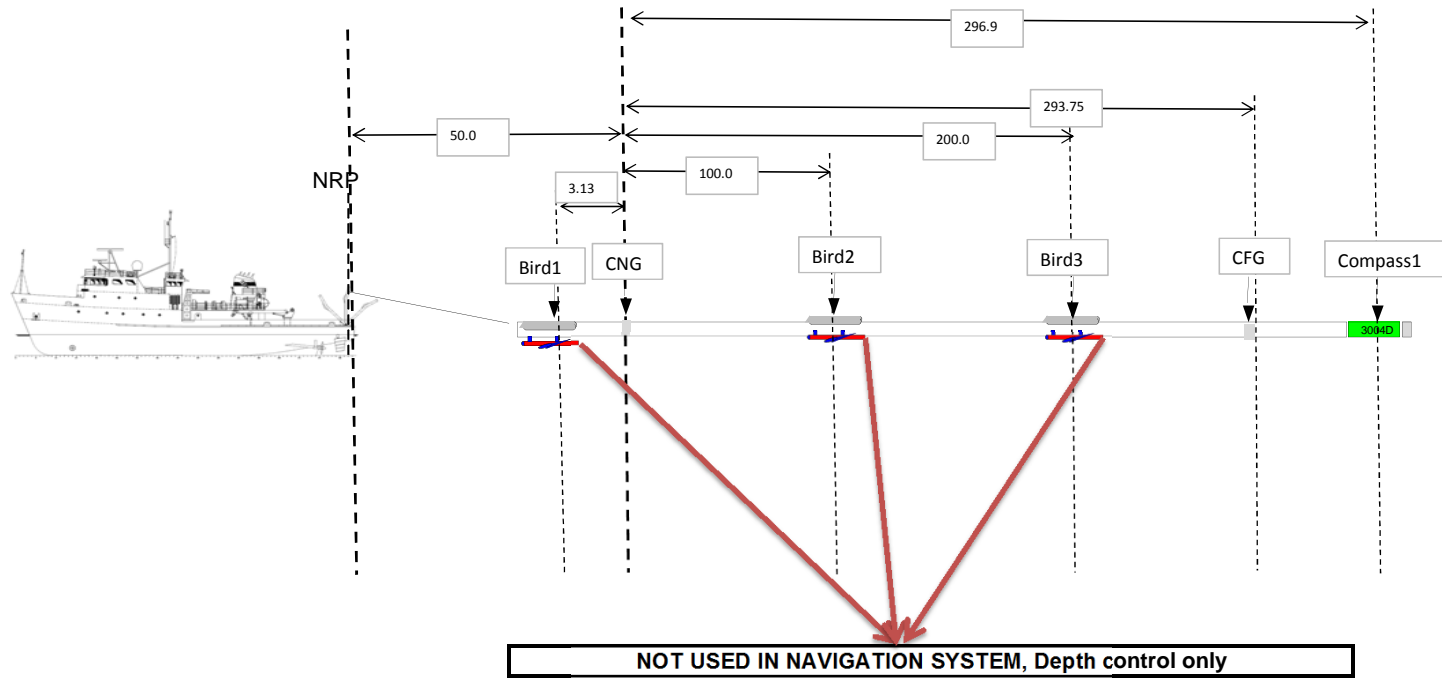
R/V New Horizon - Towing Configuration

Object	From NRP		
	X	Y	Z
S1 TowPoint	-1.46	0.00	1.10
COS TowPoint	1.70	0.00	1.10
COS Nominal	1.70	-25.00	-2.00
CMP Nominal	0.12	-37.50	-2.00
CNG Nominal	-1.46	-50.00	-2.00



All measurements in meters

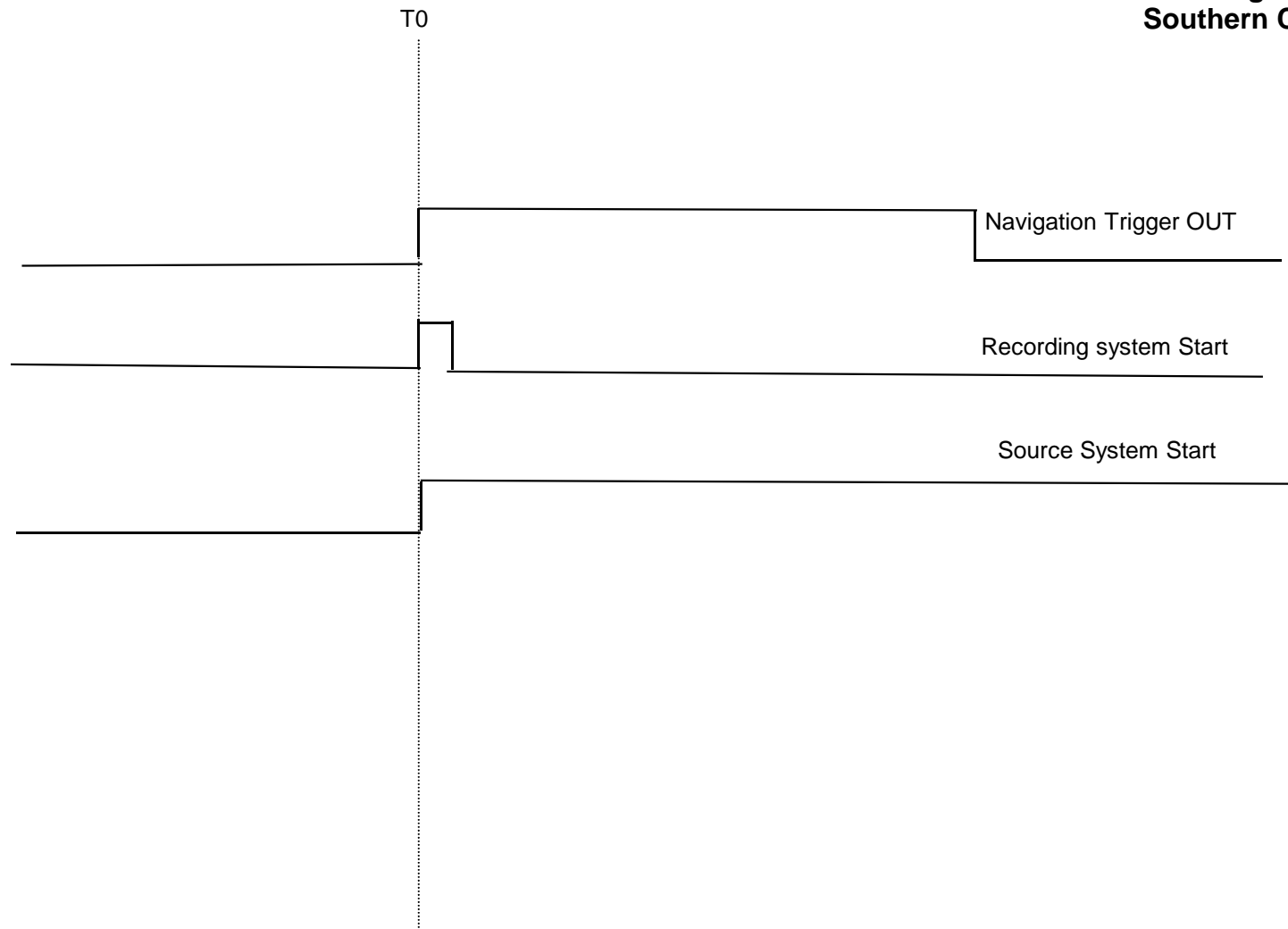
R/V New Horizon Compass Offsets



All Measurements in meters, not to scale

R/V New Horizon Timing Diagram

16 August 2013
Southern California



Revision	Date Applied	Seq applied	Changes made
rev0	16-Aug-13	Seq044 onward	original configuration

Vessel : R/V New Horizon
Client : Subsea Systems/SCRIPPS
Project : 2D Hi Res SONGS
Area : Southern California
Start Date : 16 August 2013



[Vessel Sensor Offsets](#)

[Towing Offsets](#)

[Towing Configuration](#)

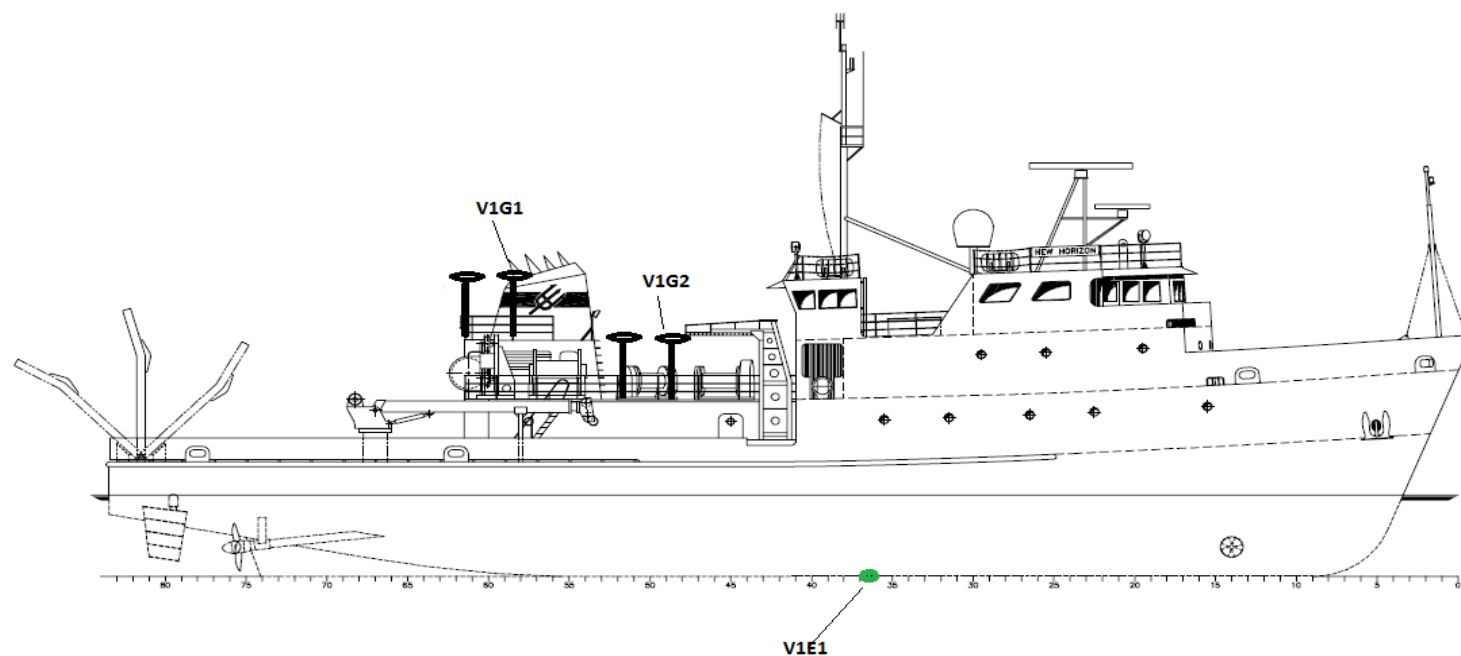
[Compass Offsets](#)

[Timing](#)

[Revision History](#)



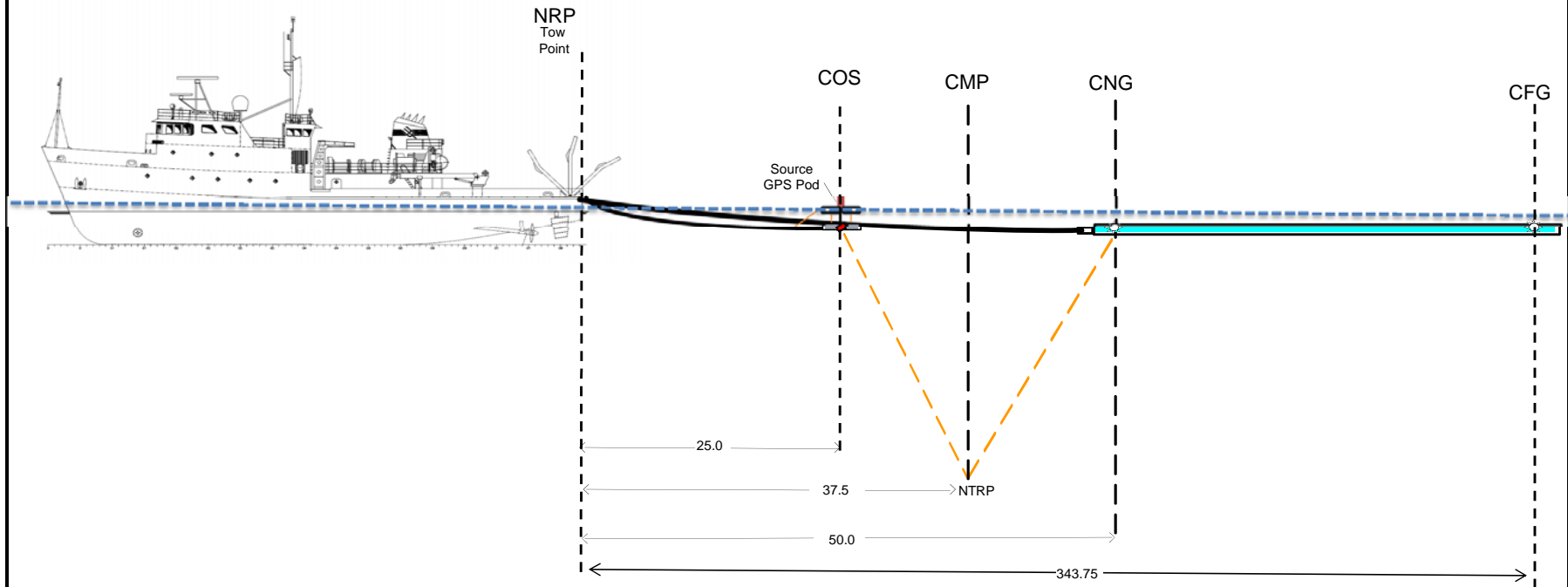
R/V New Horizon - Vessel Sensor Offsets



All measurements in meters

		STBD/PORT (X)	FORE/AFT (Y)	UP/DOWN (Z)
NRP	NAVIGATION REFERENCE POINT (Stern Center, waterline)	0.00	0.00	0.00
V1G1, V1GY1	Trimble SPS 361 - Primary	-2.34	16.07	8.35
V1G2, V1GY2	Trimble SPS 361 - Secondary	2.80	20.29	5.85
V1E1	Knudsen 3260 12KHz	0.60	29.00	-3.00

R/V New Horizon - Towing Offsets

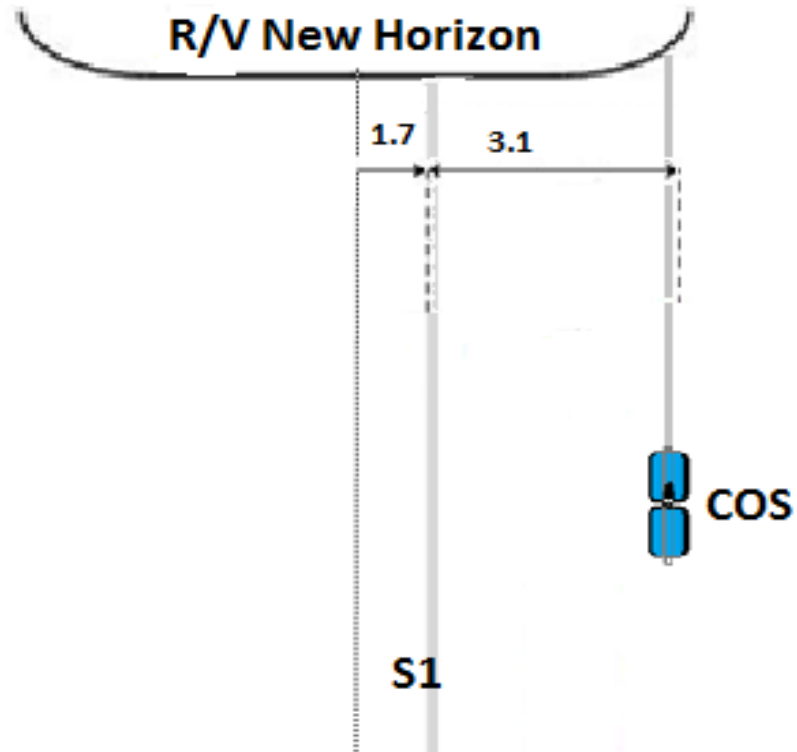


Principal Distances		Principal Offsets		Used as	Acronyms	
NRP-Stern	0.00	COS-CNG	25.00	Calculated	NRP	Nav Reference Point (centre of mast at sea level)
Stern-COS	25.00	NRP-NTRP	37.50	Offset from NRP	COS	Centre of Source
Stern-CNG	50.00	NRP-CNG	75.00	Layback	CNG	Centre of Near Group (Trace # 001)
Stern-CFG	343.75				CMP	Common Mid-Point
					NTRP	Near Trace Reflection Point
					CFG	Center of Far Group (Trace #004)

All measurements in meters

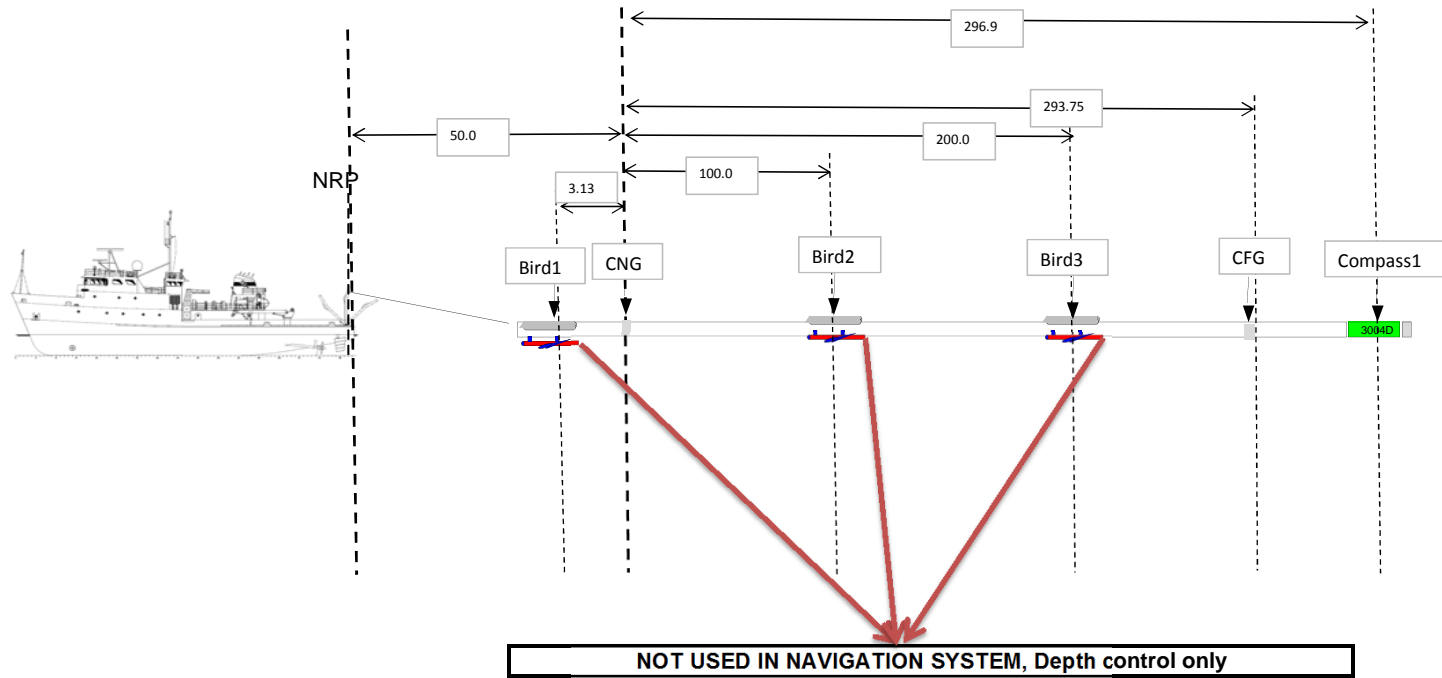
R/V New Horizon - Towing Configuration

Object	From NRP		
	X	Y	Z
S1 TowPoint	1.70	0.00	1.10
COS TowPoint	3.10	0.00	1.10
COS Nominal	3.10	-25.00	-2.00
CMP Nominal	2.40	-37.50	-2.00
CNG Nominal	1.70	-50.00	-2.00

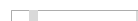


All measurements in meters

R/V New Horizon Compass Offsets



 Digicourse 5010
 Digicourse 5011
 Bird Float

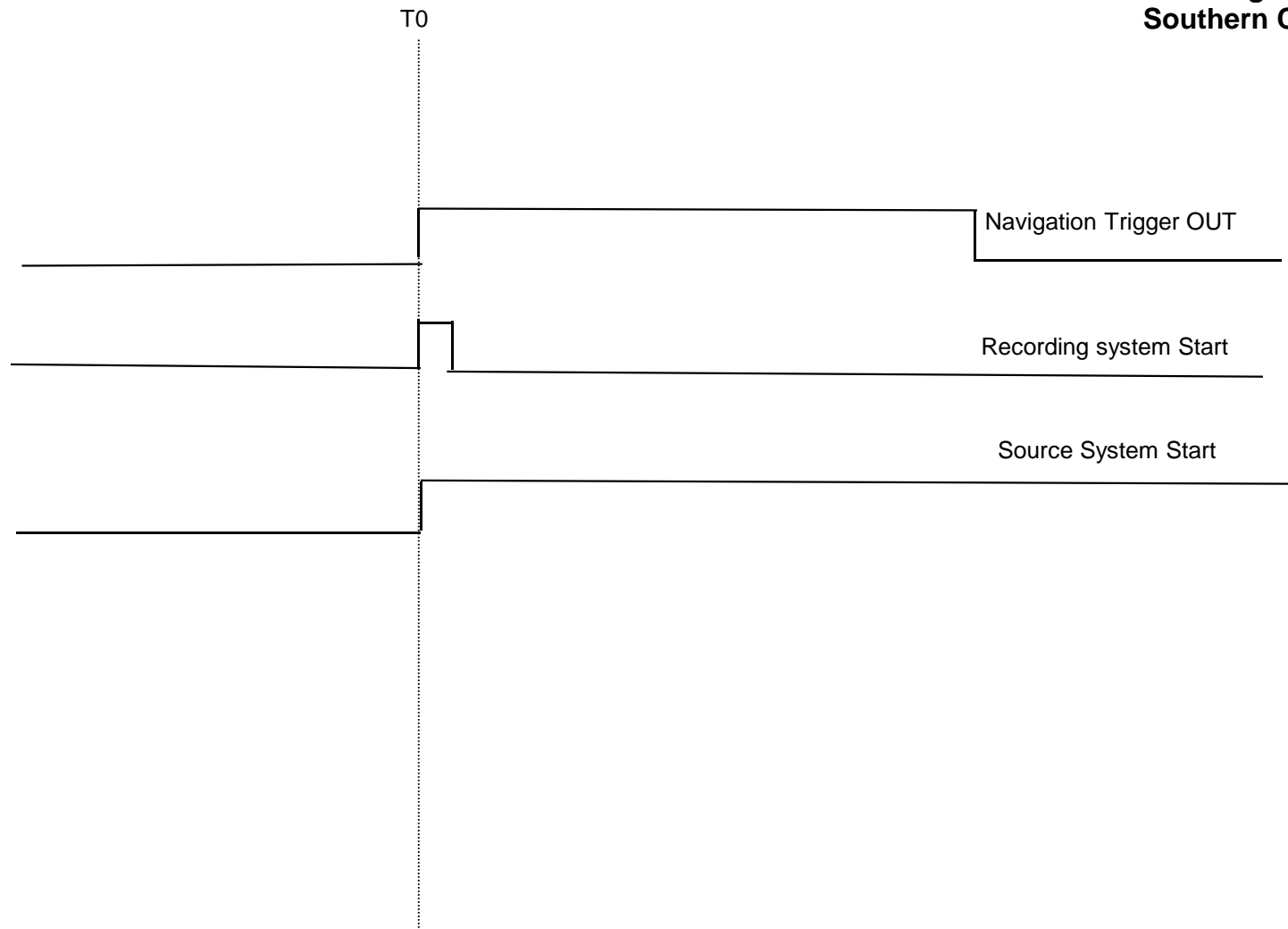
 Active Section (300m)
 Spartan 3004D Compass

 Stretch
 Stretch Section

All Measurements in meters, not to scale

R/V New Horizon Timing Diagram

16 August 2013
Southern California



Revision	Date Applied	Seq applied	Changes made
Original rev1	16-Aug-13 18-Aug-13	Seq044 onward Seq050 onward	original configuration Moved towpoints to Stbd

Vessel : R/V New Horizon
Client : Subsea Systems/SCRIPPS
Project : 2D Hi Res SONGS
Area : Southern California
Start Date : 16 August 2013



[Vessel Sensor Offsets](#)

[Towing Offsets](#)

[Towing Configuration](#)

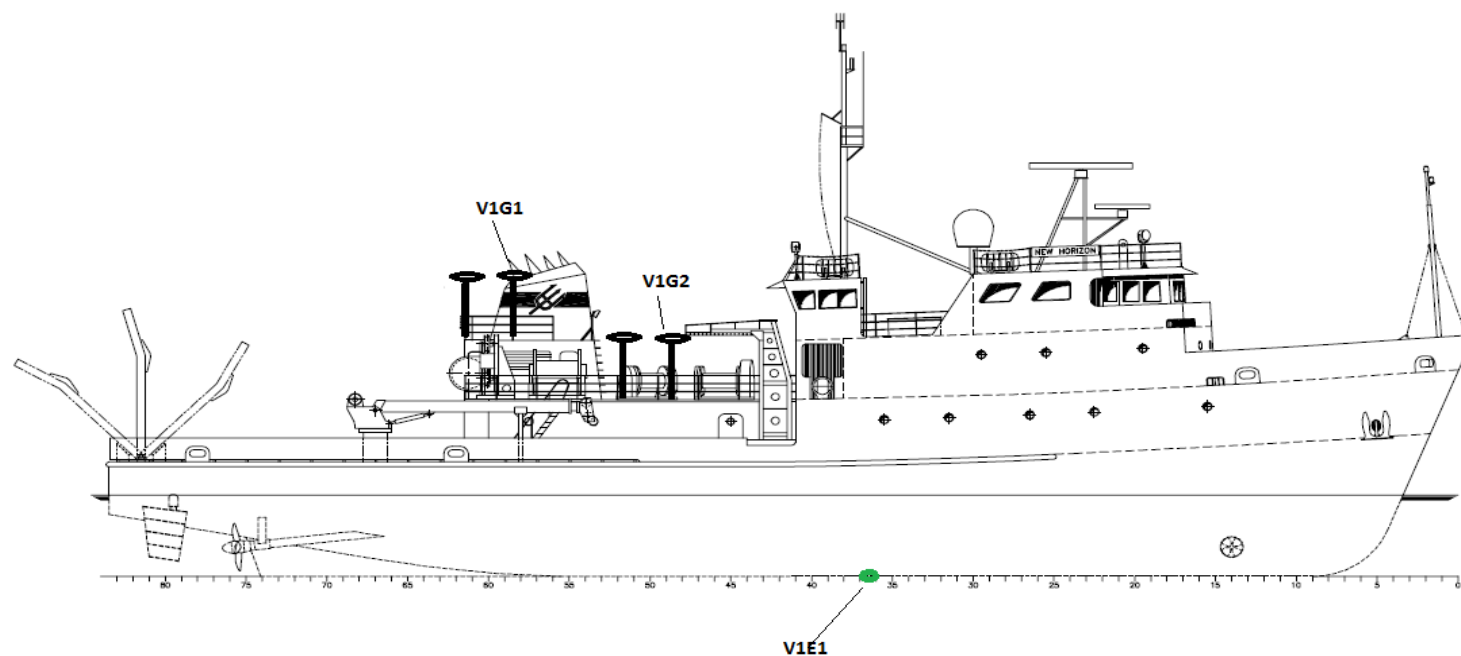
[Compass Offsets](#)

[Timing](#)

[Revision History](#)



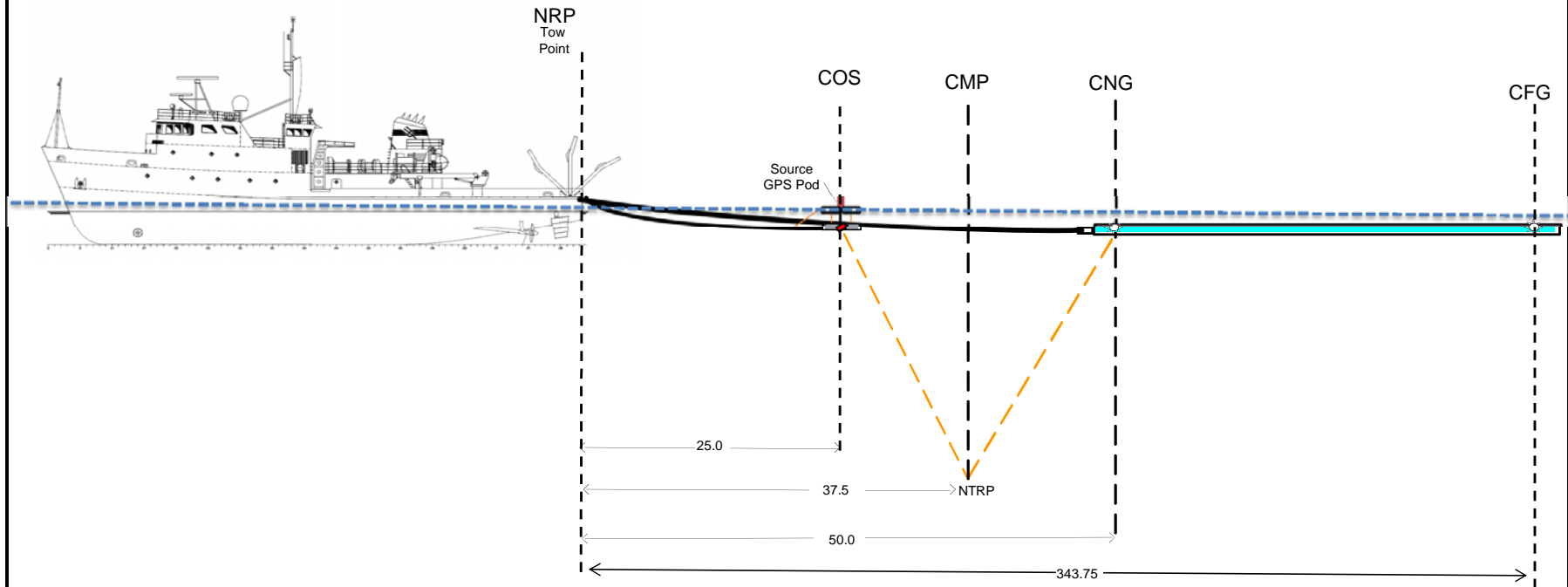
R/V New Horizon - Vessel Sensor Offsets



All measurements in meters

		STBD/PORT (X)	FORE/AFT (Y)	UP/DOWN (Z)
NRP	NAVIGATION REFERENCE POINT (Stern Center, waterline)	0.00	0.00	0.00
V1G1, V1GY1	Trimble SPS 361 - Primary	-2.34	16.07	8.35
V1G2, V1GY2	Trimble SPS 361 - Secondary	2.80	20.29	5.85
V1E1	Knudsen 3260 12KHz	0.60	29.00	-3.00

R/V New Horizon - Towing Offsets

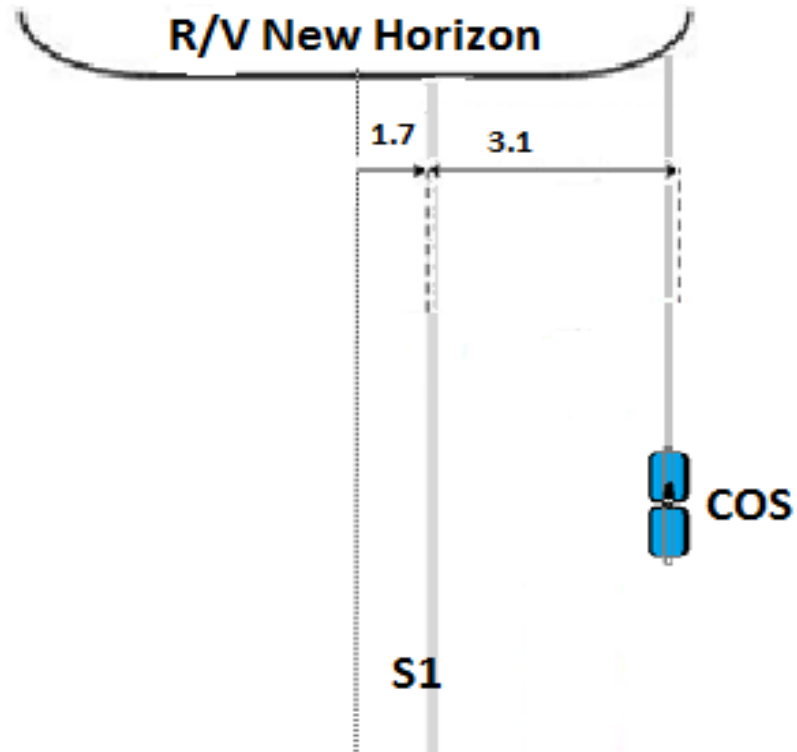


Principal Distances		Principal Offsets		Used as	Acronyms	
NRP-Stern	0.00	COS-CNG	25.00	Calculated	NRP	Nav Reference Point (centre of mast at sea level)
Stern-COS	25.00	NRP-NTRP	37.50	Offset from NRP	COS	Centre of Source
Stern-CNG	50.00	NRP-CNG	75.00	Layback	CNG	Centre of Near Group (Trace # 001)
Stern-CFG	343.75				CMP	Common Mid-Point
					NTRP	Near Trace Reflection Point
					CFG	Center of Far Group (Trace #004)

All measurements in meters

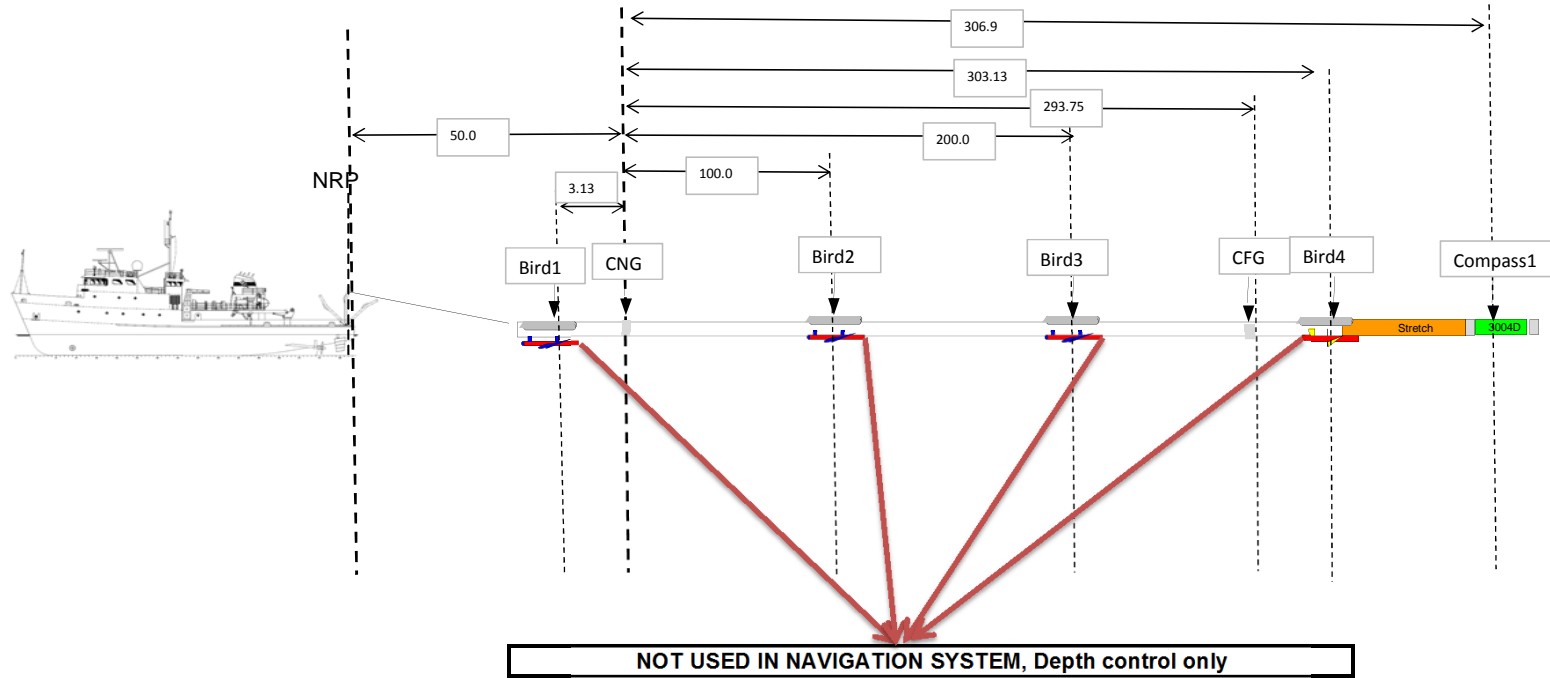
R/V New Horizon - Towing Configuration

Object	From NRP		
	X	Y	Z
S1 TowPoint	1.70	0.00	1.10
COS TowPoint	3.10	0.00	1.10
COS Nominal	3.10	-25.00	-2.00
CMP Nominal	2.40	-37.50	-2.00
CNG Nominal	1.70	-50.00	-2.00



All measurements in meters

R/V New Horizon Compass Offsets



 Digicourse 5010
 Digicourse 5011
 Bird Float

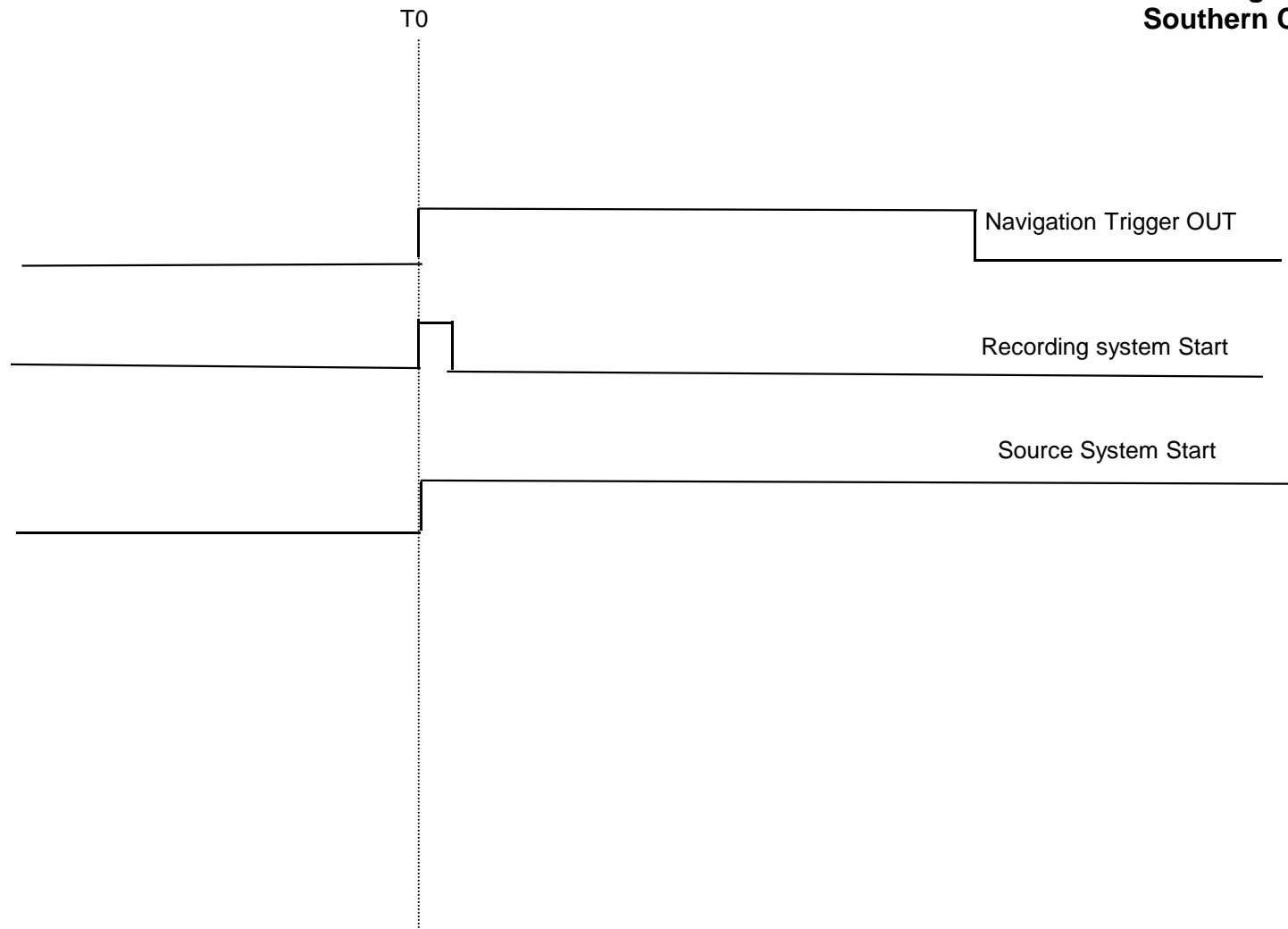
 Active Section (300m)
 Spartan 3004D Compass

 Stretch
 Stretch Section

All Measurements in meters, not to scale

R/V New Horizon Timing Diagram

16 August 2013
Southern California



Revision	Date Applied	Seq applied	Changes made
rev0	16-Aug-13	Seq044 onward	original configuration
rev1	18-Aug-13	Seq050 onward	Moved towpoints to Stbd
rev2	20-Aug-13	Seq072 onward	Added Stretch on tail of streamer and Digi Compass 4

Vessel : R/V New Horizon
Client : Subsea Systems/SCRIPPS
Project : 2D Hi Res SONGS
Area : Southern California
Start Date : 16 August 2013



[Vessel Sensor Offsets](#)

[Towing Offsets](#)

[Towing Configuration](#)

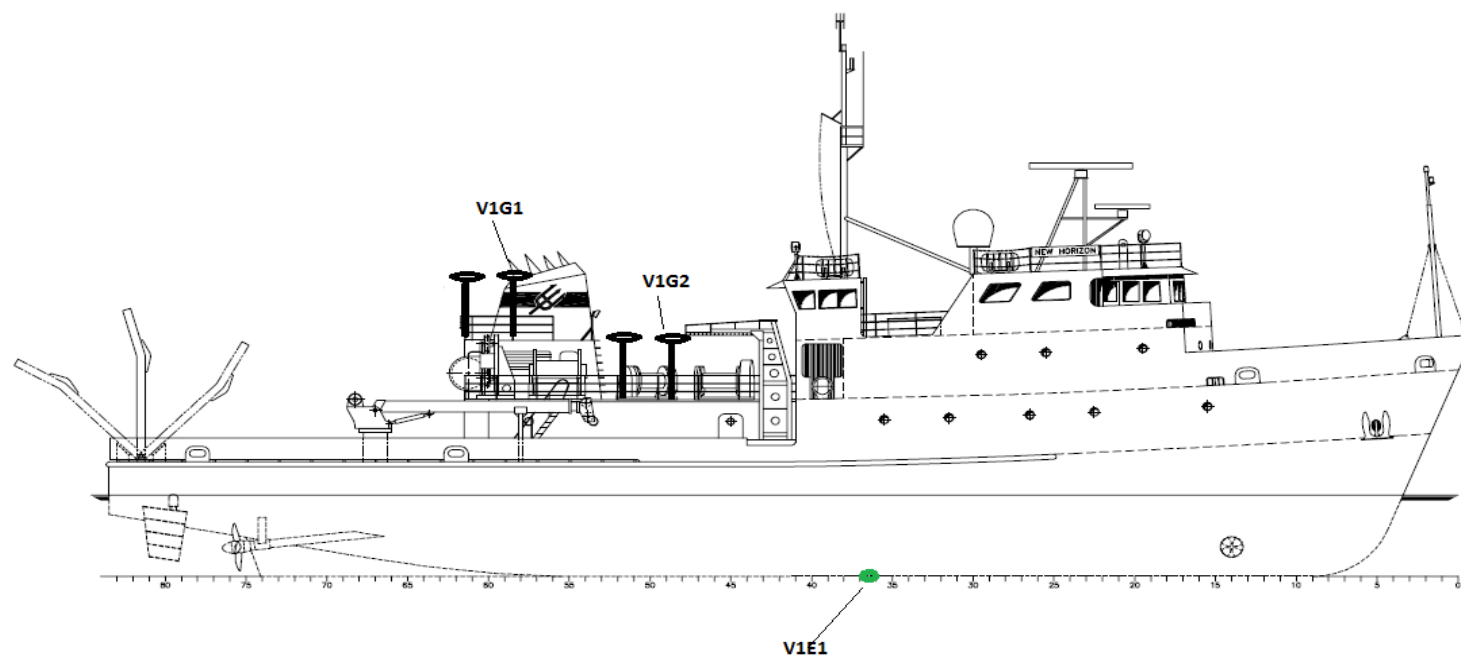
[Compass Offsets](#)

[Timing](#)

[Revision History](#)



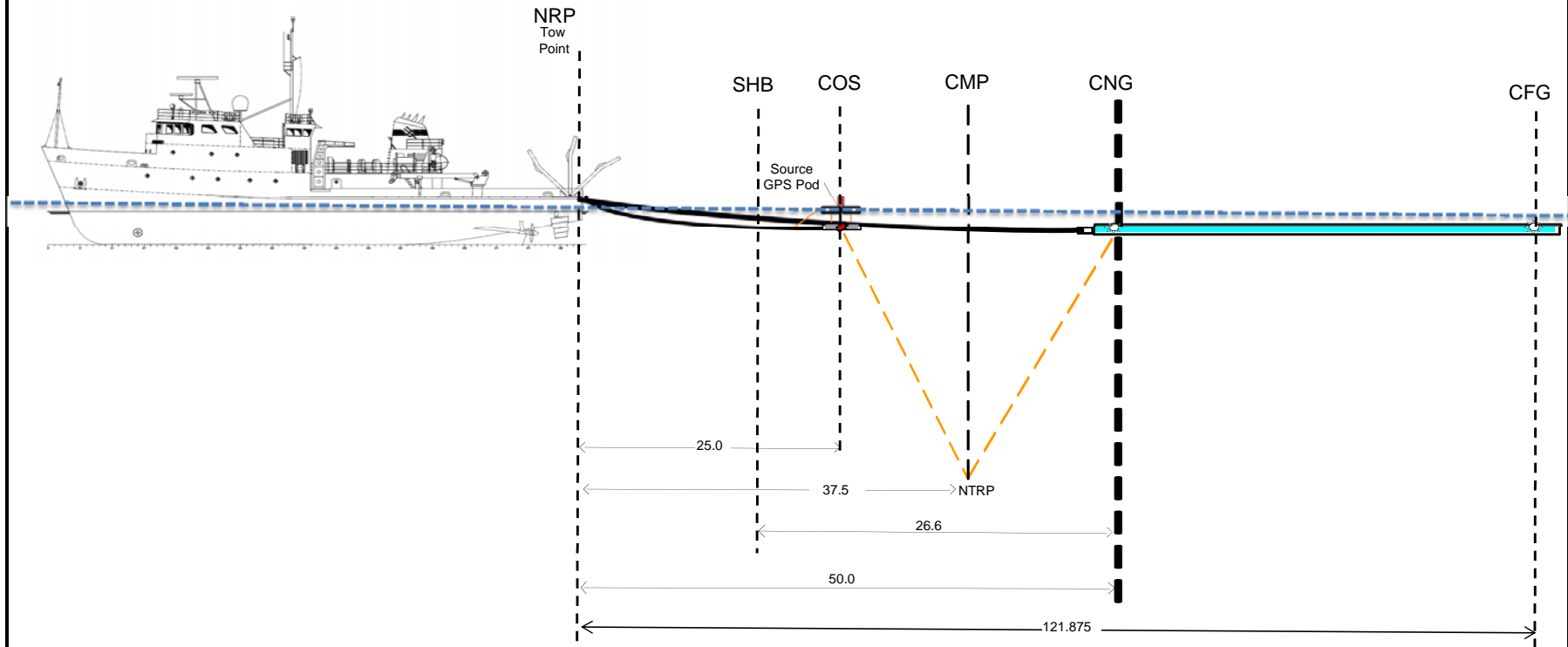
R/V New Horizon - Vessel Sensor Offsets



All measurements in meters

		STBD/PORT (X)	FORE/AFT (Y)	UP/DOWN (Z)
NRP	NAVIGATION REFERENCE POINT (Stern Center, waterline)	0.00	0.00	0.00
V1G1, V1GY1	Trimble SPS 361 - Primary	-2.34	16.07	8.35
V1G2, V1GY2	Trimble SPS 361 - Secondary	2.80	20.29	5.85
V1E1	Knudsen 3260 12KHz	0.60	29.00	-3.00

R/V New Horizon - Towing Offsets

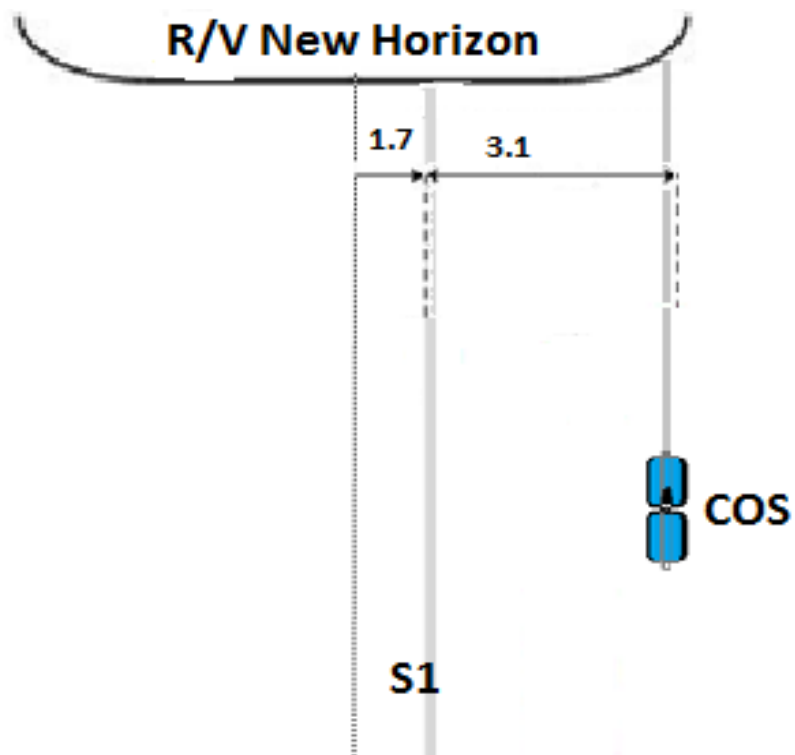


Principal Distances		Principal Offsets		Used as	Acronyms	
NRP-Stern	0.00	COS-CNG	25.00	Calculated	NRP	Nav Reference Point (centre of mast at sea level)
Stern-COS	25.00	NRP-NTRP	37.50	Offset from NRP	COS	Centre of Source
Stern-CNG	50.00	NRP-CNG	50.00	Layback	CNG	Centre of Near Group (Trace # 001)
Stern-CFG	121.88	SHB-CNG	26.60	Offset from SHB	CMP	Common Mid-Point
					NTRP	Near Trace Reflection Point
					CFG	Center of Far Group (Trace #004)
					SHB	Streamer Head Buoy

All measurements in meters

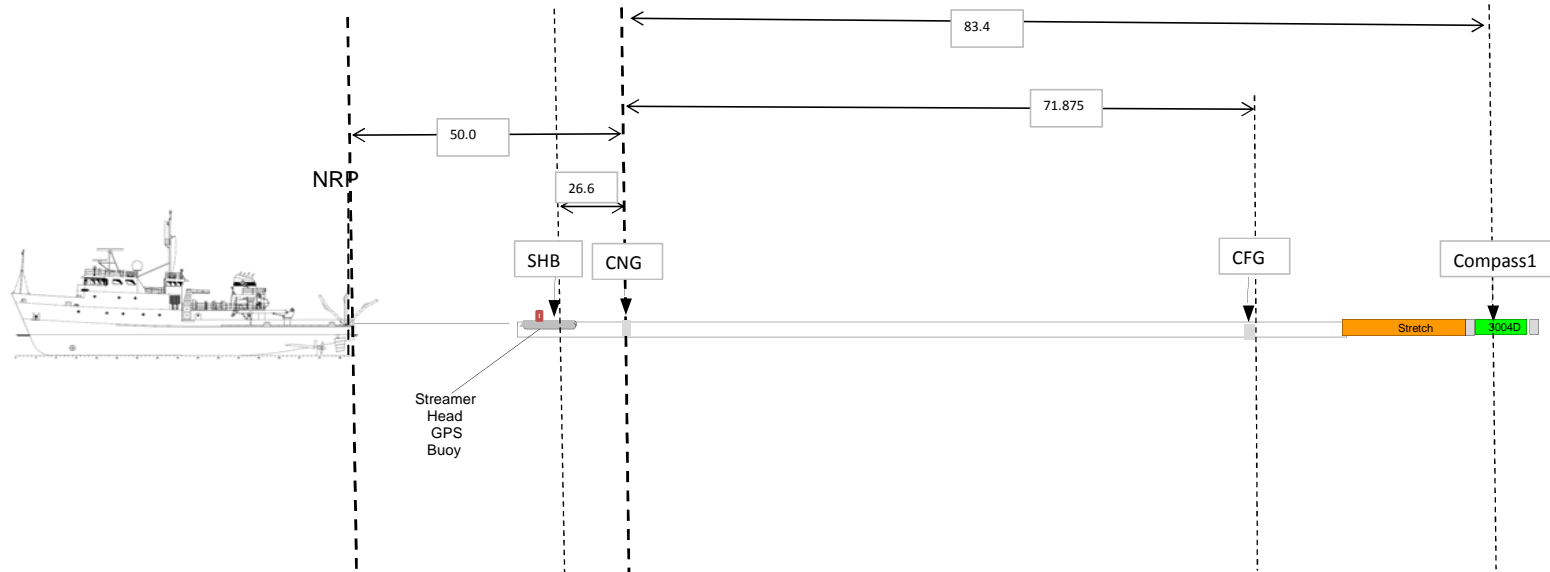
R/V New Horizon - Towing Configuration

Object	From NRP		
	X	Y	Z
S1 TowPoint	1.70	0.00	1.10
COS TowPoint	3.10	0.00	1.10
COS Nominal	3.10	-25.00	-1.00
CMP Nominal	2.40	-37.50	-1.00
CNG Nominal	1.70	-50.00	-1.00



All measurements in meters

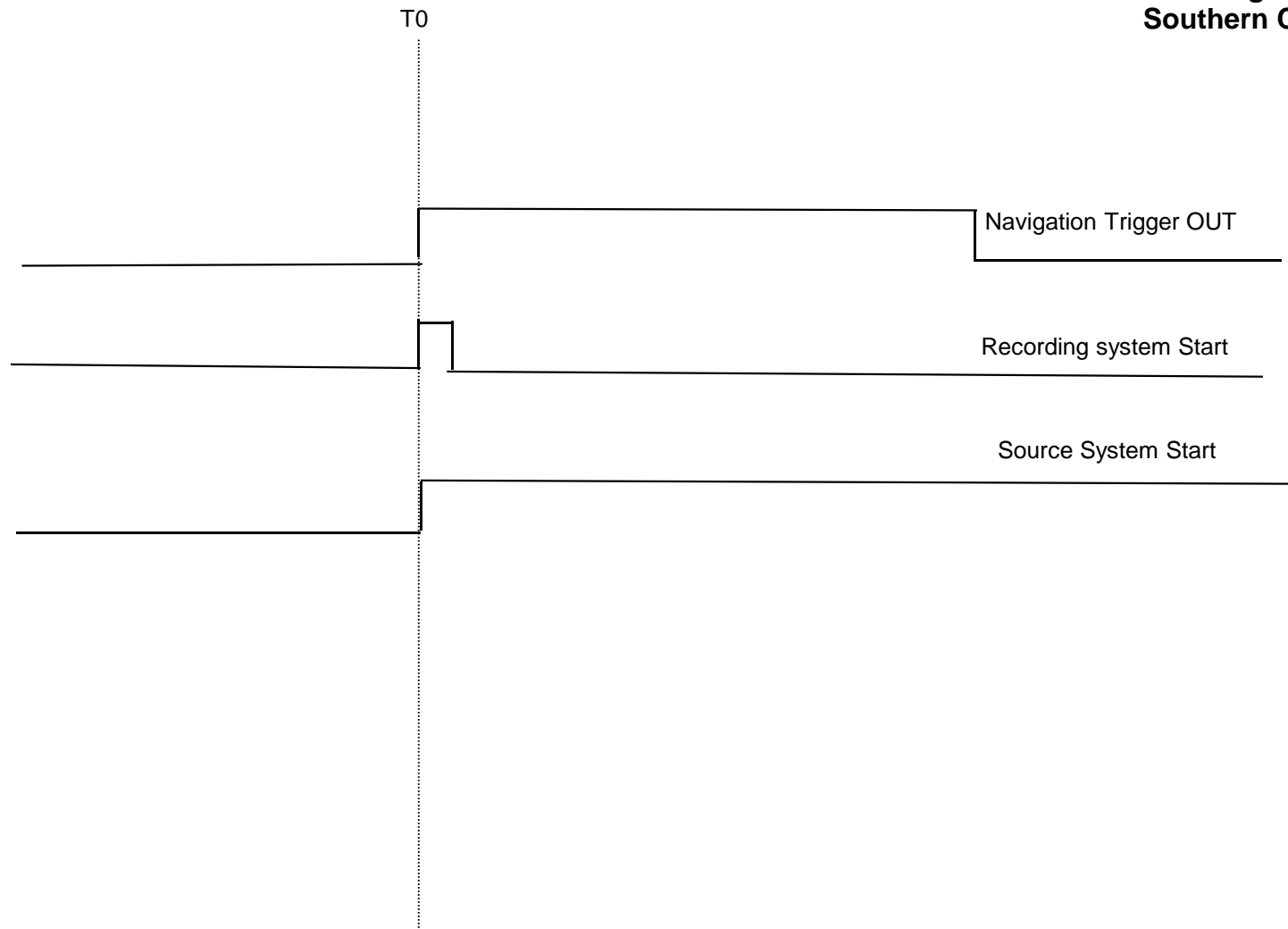
R/V New Horizon Compass Offsets



All Measurements in meters, not to scale

R/V New Horizon Timing Diagram

16 August 2013
Southern California



Revis	Date Applied	Seq applied	Changes made
rev0	16-Aug-13	Seq044 onward	original configuration
rev1	18-Aug-13	Seq050 onward	Moved towpoints to Stbd
rev2	20-Aug-13	Seq072 onward	Added Stretch on tail of streamer and Digi Compass 4
rev3	27-Aug-13	Seq110&111 only	75mtr streamer, no birds and gps head buoy added

Vessel : R/V New Horizon
Client : Subsea Systems/SCRIPPS
Project : 2D Hi Res SONGS
Area : Southern California
Start Date : 16 August 2013



[Vessel Sensor Offsets](#)

[Towing Offsets](#)

[Towing Configuration](#)

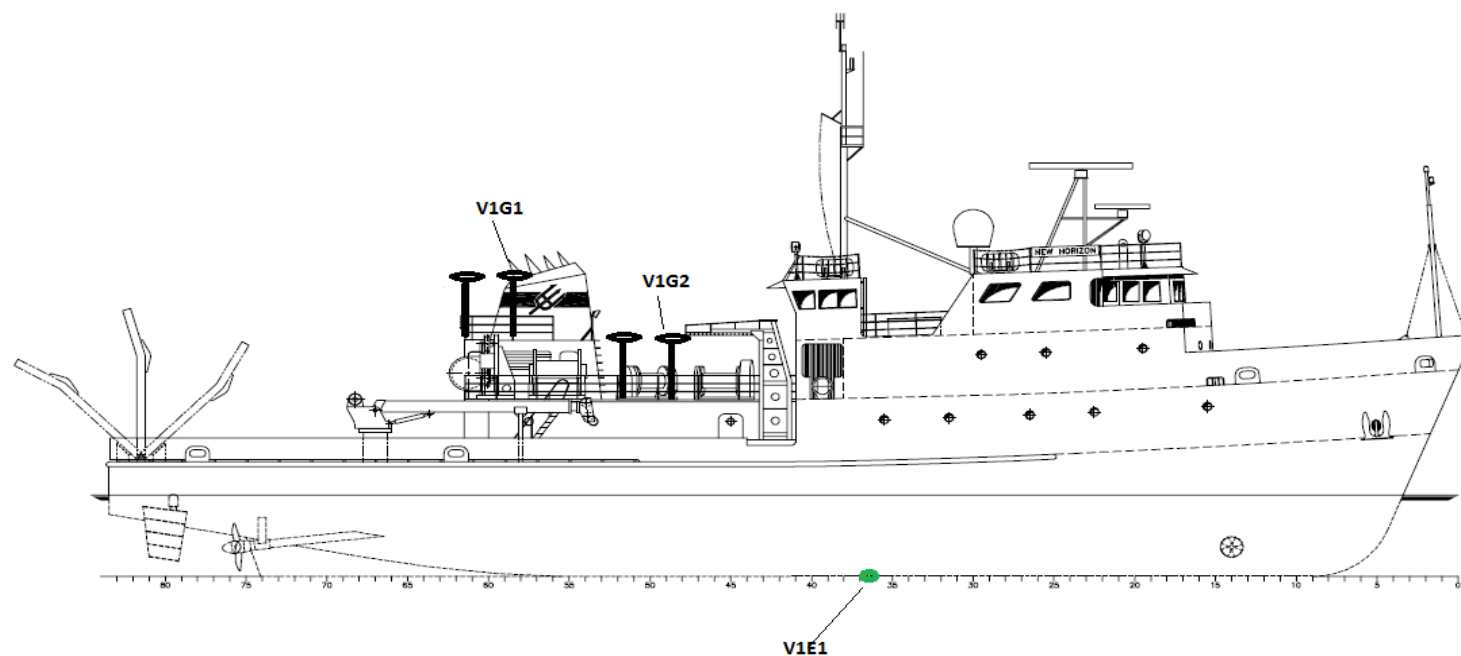
[Compass Offsets](#)

[Timing](#)

[Revision History](#)



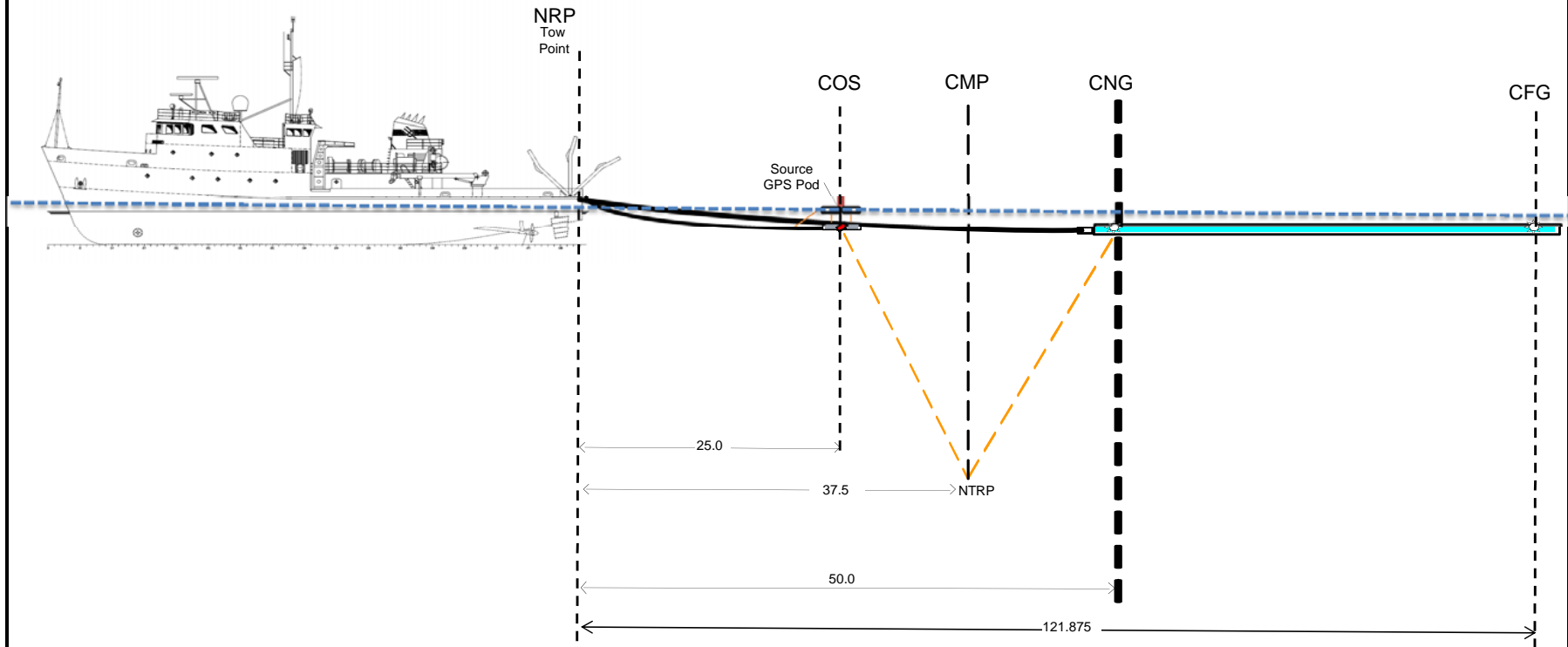
R/V New Horizon - Vessel Sensor Offsets



All measurements in meters

		STBD/PORT (X)	FORE/AFT (Y)	UP/DOWN (Z)
NRP	NAVIGATION REFERENCE POINT (Stern Center, waterline)	0.00	0.00	0.00
V1G1, V1GY1	Trimble SPS 361 - Primary	-2.34	16.07	8.35
V1G2, V1GY2	Trimble SPS 361 - Secondary	2.80	20.29	5.85
V1E1	Knudsen 3260 12KHz	0.60	29.00	-3.00

R/V New Horizon - Towing Offsets

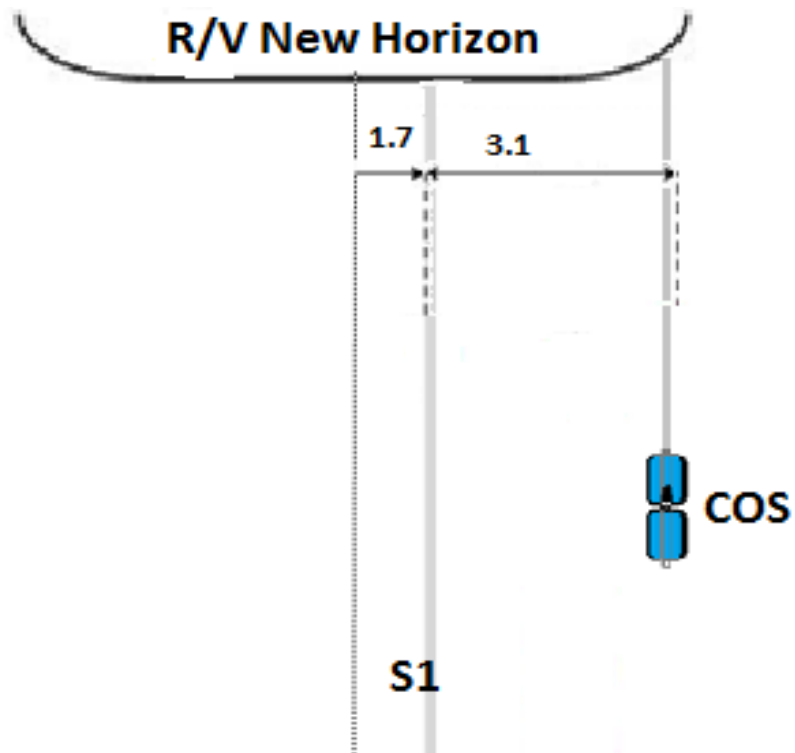


Principal Distances		Principal Offsets		Used as	Acronyms	
NRP-Stern	0.00	COS-CNG	25.00	Calculated	NRP	Nav Reference Point (centre of mast at sea level)
Stern-COS	25.00	NRP-NTRP	37.50	Offset from NRP	COS	Centre of Source
Stern-CNG	50.00	NRP-CNG	50.00	Layback	CNG	Centre of Near Group (Trace # 001)
Stern-CFG	121.88				CMP	Common Mid-Point
					NTRP	Near Trace Reflection Point
					CFG	Center of Far Group (Trace #004)

All measurements in meters

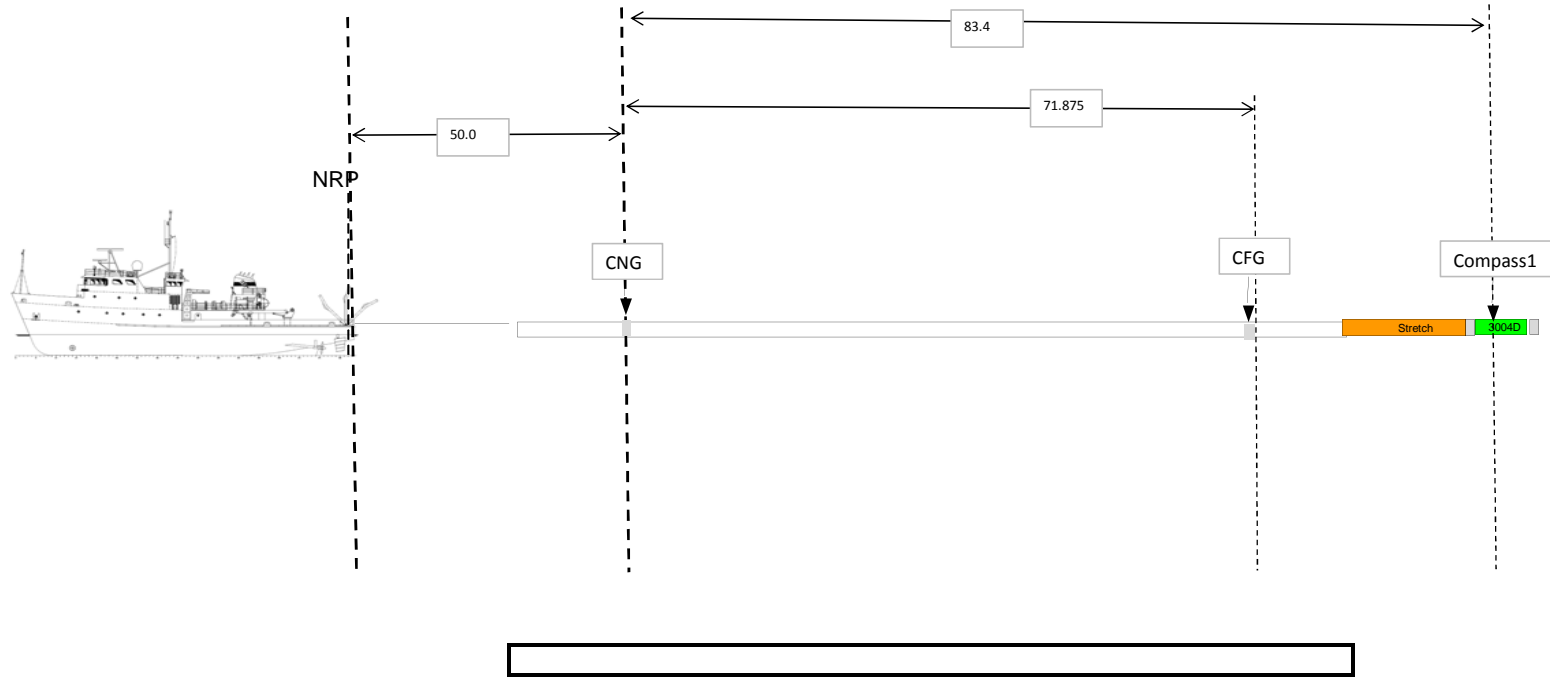
R/V New Horizon - Towing Configuration

Object	From NRP		
	X	Y	Z
S1 TowPoint	1.70	0.00	1.10
COS TowPoint	3.10	0.00	1.10
COS Nominal	3.10	-25.00	-1.00
CMP Nominal	2.40	-37.50	-1.00
CNG Nominal	1.70	-50.00	-1.00



All measurements in meters

R/V New Horizon Compass Offsets



Active Section (75mtr)

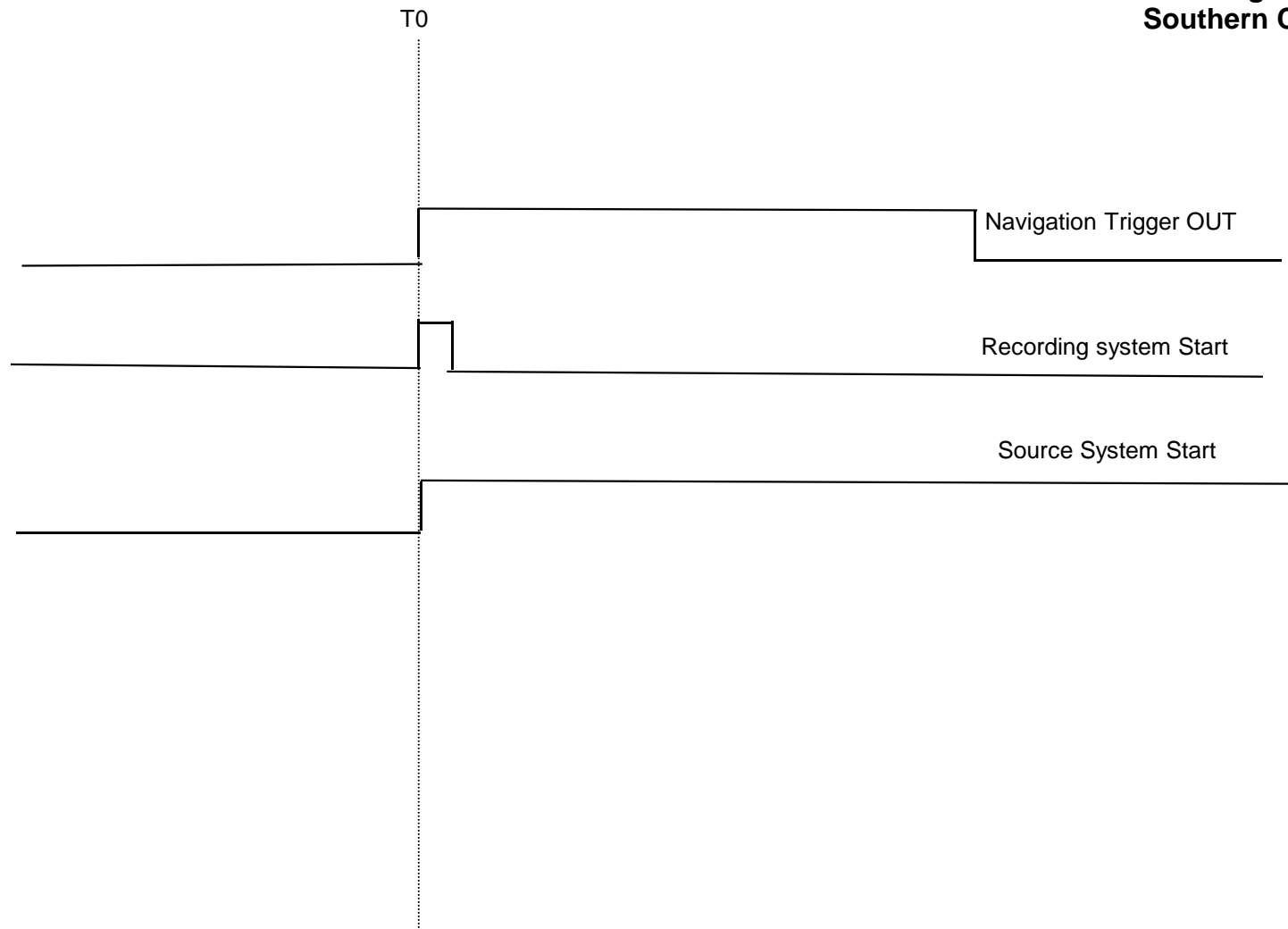
Stretch Section

Spartan 3004D Compass

All Measurements in meters, not to scale

R/V New Horizon Timing Diagram

16 August 2013
Southern California



Revis	Date Applied	Seq applied	Changes made
rev0	16-Aug-13	Seq044 onward	original configuration
rev1	18-Aug-13	Seq050 onward	Moved towpoints to Stbd
rev2	20-Aug-13	Seq072 onward	Added Stretch on tail of streamer and Digi Compass 4
rev3	27-Aug-13	Seq110&111 only	75mtr streamer, no birds and gps head buoy added
rev4	28-Aug-13	Seq112 onward	75mtr streamer, no birds, no gps head buoy

Vessel : R/V New Horizon
Client : Subsea Systems/SCRIPPS
Project : 2D Hi Res SONGS
Area : Southern California
Start Date : 16 August 2013



[Vessel Sensor Offsets](#)

[Towing Offsets](#)

[Towing Configuration](#)

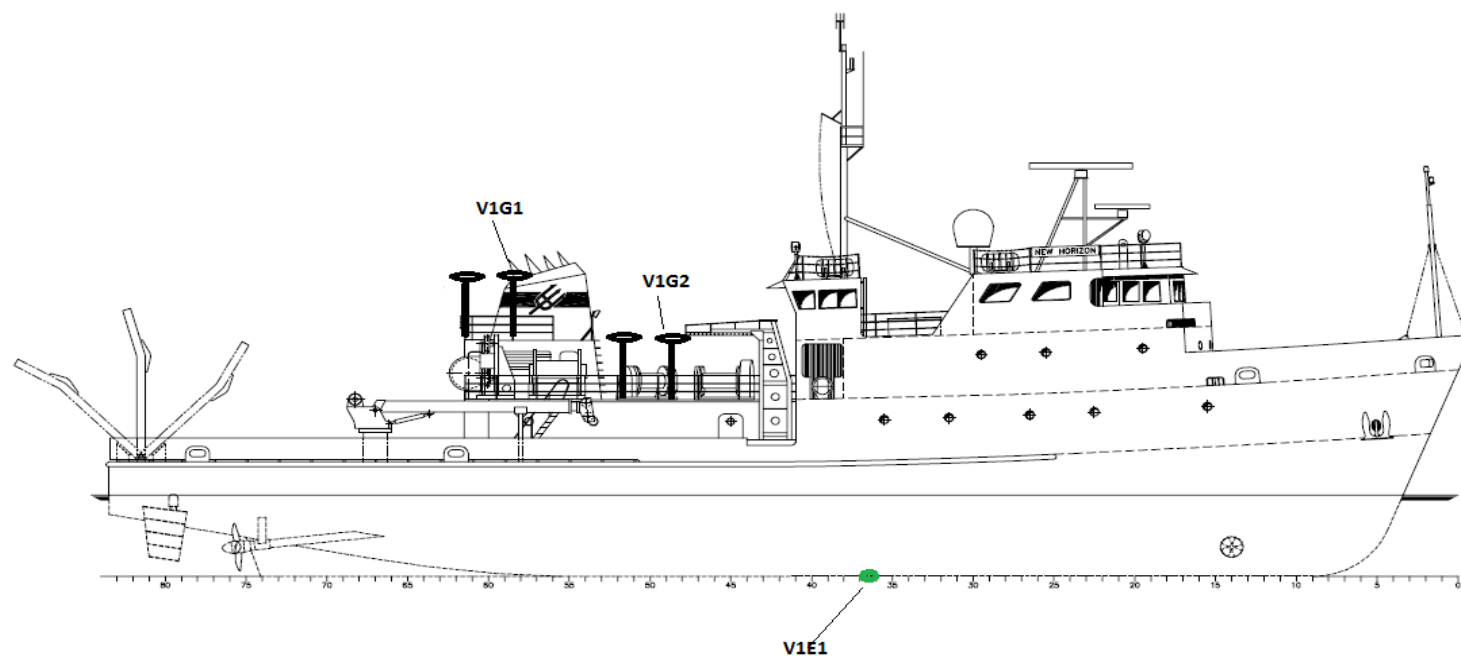
[Compass Offsets](#)

[Timing](#)

[Revision History](#)



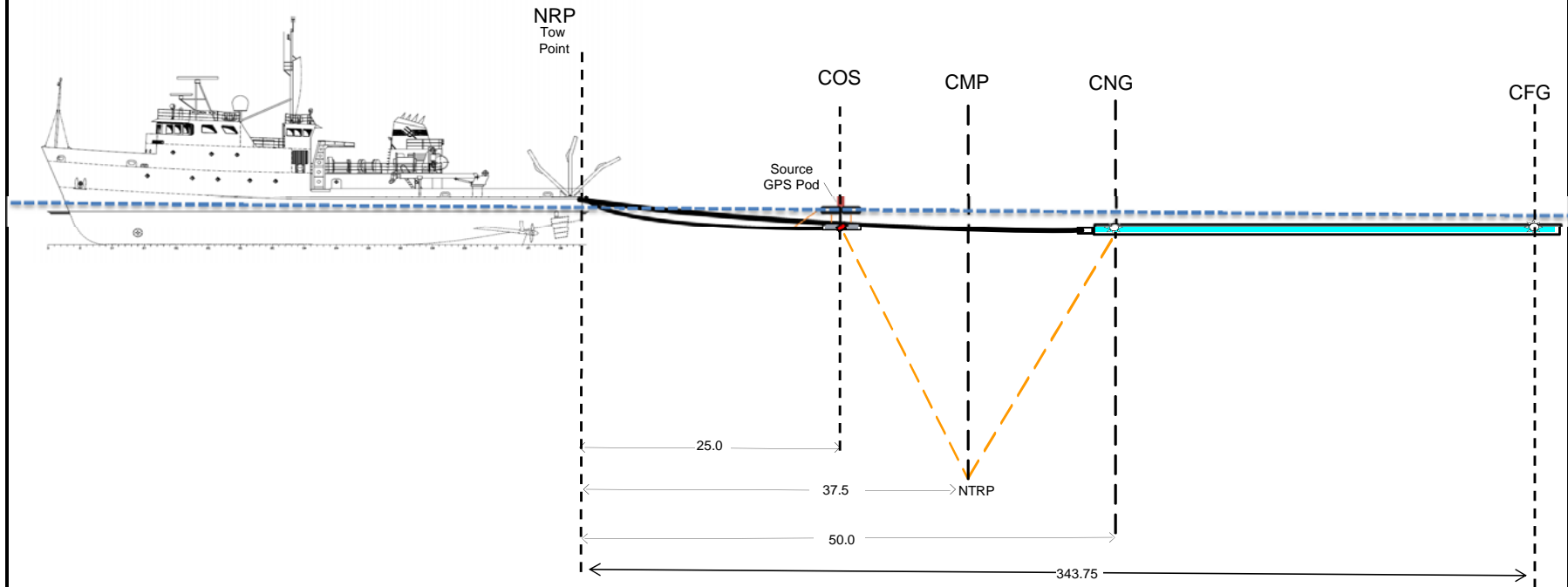
R/V New Horizon - Vessel Sensor Offsets



All measurements in meters

		STBD/PORT (X)	FORE/AFT (Y)	UP/DOWN (Z)
NRP	NAVIGATION REFERENCE POINT (Stern Center, waterline)	0.00	0.00	0.00
V1G1, V1GY1	Trimble SPS 361 - Primary	-2.34	16.07	8.35
V1G2, V1GY2	Trimble SPS 361 - Secondary	2.80	20.29	5.85
V1E1	Knudsen 3260 12KHz	0.60	29.00	-3.00

R/V New Horizon - Towing Offsets

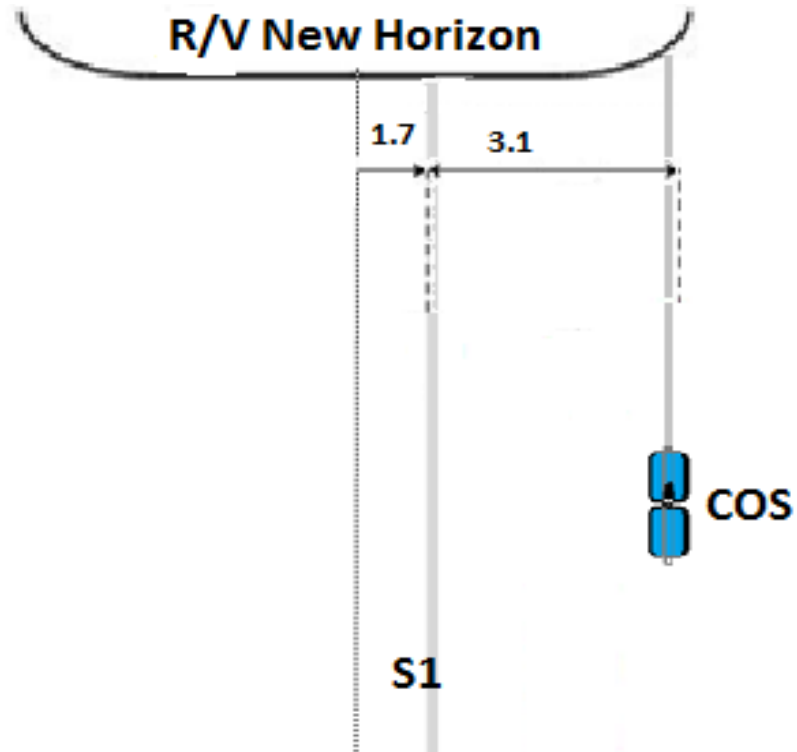


Principal Distances		Principal Offsets		Used as	Acronyms	
NRP-Stern	0.00	COS-CNG	25.00	Calculated	NRP	Nav Reference Point (centre of mast at sea level)
Stern-COS	25.00	NRP-NTRP	37.50	Offset from NRP	COS	Centre of Source
Stern-CNG	50.00	NRP-CNG	75.00	Layback	CNG	Centre of Near Group (Trace # 001)
Stern-CFG	343.75				CMP	Common Mid-Point
					NTRP	Near Trace Reflection Point
					CFG	Center of Far Group (Trace #004)

All measurements in meters

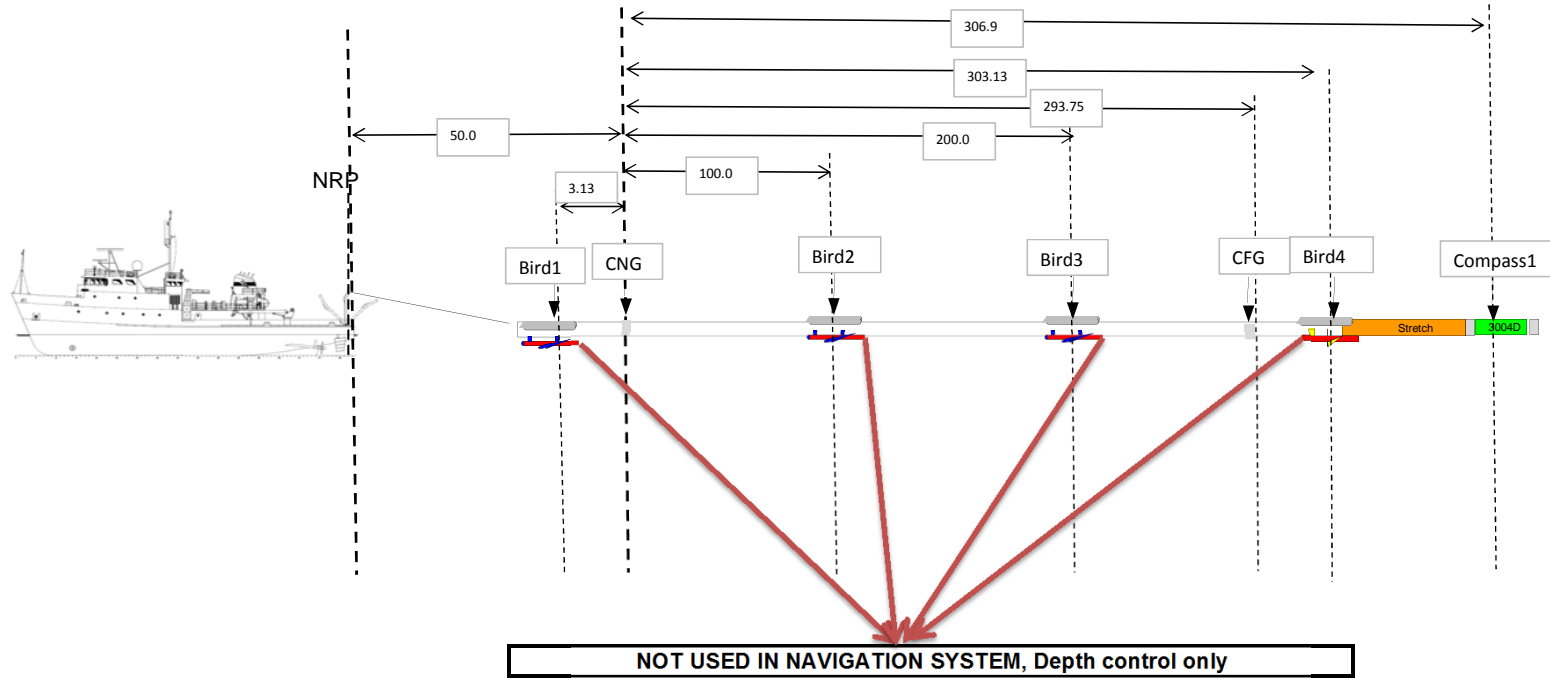
R/V New Horizon - Towing Configuration

Object	From NRP		
	X	Y	Z
S1 TowPoint	1.70	0.00	1.10
COS TowPoint	3.10	0.00	1.10
COS Nominal	3.10	-25.00	-2.00
CMP Nominal	2.40	-37.50	-2.00
CNG Nominal	1.70	-50.00	-2.00



All measurements in meters

R/V New Horizon Compass Offsets



 Digicourse 5010
 Digicourse 5011
 Bird Float

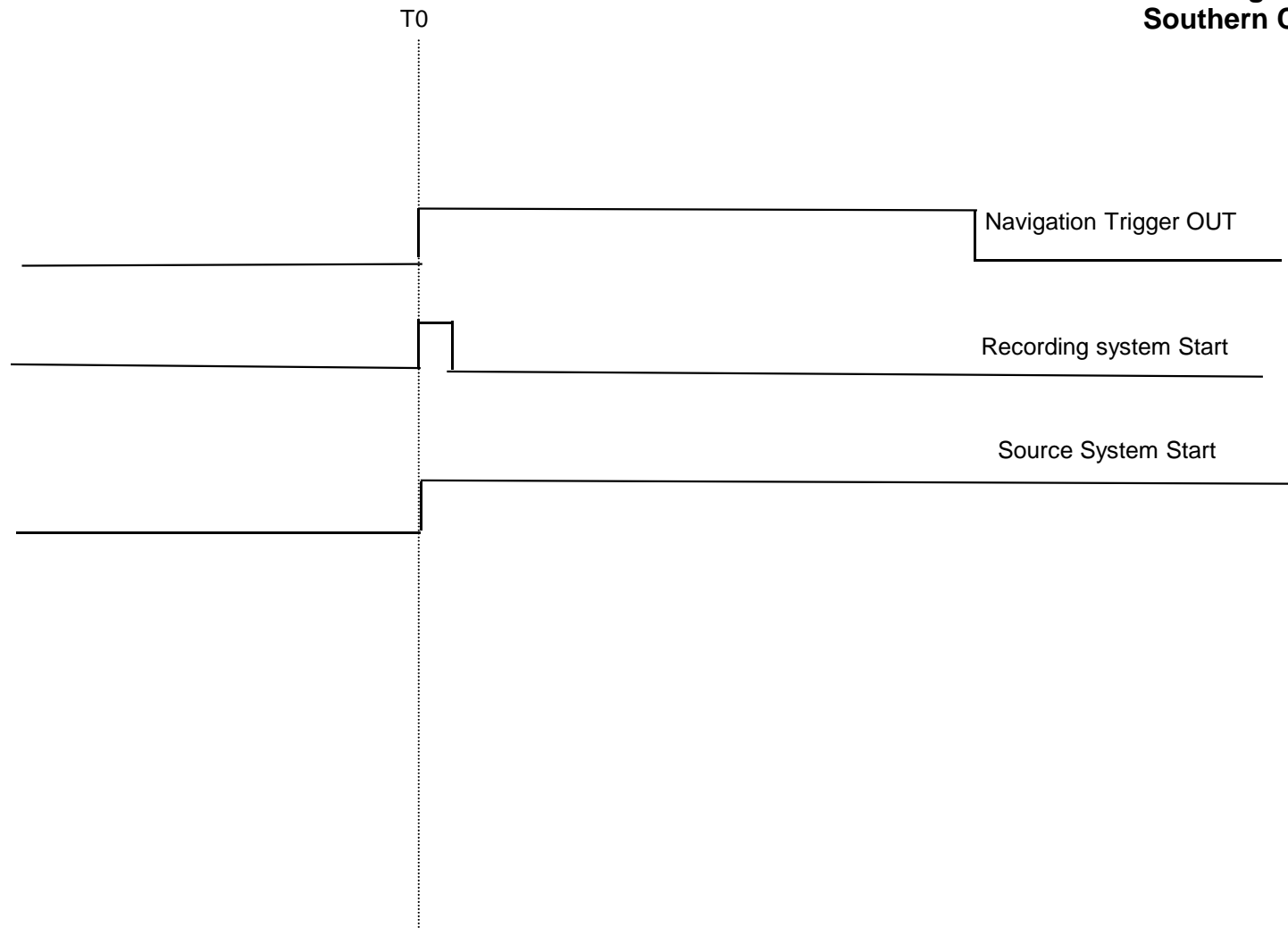
 Active Section (300m)
 Spartan 3004D Compass

 Stretch
 Stretch Section

All Measurements in meters, not to scale

R/V New Horizon Timing Diagram

16 August 2013
Southern California



Rev	Date Applied	Seq applied	Changes made
rev0	16-Aug-13	Seq044 onward	original configuration
rev1	18-Aug-13	Seq050 onward	Moved towpoints to Stbd
rev2	20-Aug-13	Seq072 onward	Added Stretch on tail of streamer and Digi Compass 4
rev3	27-Aug-13	Seq110&111 only	75mtr streamer, no birds and gps head buoy added
rev4	28-Aug-13	Seq112 onward	75mtr streamer, no birds, no gps head buoy
rev5	29-Aug-13	Seq162 onward	Reconfiguration to sparker and 300m streamer, same as rev 2 offsets

APPENDIX G

Subsea Systems Seismic Observer Logs

SONGS 2-D High Resolution Seismic Survey Offshore Southern California

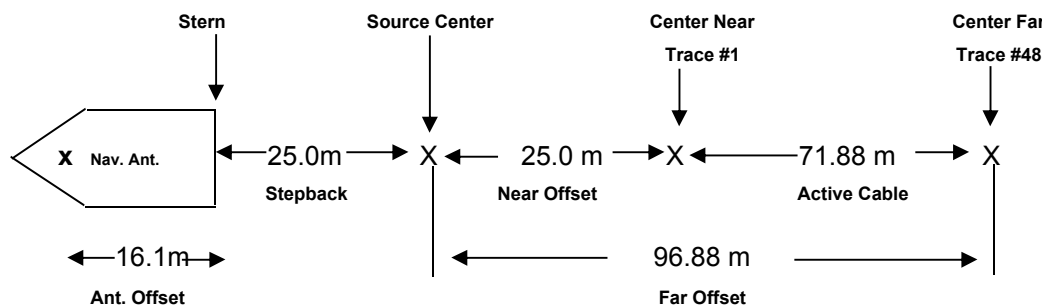
August - September 2013

FIELD LOG / OBSERVERS REPORT

Page 1 of 4

Vessel: R/V New Horizon

Client	SCE	Date	27 Aug 2013
Area and / or Block			
Offshore So Cal			
Line number			
SEE BELOW			
Operator / Observer			
Kyle, James, & Ghulsen			
Line Direction			
See Below			



Instrumentation

Source type Boomer	Source power 1.5 Kj	Pre amp gain 18 db	Number of	Plates 3	Source depth 0.5 m	Streamer Depth 1.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.25 ms.		500 msec.		24		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other	Note: no aux channels recorded	
Low	Slope	High	Slope					
Out		Out		Out			Group Layout	
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 24	Far offset 71.88 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 3.125	Shooting Interval 3.125 m.	

File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks
					(Changes in weather, sea state, operator, record delays, problems, etc.)
					Retrieved streamer; replaced number 2 digitizer
					SOL 158 attempt 2 - weighted streamer, can replaced.
1158.sgy	852	1158	128		SOL 158B UT1027 SEQ: 112 DIR: 132
1158.sgy	1194	1500	125		UT1035
1158.sgy	1694	2000	84		UT1048
1158.sgy	2194	2500	80		UT1100
1158.sgy	2694	3000	89		UT1113
1158.sgy	3194	3500	136		UT1126
1158.sgy	3694	4000	182		UT1139
1158.sgy	4194	4500	156		UT1153
1158.sgy	4694	5000	140		UT1206
1158.sgy	5194	5500	101		UT1219
1158.sgy	5331	5637	100		UT1222 EOL 158B UT1222
156.sgy	926	156	76		SOL 156 UT 1236 SEQ: 113 DIR: 312
156.sgy	1270	500	78		UT1245
156.sgy	1770	1000	83		UT1258
156.sgy	2270	1500	86		UT1310
156.sgy	2770	2000	82		UT1323
156.sgy	3270	2500	73		UT1336
156.sgy	3770	3000	72		UT1349
156.sgy	4270	3500	73		UT1401
156.sgy	4770	4000	80		UT1414
156.sgy	5270	4500	105		UT1427

Continued on Page 2

FIELD LOG / OBSERVERS REPORT

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Client	Date	Area and / or Block		Operator / Observer		Line number	Line Direction
SCE	27 Aug 2013	Offshore So Cal		Gulsen, James, Kyle		See Below	See Below
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Cable depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)		
156.sgy	5770	5000	154		UT1440		
156.sgy	6092	5322	171		UT1447 EOL 156 UT1447		
154.sgy	935	154	193		SOL 154 UT 1517 SEQ: 114 DIR: 132		
154.sgy	1281	500	149		UT1525		
154.sgy	1781	1000	109		UT1536		
154.sgy	2281	1500	95		UT1548		
154.sgy	2781	2000	79		UT1600		
154.sgy	3281	2500	70		UT1611		
154.sgy	3781	3000	65		UT1623		
154.sgy	4281	3500	67		UT1635		
154.sgy	4781	4000	69		UT1647		
154.sgy	4808	4027	69		UT1648 Shutdown due to dolphins		
154.sgy	4947	4028	69		UT1651 Resume survey		
154.sgy	4963	4044	70		UT1652 Shutdown due to dolphins		
154.sgy	5136	4045	70		UT1656 Resume survey		
154.sgy	5591	4500	71		UT1707		
154.sgy	5614	4523	72		UT1707 Shutdown due to dolphins		
154.sgy	5696	4524	71		UT1710 Resume survey		
154.sgy	6172	5000	68		UT1721		
154.sgy	6672	5500	63		UT1733		
154.sgy	6737	5565	63		UT1735 EOL 154		
152.sgy	933	152	55		SOL 152 UT 1745 SEQ: 118 DIR: 312		
152.sgy	1281	500	58		UT1753		
152.sgy	1781	1000	62		UT1806		
152.sgy	2281	1500	63		UT1819		
152.sgy	2781	2000	64		UT1831		
152.sgy	3281	2500	63		UT1843		
152.sgy	3781	3000	63		UT1855		
152.sgy	4281	3500	66		UT1908		
152.sgy	4781	4000	72		UT1920		
152.sgy	5281	4500	81		UT1934 Continued on Page 3		
152.sgy	5781	5000	86		UT1948		
152.sgy	6093	5312	88		UT1957 Off the line due to boat traffic		
152.sgy	6281	5500	88		UT2001 Off line about 180 m		
152.sgy	6582	5801	89		UT2009 EOL 152 SEQ 118		
					SOL 150 UT2038 SEQ: 119 DIR: 132		
150.sgy	935	150	83		UT2038 Missed shots 913-934		
150.sgy	1285	500	78		UT2046		
150.sgy	1785	1000	73		UT2059		
150.sgy	2285	1500	73		UT2110		
150.sgy	2785	2000	69		UT2122		
150.sgy	3285	2500	65		UT2135		
150.sgy	3785	3000	62		UT2147		
150.sgy	4285	3500	59		UT2200		
150.sgy	4785	4000	57		UT2211		
150.sgy	5285	4500	56		UT2224 Continued on Page 3		

FIELD LOG / OBSERVERS REPORT

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Client	Date	Area and / or Block		Operator / Observer	Line number	Line Direction
SCE	27 Aug 2013	Offshore So Cal		Gulsen, James, Kyle	See Below	See Below
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Cable depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)	
150.sgy	5785	5000	54		UT2237	
150.sgy	5911	5126	53		UT2241 EOL 150	
					SOL 148 UT2313 SEQ: 120 DIR: 312	
148.sgy	965	148	50		UT2313	
148.sgy	1317	500	52		UT2323	
148.sgy	1817	1000	54		UT2336	
148.sgy	1867	1050	54		UT2337 Stopped line for Dolphins	
148.sgy	1984	1051	55		UT2341 Restarted line SEQ: 121	
148.sgy	2433	1500	58		UT2352	
148.sgy	2935	2000	60		UT0005	
148.sgy	3433	2500	64		UT0017	
148.sgy	3933	3000	64		UT0030	
148.sgy	4433	3500	66		UT0043	
148.sgy	4886	3953	68		UT0055 EOL 148 UT0055 SEQ: 121	
146.sgy	901	146	57		SOL 146 UT0119 SEQ: 122 DIR: 132	
146.sgy	1255	500	55		UT0127	
146.sgy	1755	1000	54		UT0140	
146.sgy	2255	1500	54		UT0153	
146.sgy	2755	2000	51		UT0206	
146.sgy	3255	2500	49		UT0219	
146.sgy	2516	2761	47		UT0226	
					EOL 146 UT0226 SEQ: 122	
142.sgy	981	142	55.6		SOL 142 UT0329 SEQ: 123 DIR: 222	
142.sgy	1339	500	81		UT0339	
142.sgy	1554	715	142		EOL 142 UT0344 SEQ: 123	
140.sgy	942	140	142		SOL 140 UT0401 SEQ: 124 DIR: 042	
140.sgy	1342	500	68		UT0411	
140.sgy	1582	780	52		UT418	
					EOL 140 UT0418 SEQ: 124	
138.sgy	985	138	54		SOL 138 UT0435 SEQ: 125 DIR:222	
138.sgy	1347	500	81		UT0444	
138.sgy	1652	805	169		UT0451	
					EOL 138 UT0451 SEQ:125	
136.sgy	959	143	217		SOL:136 UT0502 SEQ: 126 DIR:042	
136.sgy	1135-1243				UT0510 Offline shots	
136.sgy	1318	500	69		UT0512	
136.sgy	1679	863	51		UT0522	
					EOL 136 UT05 SEQ:126	
134.sgy	978	134	54		SOL 134 UT0530 SEQ:127 DIR: 242	
134.sgy	1344	500	78		UT0538	
134.sgy	1747	903	203		EOL 134 UT0548 SEQ: 127	
					Continued on Page 4	

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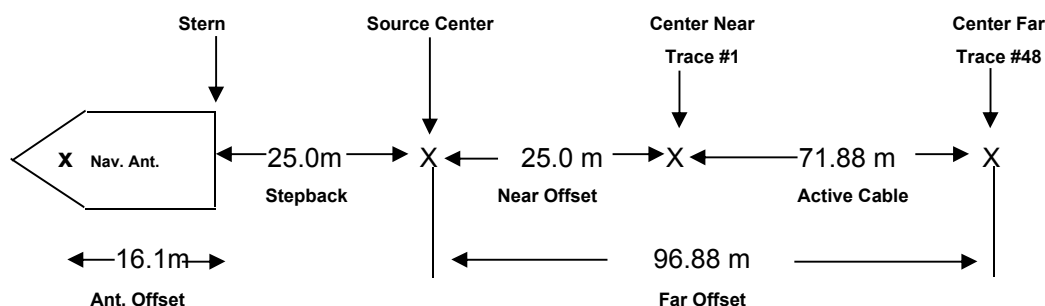
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FIELD LOG / OBSERVERS REPORT

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Vessel: R/V New Horizon

Client	SCE	Date	28 Aug 2013
Area and / or Block			
Offshore So Cal			
Line number			
SEE BELOW			
Operator / Observer			
Christine, Joe, Valerie			
Line Direction			
See Below			



Instrumentation

Source type	Source power	Pre amp gain	Number of	Plates	Source depth	Streamer Depth		
Boomer	1.5 Kj	18 db		3	0.5 m	1.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.25 ms.		500 msec.		24		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out				Group Layout
Recording Instruments	Type		Format		Tape Drives		Near TR No.	Near offset
	Geo-Eel		SEG Y(IBM)		Hard Disk/ USB Disk		1	25.0 m.
Navigation System	Primary			Secondary			Far TR No.	Far offset
	NavPoint Longliner DGPS						24	71.88 m.
Boat speed		Navigation fix interval					Group Interval.	Shooting Interval
~4.5 Knots		N/A					3.125	3.125 m.

File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks
(Changes in weather, sea state, operator, record delays, problems, etc.)					
128.sgy	947	128	280		SOL 128 UT 0704 SEQ: 130 DIR:042
128.sgy	1319	500	76		UT0714
128.sgy	1860	1041	103		EOL 128 UT 0728 SEQ:130
126.sgy	977	126	105		SOL 126 UT0744 SEQ: 131 DIR: 222
126.sgy	1351	500	141		UT0753
126.sgy	1923	1072	224		EOL 126 UT0808 SEQ: 131
124.sgy	951	124	273		SOL 124 UT0823 SEQ: 132 DIR: 042
124.sgy	1327	500	78		UT0833
124.sgy	1827	1000	51		UT0845
124.sgy	1959	1123	48		UT0848
					EOL 124 UT0848 SEQ: 132 DIR:44
122.sgy	937	122	48		SOL 122 UT0903 SEQ: 133 DIR:222
122.sgy	1315	500	64		UT0912
122.sgy	1815	1000	169		UT0925
122.sgy	2014	1199	268		EOL 122 UT0930 SEQ: 133
120.sgy	947	120	243		SOL 120 UT0942 SEQ: 134 DIR: 42
120.sgy	1327	500	73		UT0951
120.sgy	1827	1000	54		UT1004
120.sgy	2033	1206	47		UT1009
					EOL:120 UT:1009 SEQ:134 DIR:42
Continued on Page 2					

FIELD LOG / OBSERVERS REPORT

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Client	Date	Area and / or Block		Operator / Observer		Line number	Line Direction
SCE	28 Aug 2013	Offshore So Cal		Gulsen, James, Kyle		See Below	See Below
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Cable depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)		
118.sgy	949	118	47		SOL: 118 UT1023 SEQ: 135 DIR: 222		
118.sgy	1331	500	61		UT1032		
118.sgy	1831	1000	98		UT1045		
118.sgy	2102	1271	216		UT1051		
					EOL:118 UT:1051 SEQ:135 DIR:222		
116.sgy	974	116	223		SOL:116 UT:1105 SEQ:136 DIR:42		
116.sgy	1358	500	71		UT1115		
116.sgy	1858	1000	58		UT1128		
116.sgy	2120	1262	46		UT1135		
					EOL:116 UT:1135 SEQ:136 DIR:42		
114.sgy	955	114	50		SOL:114 UT:1148 SEQ:137 DIR:222		
114.sgy	1341	500	59		UT1159		
114.sgy	1841	1000	78		UT1212		
114.sgy	2183	1342	206		UT1220		
					EOL:114 UT:1220 SEQ:137 DIR:222		
112.sgy	938	112	221		SOL:112 UT:1232 SEQ:138 DIR:42		
112.sgy	1326	500	74		UT1242		
112.sgy	1826	1000	57		UT1254		
112.sgy	2177	1351	47		EOL:112 UT:1302 SEQ:138 DIR:42		
110.sgy	991	110	50		SOL:110 UT:1318 SEQ:139 DIR:222		
110.sgy	1381	500	61		UT1328		
110.sgy	1881	1000	76		UT1340		
110.sgy	2251	1370	129		EOL:110 UT:1349 SEQ:139 DIR:222		
108.sgy	956	108	178		SOL:108 UT:1402 SEQ:140 DIR:42		
108.sgy	1348	500	72		UT1412		
108.sgy	1848	1000	61		UT1425		
108.sgy	2240	1392	44		EOL:108 UT:1434 SEQ:140 DIR:42		
106.sgy	992	106	48		SOL:106 UT:1449 SEQ:141 DIR:222		
106.sgy	1386	500	64		UT1459		
106.sgy	1886	1000	71		UT1511		
106.sgy	2318	1432	189		EOL:106 UT:1521 SEQ:141 DIR:222		
104.sgy	976	104	161		SOL:104 UT:1533 SEQ:142 DIR:42		
104.sgy	1372	500	151		UT1543		
104.sgy	1816	944	63		UT1554 Shutdown due to dolphins		
104.sgy	1977	945	60		UT1558 Resume survey		
104.sgy	2032	1000	59		UT1559		
104.sgy	2298	1266	47		EOL:104 UT:1606 SEQ:143 DIR:42		
102.sgy	996	102	50		SOL:102 UT:1618 SEQ:144 DIR:222		
102.sgy	1090	196	55		UT1622 Display not functional, new line		
197.sgy	1120	197	57		UT1621 Restarted acquisition software		
197.sgy	1423	500	65		UT1628		
197.sgy	1923	1000	76		UT1641		
197.sgy	2326	1403	188		EOL:102 UT:1651 SEQ:144 DIR:222		
					Continued on page 3		

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Client	Date	Area and / or Block		Operator / Observer	Line number	Line Direction
SCE	28 Aug 2013	Offshore So Cal		Gulsen, James, Kyle	See Below	See Below
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Cable depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)	
100.sgy	1104	100	87		SOL:100 UT:1705 SEQ:145 DIR:42	
100.sgy	1504	500	70		UT1715	
100.sgy	2004	1000	58		UT1727	
100.sgy	2244	1240	47		EOL:100 UT:1733 SEQ:145 DIR:42	
98.sgy	993	98	50		SOL:98 UT:1744 SEQ:146 DIR:222	
98.sgy	1395	500	66		UT1754	
98.sgy	1895	1000	78		UT1807	
98.sgy	2244	1349	163		EOL:98 UT:1815 SEQ:146 DIR:222	
96.sgy	949	96	155		SOL:96 UT:1824 SEQ:147 DIR:42	
96.sgy	1353	500	79		UT1834	
96.sgy	1853	1000	64		UT1846	
96.sgy	2159	1306	49		EOL:96 UT1854: SEQ:147 DIR:42	
94.sgy	950	94	49		SOL:94 UT:1906 SEQ:148 DIR:222	
94.sgy	1356	500	69		UT1916	
94.sgy	1856	1000	87		UT1929	
94.sgy	2084	1228	140		EOL:94 UT:1934 SEQ:148 DIR:222	
					Stopped early due to whale	
92.sgy	947	92	160		SOL:92 UT:1950 SEQ:149 DIR:42	
92.sgy	976	121	155		Abort survey due to sea lion. Turning around for 92B	
92.sgy					EOL:92 UT:1951 SEQ:149 DIR:42	
1092.sgy	979	1092	223		SOL:92b UT:2005 SEQ:150 DIR:42	
1092.sgy	1387	1500	82		UT2015	
1092.sgy	1887	2000	59		UT2027	
1092.sgy	2125	2238	48		EOL:92b UT:2032 SEQ:150 DIR:42	
90.sgy	967	90	50		SOL:90 UT:2045 SEQ:151 DIR:222	
90.sgy	1377	500	70		UT2055	
90.sgy	1877	1000	111		UT2108	
90.sgy	2087	1210	129		EOL:90 UT2115 SEQ 151 DIR 222	
88.sgy	937	88	187		SOL:88 UT: 2127 SEQ:152 DIR:42	
88.sgy	1349	500	88		UT2138	
88.sgy	1849	1000	60		UT2151	
88.sgy	2032	1183	50		EOL:88 UT2156 SEQ:152 DIR:42	
86.sgy	953	86	53		SOL:86 UT2208 SEQ:153 DIR:222	
86.sgy	1367	500	75		UT2220	
86.sgy	1867	1000	157		UT2234	
86.sgy	1959	1092	192		EOL:86 UT2236 SEQ:153 DIR:222	
84.sgy	944	84	185		SOL:84 UT2249 SEQ:154 DIR:42	
84.sgy	1360	500	84		UT2300	
84.sgy	1889	1029	52		EOL:1-29 UT2313 SEQ:154 DIR:42	
					Continued on Page 4	

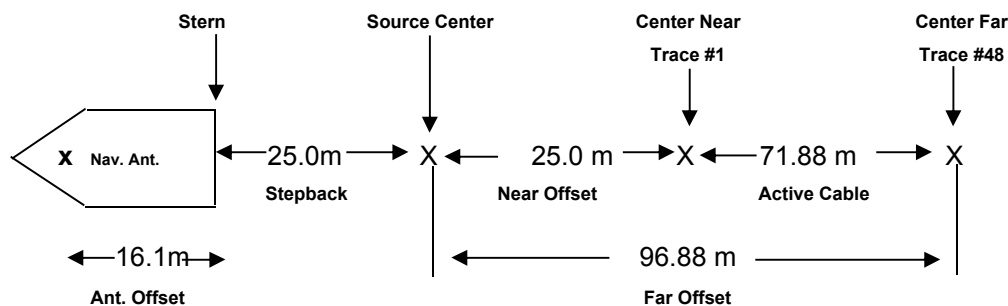
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Client	Date
SCE	26 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
160	
Operator / Observer	
Valerie/Joe/Christine	
Line Direction	
312	

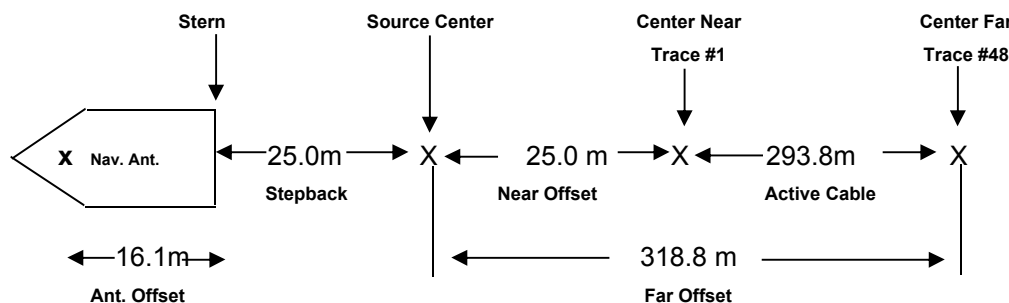


Source type Boomer	Source power 1.5 Kj	Pre amp gain 18 db	Number of	Plates 3	Source depth 0.5 m	Streamer Depth 1.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.25 ms.		700 msec.		24		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type		Format		Tape Drives		Near TR No.	Near offset
	Geo-Eel		SEG Y(IBM)		Hard Disk/ USB Disk		1	25.0 m.
Navigation System	Primary			Secondary			Far TR No.	Far offset
	NavPoint Longliner DGPS						24	71.88 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 3.125	Shooting Interval 3.125 m.	

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Client	Date
SCE	21 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
1	
Operator / Observer	
Valerie/Joe	
Line Direction	
042	



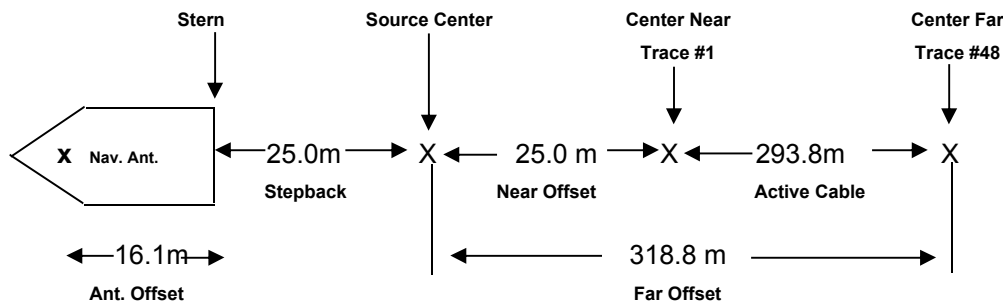
Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other	Note: no aux channels recorded	
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Date
21 Aug 2013

Client	Date
SCE	21 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
2	
Operator / Observer	
Valerie/Joe	
Line Direction	
222	

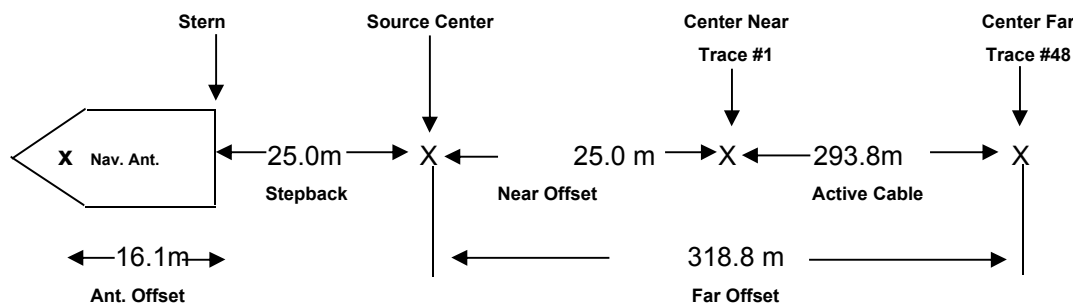


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

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Client	Date
SCE	21 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
3	
Operator / Observer	
Kyle/Gulsen/James	
Line Direction	
042	

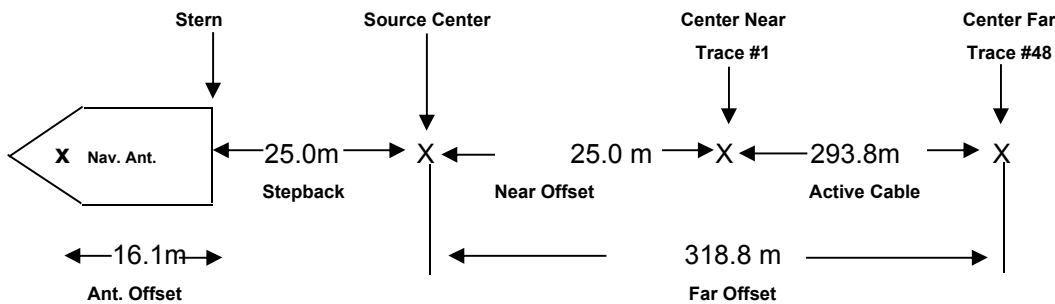


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Page 1

Client	Date
SCE	21 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
4	
Operator / Observer	
Kyle/Gulsen/James	
Line Direction	
222	

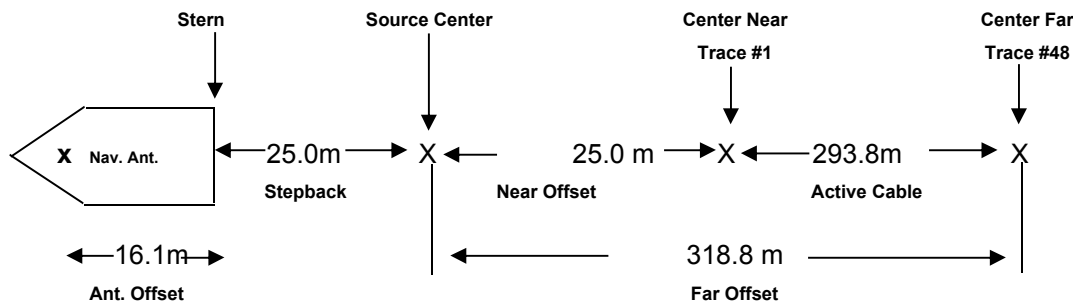


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out							Group Layout	
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Client	Date
SCE	21 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
5	
Operator / Observer	
Valerie/Alistair/Joe	
Line Direction	
042	

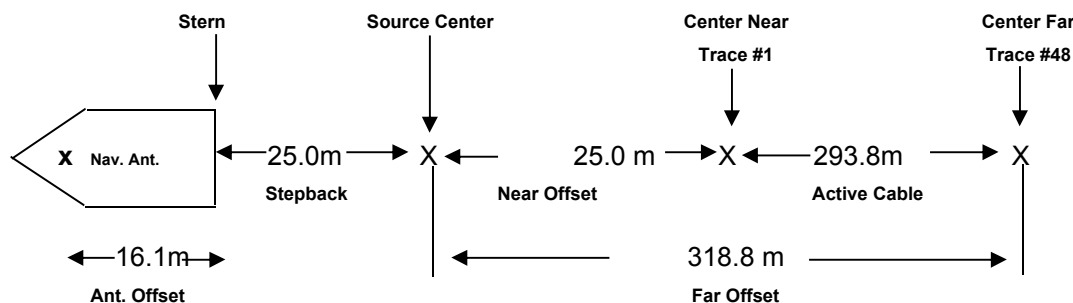


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

Page 1

Client	Date
SCE	20 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
6	
Operator / Observer	
Valerie/Alistair/Joe	
Line Direction	
222	

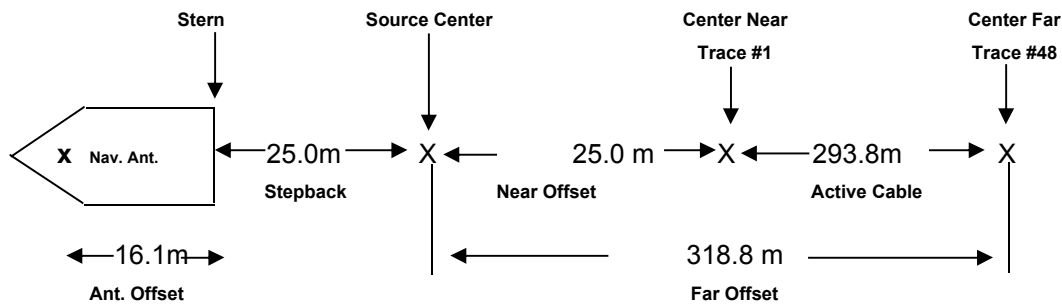


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client	Date
SCE	21 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
7	
Operator / Observer	
Valerie/Alistair/Joe	
Line Direction	
42	

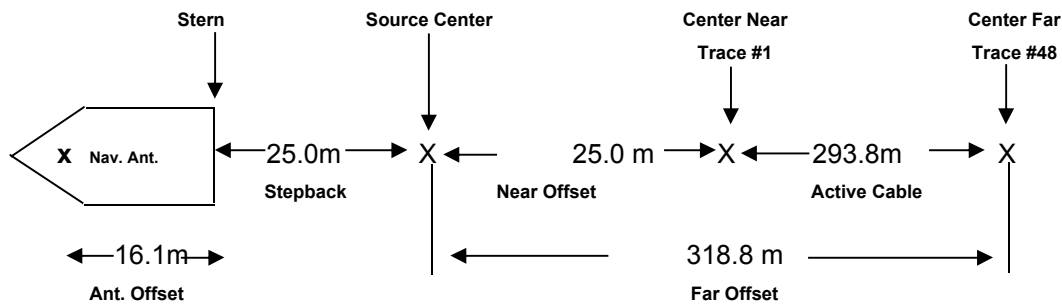


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

Page 1

Client	Date
SCE	20 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
8	
Operator / Observer	
James/Gulsen/Kyle	
Line Direction	
222	

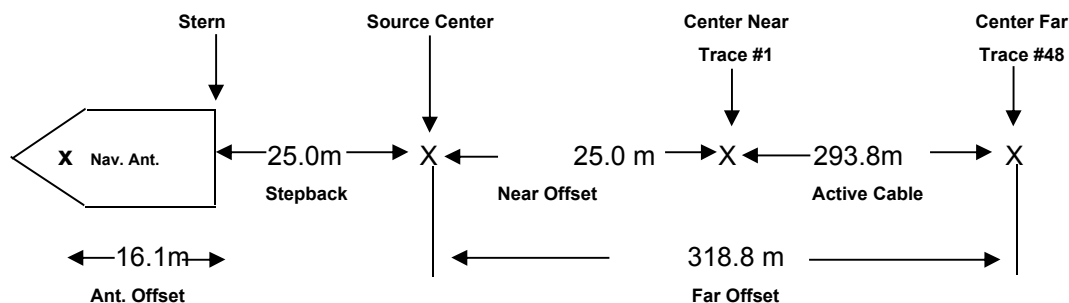


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

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Client	Date
SCE	20 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
9	
Operator / Observer	
James/Gulsen/Kyle	
Line Direction	
042	

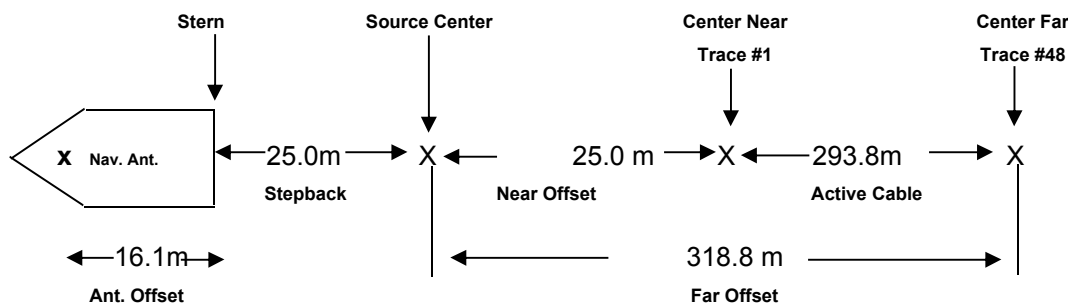


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Page 1

Client	Date
SCE	20 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
10	
Operator / Observer	
James/Gulsen/Kyle	
Line Direction	
222	



Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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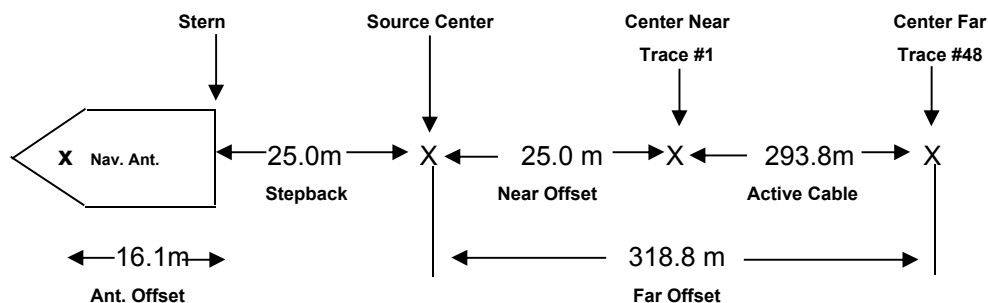
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Client

SCE

Date

16 Aug 2013



Area and / or Block

Offshore So Cal

Line number

11

Operator / Observer

Joe/Valerie

Line Direction

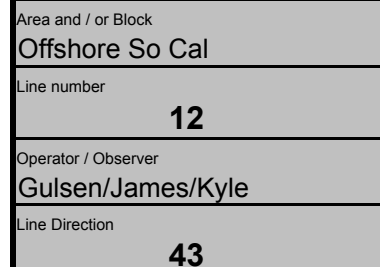
222

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Client	Date
SCE	17 Aug 2013

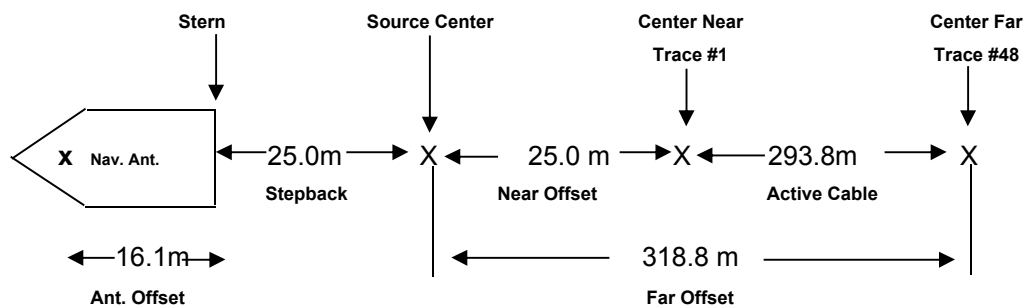


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

Subsea Systems, Inc.

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Client	Date
SCE	29 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
12D	
Operator / Observer	
Christine/Joe/Valerie	
Line Direction	
042	

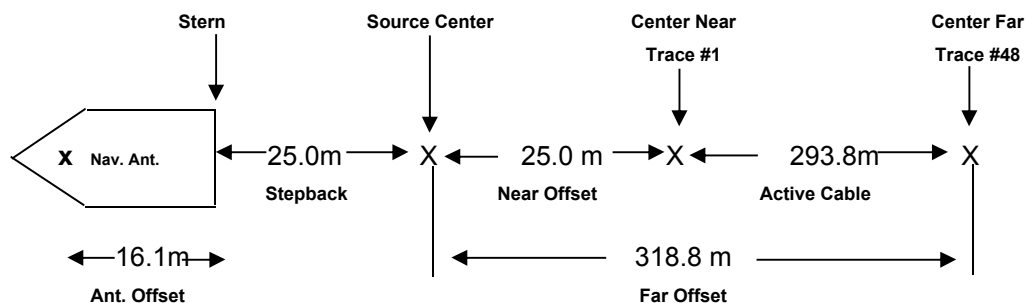


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client	Date
SCE	17 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
13	
Operator / Observer	
Gulsen/James/Kyle	
Line Direction	
222	

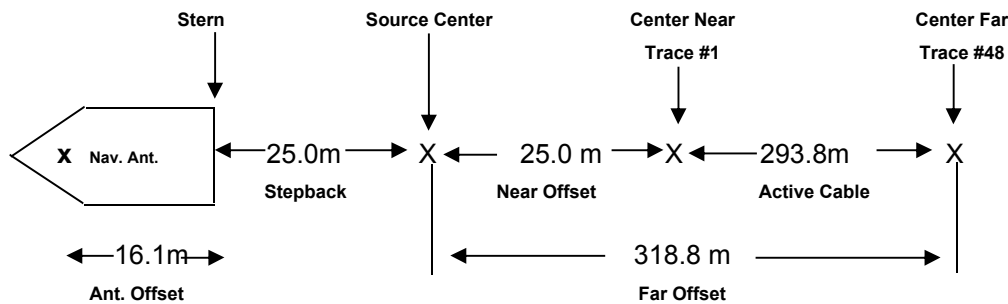


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

[illegible]

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Client	Date
SCE	17 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
14	
Operator / Observer	
Gulsen/James/Kyle	
Line Direction	
042	

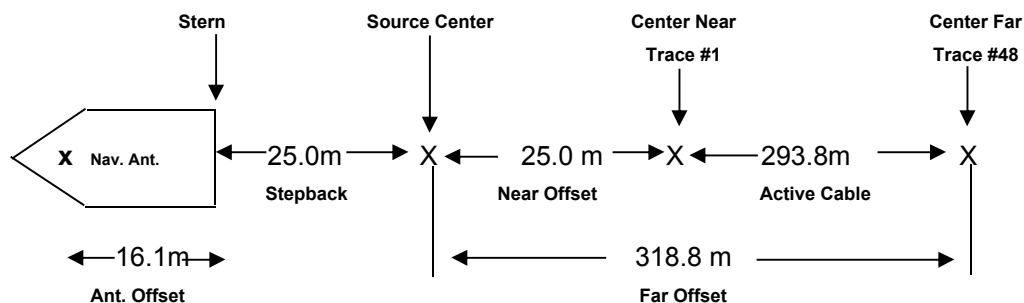


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Client	SCE	Date	17 Aug 2013
Area and / or Block Offshore So Cal			
Line number 15			
Operator / Observer Alistair/Valerie/Joe			
Line Direction 222			

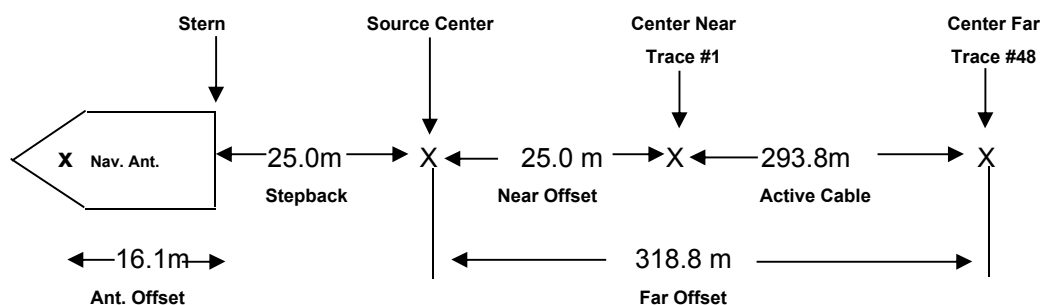


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Client	Date
SCE	17 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
16	
Operator / Observer	
Alistair/Valerie/Joe	
Line Direction	
42	

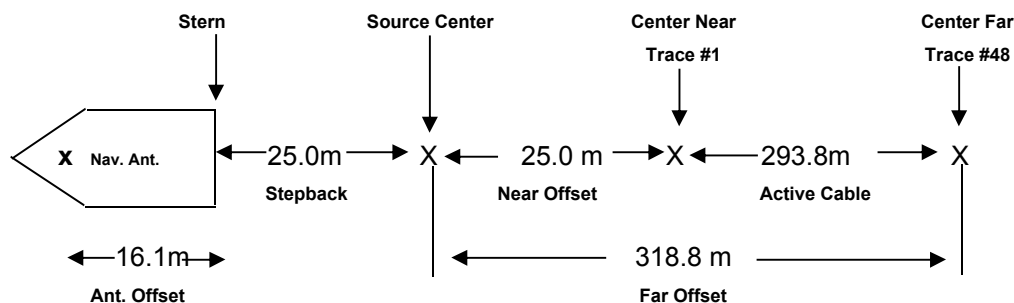


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client	Date
SCE	18 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
17	
Operator / Observer	
Alistair/Valerie/Joe	
Line Direction	
222	

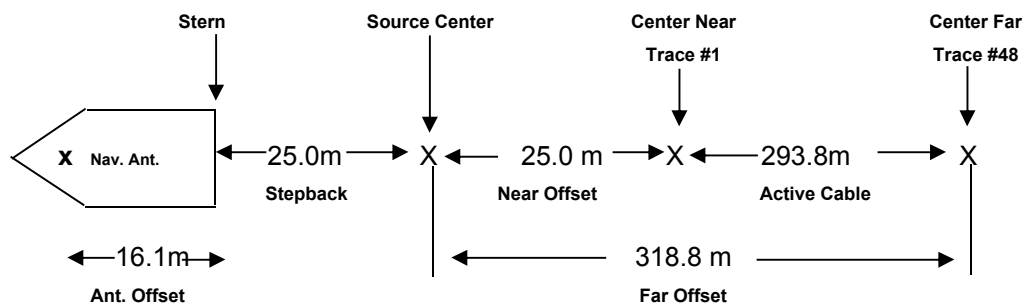


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Client	Date
SCE	18 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
18	
Operator / Observer	
Gulsen/James/Kyle	
Line Direction	
42	

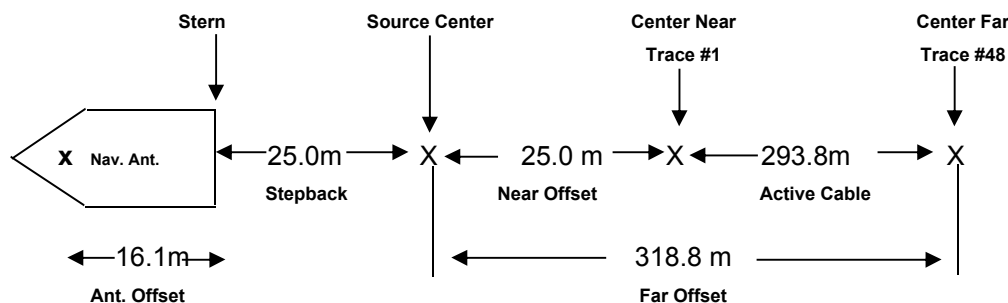


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out				Group Layout		
Recording Instruments	Type	Format		Tape Drives		Near TR No.	Near offset	
	Geo-Eel	SEG Y(IBM)		Hard Disk/ USB Disk		1	25.0 m.	
Navigation System	Primary			Secondary			Far TR No.	Far offset
	NavPoint Longliner DGPS						48	293.8 m.
Boat speed		Navigation fix interval				Group Interval.	Shooting Interval	
~4.5 Knots		N/A				6.25 m	6.25 m.	

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Page 1

Client	Date
SCE	18 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
19	
Operator / Observer	
Gulsen/James/Kyle	
Line Direction	
222	

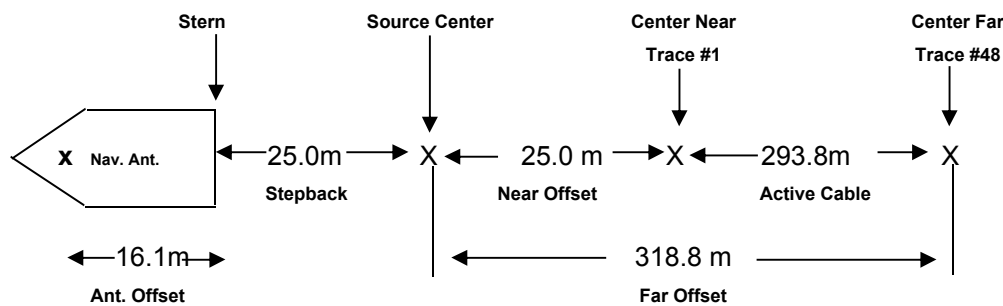


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Page 1

Client	Date
SCE	18 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
20	
Operator / Observer	
Gulsen/James/Kyle/Joe/Valerie	
Line Direction	
42	



Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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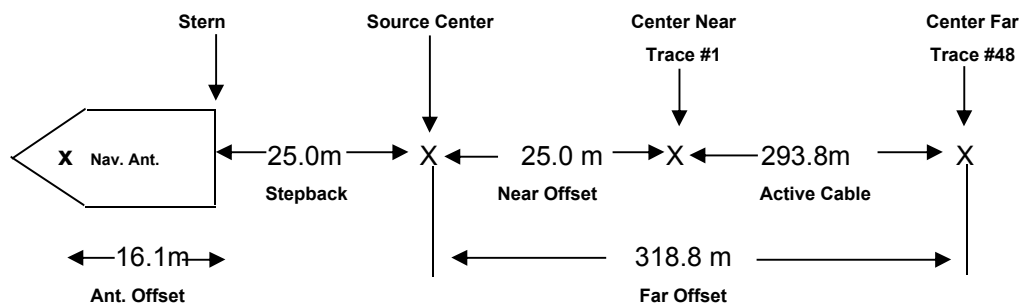
Page 1

Client

SCE

18

18 Aug 2013



Area and / or Block

Offshore So Cal

Line number

21

Operator / Observer

Alistair/Joe/Valerie

Line Direction

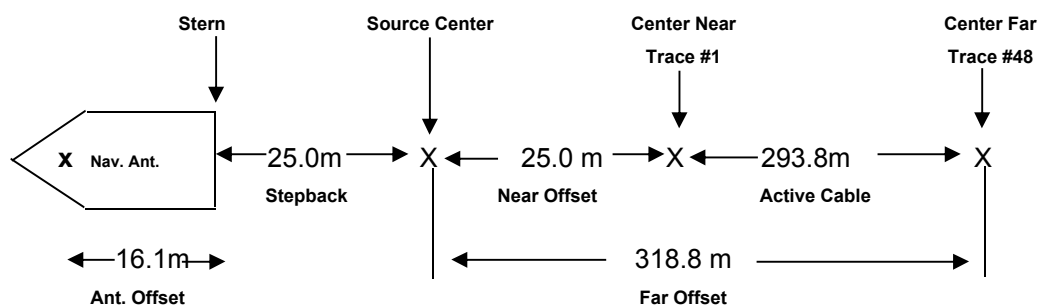
222

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type	Format		Tape Drives		Near TR No.	Near offset	
	Geo-Eel	SEG Y(IBM)		Hard Disk/ USB Disk		1	25.0 m.	
Navigation System	Primary			Secondary			Far TR No.	Far offset
	NavPoint Longliner DGPS						48	293.8 m.
Boat speed		Navigation fix interval				Group Interval.	Shooting Interval	
~4.5 Knots		N/A				6.25 m	6.25 m.	

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Client	Date
SCE	19 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
22	
Operator / Observer	
Alistair/Joe/Valerie	
Line Direction	
42	

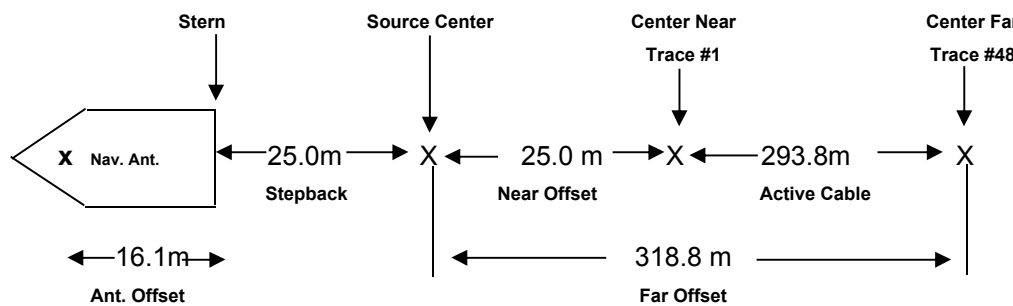


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Client	Date
SCE	19 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
23	
Operator / Observer	
Gulsen/James/Kyle	
Line Direction	
222	

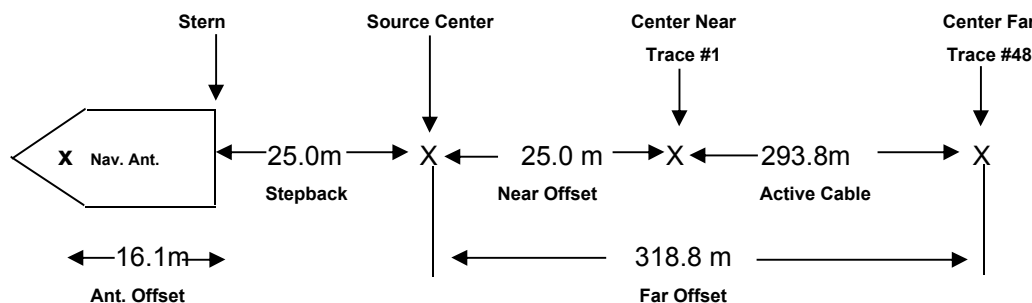


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Page 1

Client	Date
SCE	19 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
24	
Operator / Observer	
Gulsen/James/Kyle	
Line Direction	
42	



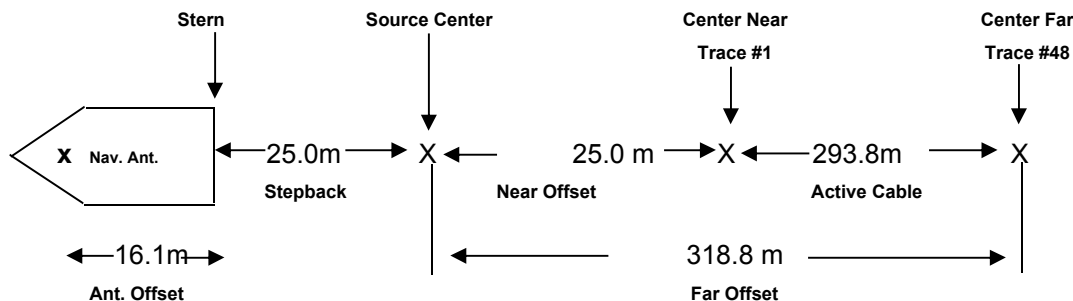
Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

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Page 1

Client

Date
19 Aug 2013



Area and / or Block

Offshore So Cal

Line number

25

Operator / Observer

Gulsen/James/Kyle

Line Direction

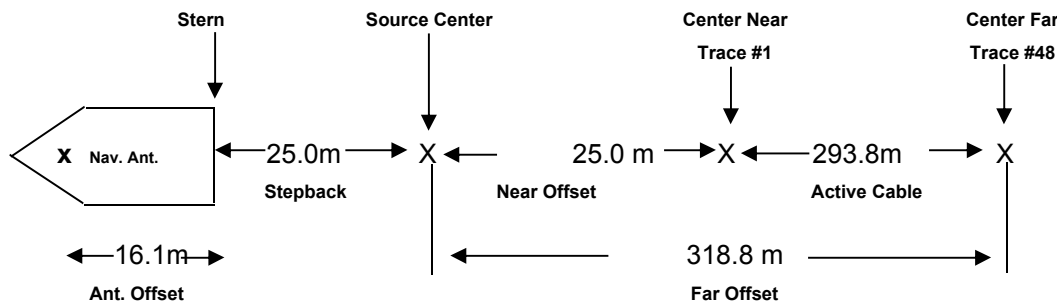
222

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out							Group Layout	
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Page 1

Client	Date
SCE	19 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
26	
Operator / Observer	
Valerie/Alistair/Joe	
Line Direction	
42	



Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 2.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

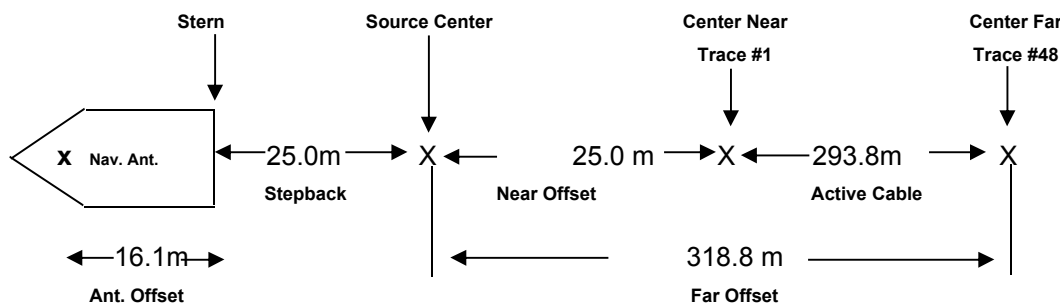
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FIELD LOG / OBSERVERS REPORT

Page 1

Vessel: R/V New Horizon

Client	SCE	Date	19 Aug 2013
Area and / or Block	Offshore So Cal		
Line number	27		
Operator / Observer	Valerie/Alistair/Joe		
Line Direction	222		



Instrumentation

Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db		3	2.0 m	2.0 m	
	Sample Int.	Record Length	No. of channels				
Primary	0.5 ms.	2000 msec.	48				Signature Hydrophone depth
Secondary	ms.	Sec.					
Filter	Filter	60 HZ Notch	Other				Note: no aux channels recorded
Low	Slope	High	Slope				
Out	Out	Out					Group Layout
Recording Instruments	Type	Format	Tape Drives	Near TR No.	Near offset		
	Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk	1	25.0 m.		
Navigation System	Primary	Secondary		Far TR No.	Far offset		
	NavPoint Longliner DGPS			48	293.8 m.		
Boat speed	Navigation fix interval			Group Interval.	Shooting Interval		
~4.5 Knots	N/A			6.25 m	6.25 m.		

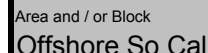
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas calm, Swell ~1m Wind N 3.6 kt
27.sgy	1005	40	250	2.7	SOL 027 UT 0417 SEQ: 067 Local Time: 2117 Hrs
					Note: Shots 992 to ~1005 were missed
					Line technically started at 992
27.sgy	1562	597	458	2.5	UT0441 Streamer Leakage: 640
27.sgy	2056	1091	592	2.8	UT0502
27.sgy	2512	1547	663	3	UT0522 Streamer leakage: 500
27.sgy	2673	1708	667	3	UT0530 Serial String not detected
2046.sgy	3011	2046	700	3	UT0545 File change
2046.sgy	3520	N/A	700	3	UT0607 Shot missed
2046.sgy	4115	3149	749	2.7	UT0632
2046.sgy	4603	3637	835	2.5	UT0654 Streamer leakage: 480
4065.sgy	5031	4065	888	2.5	UT0712 File change
4065.sgy	5134	4168	905	2.5	UT0717 STOPPED
					SEQ 070 Line 027B
4065.sgy	5217	4169	915	2.5	UT0721 Trigger time threshold exceeded, not recorded
4065.sgy	5218	4170	915	2.5	UT0721 First shot recorded on Line 27b
4065.sgy	5265	N/A	915		UT0723 Shot missed
4065.sgy	5586	4537	955	2.6	EOL 027/027B Streamer leakage: 480
					Retrieve source and streamer
					Change out active section #1 (ch 1-8) with S/N 06-707
					Replace DS1010 (smoked) with DS1007; leakage now okay
					Add Bird #4 (S/N 24502) to end of streamer
					Check sparker tips, Redeploy equipment

Page 1

Client

Date

21 Aug 2013



Line number

28

Operator / Observer

Valerie/Joe

Line Direction

135

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

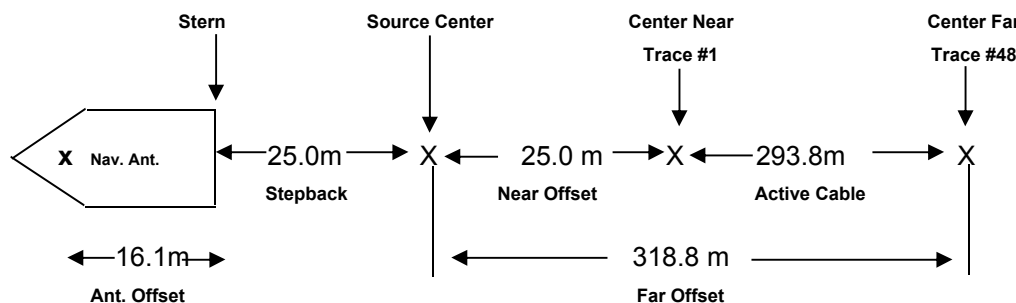
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FIELD LOG / OBSERVERS REPORT

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Vessel: R/V New Horizon

Client	SCE	Date	21 Aug 2013
Area and / or Block	Offshore So Cal		
Line number	29		
Operator / Observer	James/Kyle/Gulsen		
Line Direction	135		



Instrumentation

Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db		3	2.0 m	3.0 m	
	Sample Int.	Record Length	No. of channels				
Primary	0.5 ms.	2000 msec.	48				Signature Hydrophone depth
Secondary	ms.	Sec.					
Filter	Filter	60 HZ Notch	Other				Note: no aux channels recorded
Low	Slope	High	Slope				
Out	Out	Out					Group Layout
Recording Instruments	Type	Format	Tape Drives	Near TR No.	Near offset		
	Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk	1	25.0 m.		
Navigation System	Primary	Secondary		Far TR No.	Far offset		
	NavPoint Longliner DGPS			48	293.8 m.		
Boat speed	Navigation fix interval			Group Interval.	Shooting Interval		
~4.5 Knots	N/A			6.25 m	6.25 m.		

File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks
					(Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas calm, slight chop. Swell ~0.5 - 1m Wind WNW 10.8 kt
29.sgy	976	29	409	2.5	SOL 029 UT1736 SEQ: 086
29.sgy	1447	500	633	2.5	UT1756
29.sgy	1947	1000	653	2.5	UT1818
29.sgy	2447	1500	639	2.3	UT1839
29.sgy	2612	1665	643	5.2	UT1847 Slowing for boat traffic
29.sgy	2701	1754	635	2.8	UT1852 Resume normal speed
29.sgy	2947	2000	637	2.4	UT1903
2048.sgy	2995	2048	638	2.4	UT1905 SOF
2048.sgy	3447	2500	623	2.7	UT1924
2048.sgy	3935	2988	531	2.6	UT1946 Nav. Serial String Not Detected
2048.sgy	3947	3000	528	2.7	UT1946
2048.sgy	4447	3500	497	2.4	UT2008
2048.sgy	4621	3674	481	2.4	UT2016 Shutdown due to dolphins within 100m
2048.sgy	4703	3675	466	4.8	UT2020 Low streamers due to reduced ship speed
2048.sgy	4808	3780	548	2.2	UT2025 Shutdown due to dolphins within 100m
2048.sgy	4892	3781	591	4.9	UT2030 Low streamers due to reduced ship speed
2048.sgy	4990	3879	515	2.1	UT2034 Shutdown due to dolphins within 100m
2048.sgy	5104	3880	554	4.9	UT2041 Low streamers due to reduced ship speed
2028.sgy	5224	4000	442	1.7	UT2047
4067.sgy	5291	4067	445	2.4	UT2049 SOF
4067.sgy	5724	4500	356	2.5	UT2110
4067.sgy	6224	5000	351	2.1	UT2130
4067.sgy	6724	5500	304	2.5	UT2152
4067.sgy	7224	6000	404	2.6	UT2213
6086.sgy	7310	6086	364	2.7	UT2216 SOF
6086.sgy	7724	6500	339	2.7	UT2234
6086.sgy	8224	7000	292	2.4	UT2256
6086.sgy	8541	7317	290	2.7	UT2309 Peak noise threshold exceeded on channel 12
					Continued on Page 2

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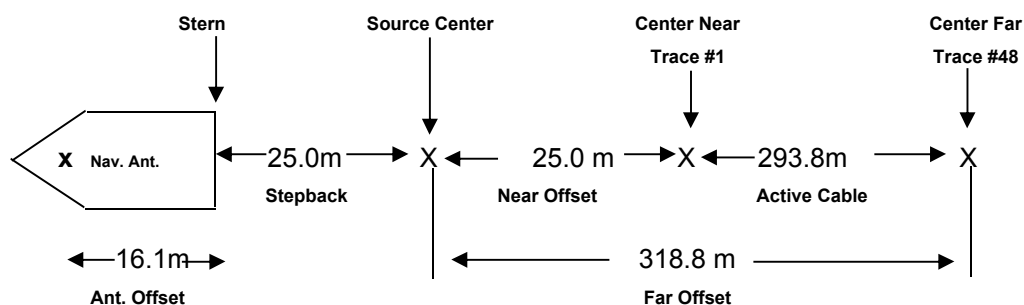
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FIELD LOG / OBSERVERS REPORT

Page 1

Vessel: R/V New Horizon

Client	SCE	Date	22 Aug 2013
Area and / or Block	Offshore So Cal		
Line number	30		
Operator / Observer	Valerie/Joe/Christine		
Line Direction	315		



Instrumentation

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 3.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out		Out		Out		Group Layout		
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

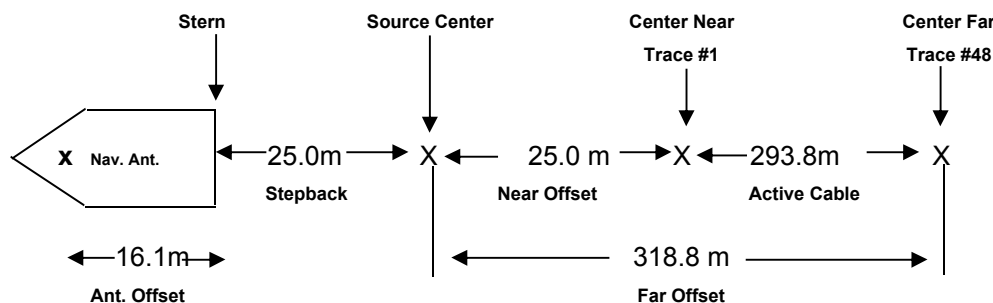
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks
					(Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas calm, slight chop. Swell ~0.5 - 1m Wind SSW 1.6 knots
30.sgy	979	34	281	3	SOL 030 UT0152 SEQ: 092 Local Time: 1853 Hrs
30.sgy	1445	500	360	2.6	UT0212
30.sgy	1945	1000	408	2.7	UT0234
30.sgy	2445	1500	477	2.8	UT0255
30.sgy	2945	2000	437	2.8	UT0316
2049.sgy	2994	2053	437	2.8	UT0318 File change
2049.sgy	3445	2500	430	2.7	UT0336
2049.sgy	3945	3000	428	2.6	UT0357
2049.sgy	4445	3500	440	2.7	UT0417
2049.sgy	4945	4000	529	2.7	UT0438
4068.sgy	5013	4068	540	2.7	UT0441 File change
4068.sgy	5445	4500	680	2.9	UT0459
4068.sgy	5945	5000	482	2.7	UT0520
4068.sgy	6445	5500	564	2.9	UT0541
4068.sgy	6945	6000	615	2.7	UT0602
6087.sgy	7032	6087		2.7	UT0606 File change
6087.sgy	7445	6500	617	2.7	UT0623
6087.sgy	7945	7000	657	2.8	UT0644
6087.sgy	8445	7500	679	2.9	UT0705
6087.sgy	8945	8000	690	2.6	UT0726
6087.sgy	9036	8091	690	2.6	UT0730 Serial String
8106.sgy	9051	8106	685	2.6	UT0730
8106.sgy	9445	8500	685	2.6	UT0747
8106.sgy	9945	9000	668	2.7	UT0807
8106.sgy	10445	9500	657	2.8	UT0828
8106.sgy	10945	10000	651	2.8	UT0848
10125.sgy	11070	10125	637	2.7	UT0853
10125.sgy	11445	10500	620	2.6	UT0908
10125.sgy	11570	10625	607	2.8	EOL 030 UT 0913 SEQ: 092

FIELD LOG / OBSERVERS REPORT

Page 1

Vessel: R/V New Horizon

Client	SCE	Date	23 Aug 2013
Area and / or Block			
Offshore So Cal			
Line number			
31			
Operator / Observer			
Valerie/Joe/Christine			
Line Direction			
135			



Instrumentation

Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db		3	3.0 m	3.0 m	
Sample Int.		Record Length		No. of channels			
Primary		0.5 ms.		2000 msec.		48	
Secondary		ms.		Sec.			
Filter		Filter		60 HZ Notch		Other	
Low	Slope	High	Slope	Out			
Out		Out		Out			
Recording Instruments		Type	Format	Tape Drives		Near TR No.	Near offset
		Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk		1	25.0 m.
Navigation System		Primary		Secondary		Far TR No.	Far offset
		NavPoint Longliner DGPS				48	293.8 m.
Boat speed		Navigation fix interval				Group Interval.	Shooting Interval
~4.5 Knots		N/A				6.25 m	6.25 m.

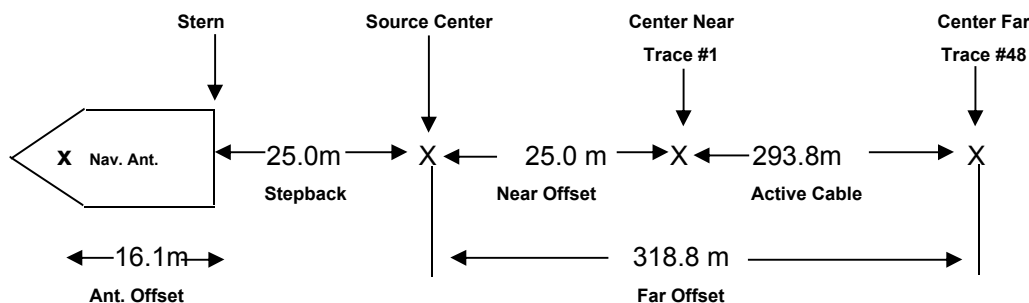
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas calm, slight chop. Swell ~0.5 - 1m Wind SSW 1.6 knots
31.sgy	977	31	618	2.7	SOL 031 UT 1000 SEQ: 093 Local Time:0300 Hrs
31.sgy	1446	500	654	2.9	UT1020
31.sgy	1946	1000	661	2.8	UT1042
31.sgy	2446	1500	707	3	UT1104
31.sgy	2946	2000	714	3	UT1125
2050.sgy	2996	2050	730	2.8	UT1127 SOF
2050.sgy	3446	2500	730	2.7	UT1147
2050.sgy	3946	3000	738	2.9	UT1240
2050.sgy	4446	3500	732	2.8	UT1230
2050.sgy	4946	4000	755	2.7	UT1241
4069.sgy	5015	4069	765	2.8	UT1244 SOF
4069.sgy	5446	4500	783	2.7	UT1313
4069.sgy	5634	4688	790	2.9	UT1321 Shut down due to dolphins End of SEQ 093
4069.sgy	5866	4689	794	2.6	UT1332 Resumed shooting, Start of SEQ 094
4069.sgy	6446	5000	795	2.9	UT1345
4069.sgy	6677	5500	786	2.9	UT1406
4069.sgy	7177	6000	779	2.6	UT1427
6088.sgy	7265	6088	750	2.8	UT1431 SOF
6088.sgy	7677	6500	728	2.8	UT1449
6088.sgy	8177	7000	580	2.9	UT1510
6088.sgy	8677	7500	544	2.9	UT1531
6088.sgy	9177	8000	524	2.7	UT1552
8107.sgy	9284	8107	516	2.8	UT1556 SOF
8107.sgy	9677	8500	514	2.8	UT1612
8107.sgy	10177	9000	464	2.9	UT1634
8107.sgy	10677	9500	453	2.8	UT1655
8107.sgy	11177	10000	436	2.8	UT1717
10126.sgy	11303	10126	430	2.6	UT1722 SOF
10410.sgy	11587	10410	425	2.8	UT1735 EOL 031 UT1735 SEQ: 094

FIELD LOG / OBSERVERS REPORT

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Vessel: R/V New Horizon

Client	SCE	Date	23 Aug 2013
Area and / or Block			
Offshore So Cal			
Line number			
32			
Operator / Observer			
Kyle/James/Gulsen			
Line Direction			
315			



Instrumentation

Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db		3	2.0 m	3.0 m	
Sample Int.		Record Length		No. of channels			
Primary		0.5 ms.		2000 msec.		48	
Secondary		ms.		Sec.			
Filter		Filter		60 HZ Notch		Other	
Low	Slope	High	Slope	Out			
Out		Out		Out			
Recording Instruments		Type	Format	Tape Drives		Near TR No.	Near offset
		Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk		1	25.0 m.
Navigation System		Primary		Secondary		Far TR No.	Far offset
		NavPoint Longliner DGPS				48	293.8 m.
Boat speed		Navigation fix interval				Group Interval.	Shooting Interval
~4.5 Knots		N/A				6.25 m	6.25 m.

File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas relatively calm, slight chop. Swell 1 - 1.5m Wind NW 6.2 knots
					All three sparker tips were replaced between lines 31 and 32
32.sgy	972	32	523	2.7	SOL 032 UT1813 SEQ: 095 Local Time: 1113 Hrs
32.sgy	1440	500	501	2.8	UT1831
32.sgy	1940	1000	504	2.8	UT1853
32.sgy	2440	1500	549	2.7	UT1915
32.sgy	2940	2000	556	2.7	UT1937
2051.sgy	2991	2051	577	2.7	UT1940 SOF
2051.sgy	3440	2500	600	2.8	UT2000
2051.sgy	3940	3000	654	2.7	UT2023
2051.sgy	4440	3500	654	2.7	UT2046
2051.sgy	4866	3926	738	2.7	UT2106 Shutdown for dolphins End of SEQ 095
2051.sgy	4944	3927	747	2.7	UT2111 All Clear; firing source Start of SEQ 096
2051.sgy	5017	4000	714	2.7	UT2115
4070.sgy	5087	4070	767	3.2	UT2118 SOF
4070.sgy	5517	4500	797	2.6	UT2136
4070.sgy	6017	5000	803	2.8	UT2157
4070.sgy	6517	5500	796	3.3	UT2218
4070.sgy	6937	none	?	?	UT2235 Skipped shot
4070.sgy	7018	6000	787	2.9	UT2239
6089.sgy	7107	6089	781	2.5	UT2242 SOF
6089.sgy	7373	6355	774	2.7	UT2253 Shutdown for dolphins End of SEQ 096
6089.sgy	7481	6356	769	3	UT2259 Start of SEQ 097
6089.sgy	7842	6717	760	3	Not detecting serial strings
6089.sgy	8430	7305	752	3.2	End of SEQ 097
7307.sgy	8550	7307	743	2.9	Start of SEQ 098
7307.sgy	8743	7500	720	2.8	UT2353
7307.sgy	9243	8000	690	2.9	UT0015
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FIELD LOG / OBSERVERS REPORT Page 2

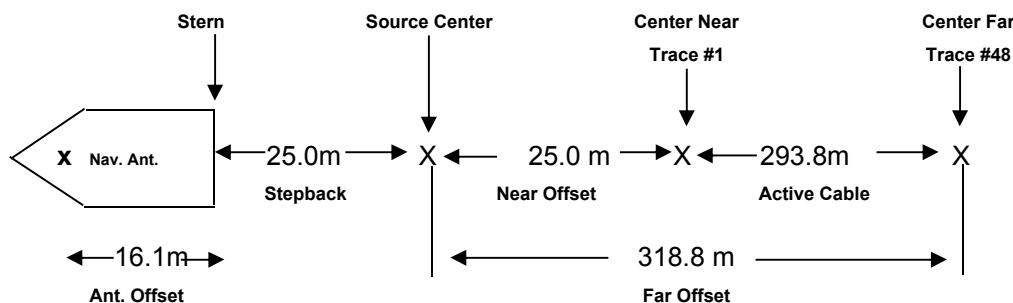
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FIELD LOG / OBSERVERS REPORT

Page 1

Vessel: R/V New Horizon

Client	SCE	Date	23 Aug 2013
Area and / or Block	Offshore So Cal		
Line number	33		
Operator / Observer	Valerie/Joe/Christine		
Line Direction	135		



Instrumentation

Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db		3	2.0 m	3.0 m	
	Sample Int.	Record Length	No. of channels				
Primary	0.5 ms.	2000 msec.	48				Signature Hydrophone depth
Secondary	ms.	Sec.					
Filter	Filter	60 HZ Notch	Other				Note: no aux channels recorded
Low	Slope	High	Slope				
Out	Out	Out					Group Layout
Recording Instruments	Type	Format	Tape Drives	Near TR No.	Near offset		
	Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk	1	25.0 m.		
Navigation System	Primary	Secondary		Far TR No.	Far offset		
	NavPoint Longliner DGPS			48	293.8 m.		
Boat speed	Navigation fix interval			Group Interval.	Shooting Interval		
~4.5 Knots	N/A			6.25 m	6.25 m.		

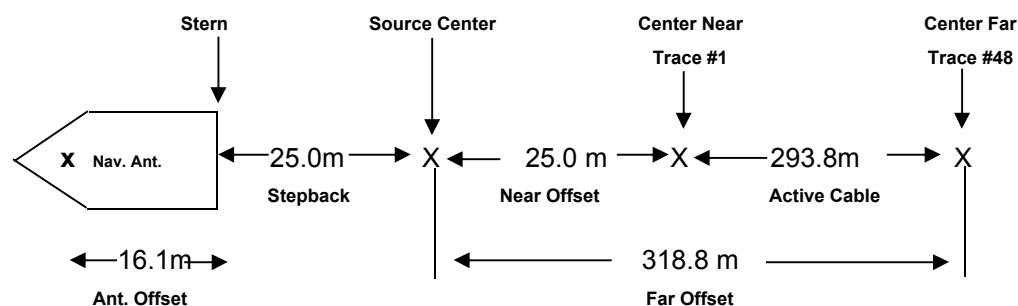
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas relatively calm, slight chop. Swell 1 - 1.5m Wind W 6.5 kt
33.sgy	981	33	602	3.2	SOL 033 UT0221 SEQ:99 Local Time: 1921 Hrs
33.sgy	1448	500	601	2.9	UT0241
33.sgy	1948	1000	620	2.8	UT0303
33.sgy	1962	1014	620	2.8	UT0303 Peak noise threshold exceeded chl 25 - 410 microbars
33.sgy	2448	1500	617	2.9	UT0324
33.sgy	2861	1913	631	2.8	UT0342 Serial String not detected
2052.sgy	3000	2052	638	2.6	UT0348
2052.sgy	3448	2500	619	2.7	UT0407
2052.sgy	3948	3000	755	2.8	UT0428
2052.sgy	4448	3500	774	3	UT0450
2052.sgy	4948	4000	769	2.9	UT0511
4071.sgy	5019	4071	772	2.8	UT0514
4071.sgy	5448	4500	786	2.7	UT0532
4071.sgy	5948	5000	803	2.9	UT0553
4071.sgy	6448	5500	807	3	UT0615
4071.sgy	6948	6000	795	2.9	UT0636
6090.sgy	7038	6090	792	2.8	UT0640
6090.sgy	7448	6500	758	2.8	UT0657
6090.sgy	7948	7000	698	3	UT0719
6090.sgy	8448	7500	705	2.8	UT0740
6090.sgy	8948	8000	660	2.6	UT0801
8109.sgy	9057	8109	656	2.7	UT0805
8109.sgy	9448	8500	611	2.6	UT0822
8109.sgy	9948	9000	650	2.7	UT0843
8109.sgy	10448	9500	700	2.9	UT0906
8109.sgy	10948	10000	688	2.9	UT0928
10128.sgy	11076	10128	653		UT0933
10128.sgy	11448	10500	650	2.8	UT0948
10128.sgy	11591	10643	655	2.8	UT0955 End of the line

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Vessel: R/V New Horizon

Client	SCE	Date	24 Aug 2013
Area and / or Block	Offshore So Cal		
Line number	34		
Operator / Observer	James/Kyle/Gulsen		
Line Direction	315		



Instrumentation

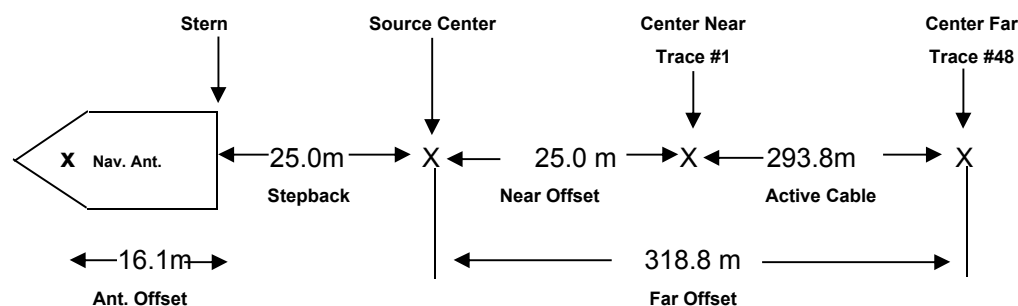
Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db		3	2.0 m	3.0 m	
	Sample Int.	Record Length	No. of channels				
Primary	0.5 ms.	2000 msec.	48				Signature Hydrophone depth
Secondary	ms.	Sec.					
Filter	Filter	60 HZ Notch	Other				Note: no aux channels recorded
Low	Slope	High	Slope				
Out	Out	Out					Group Layout
Recording Instruments	Type	Format	Tape Drives	Near TR No.	Near offset		
	Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk	1	25.0 m.		
Navigation System	Primary	Secondary		Far TR No.	Far offset		
	NavPoint Longliner DGPS			48	293.8 m.		
Boat speed	Navigation fix interval			Group Interval.	Shooting Interval		
~4.5 Knots	N/A			6.25 m	6.25 m.		

File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks
					(Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas calm, slight chop. Swell 1.5 - 2 m Wind NNW 4.3 kt
34.sgy	976	34	669	2.8	SOL 034 UT1028 SEQ:100 Local Time: 0328 Hrs
34.sgy	1442	500	721	3	UT1047
34.sgy	1942	1000	714	2.9	UT1109
34.sgy	2442	1500	669	3	UT1131
34.sgy	2942	2000	669	2.9	UT1153
2053.sgy	2995	2053	650	2.8	UT1155 SOF
2053.sgy	3442	2500	682	2.8	UT1214
2053.sgy	3942	3000	717	2.9	UT1236
2053.sgy	4442	3500	735	2.9	UT1257
2053.sgy	4942	4000	754	2.7	UT1319
4072.sgy	5014	4072	759	2.8	UT1332 SOF
4072.sgy	5442	4500	809	2.6	UT1340
4072.sgy	5942	5000	809	2.9	UT1401
4072.sgy	6442	5500	806	2.5	UT1421
4072.sgy	6942	6000	800	3	UT1443
6091.sgy	7033	6091	798	2.9	UT1446 SOF
6091.sgy	7542	6500	781	2.7	UT1503
6091.sgy	7942	7000	780	2.8	UT1525
6091.sgy	8325	7383	763	3	UT1542 Suspended survey for dolphins
6091.sgy	8431	7384	766	2.9	UT1548 Restarted line. Seq 101
6091.sgy	8547	7500	749	3	UT1553
6091.sgy	9047	8000	496	2.8	UT1614
8110.sgy	9157	8111	496	2.8	UT1619 SOF
8110.sgy	9547	8500	638	3	UT1635
8110.sgy	10047	9000	632	2.7	UT1657
8110.sgy	10547	9500	615	2.8	UT1718
8110.sgy	11047	10000	587	2.7	UT1739
10129.sgy	11176	10129	604	3	UT1744
10129.sgy	11262	10215	567	2.8	UT1747 Suspended survey for dolphins
					Ended line early at shot 11262.

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Vessel: R/V New Horizon



Client	SCE	Date	24 Aug 2013
Area and / or Block	Offshore So Cal		
Line number	35		
Operator / Observer	James/Kyle/Gulsen		
Line Direction	135		

Instrumentation

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m			
	Sample Int.		Record Length		No. of channels				
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth		
Secondary	ms.		Sec.						
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded	
Low	Slope	High	Slope	Out					
Out		Out		Out		Group Layout			
Recording Instruments	Type	Format		Tape Drives		Near TR No.	Near offset		
	Geo-Eel	SEG Y(IBM)		Hard Disk/ USB Disk		1	25.0 m.		
Navigation System	Primary			Secondary				Far TR No.	Far offset
	NavPoint Longliner DGPS							48	293.8 m.
Boat speed		Navigation fix interval				Group Interval.	Shooting Interval		
~4.5 Knots		N/A				6.25 m	6.25 m.		

Note: no aux channels recorded

Group Layout

File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks
					(Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas calm, slight chop. Swell 1.5 - 2 m Wind WNW 3.8 knots
35.sgy	981	35	458	3.3	SOL 035 UT1827 SEQ:102 Local Time: 1127 Hrs
35.sgy	1446	500	505	2.8	UT1846
35.sgy	1946	1000	578	2.8	UT1908
35.sgy	2446	1500	594	3	UT1929
35.sgy	2946	2000	605	2.8	UT1950
2054.sgy	3000	2054	648	2.8	UT1952
2054.sgy	3446	2500	719	3	UT2011
2054.sgy	3946	3000	785	3	UT2031
2054.sgy	4446	3500	783	2.8	UT2053
2054.sgy	4946	4000	790	2.7	UT2115
4073.sgy	5019	4073	789	3	UT2118
4073.sgy	5446	4500	798	2.8	UT2136
4073.sgy	5946	5000	806	2.8	UT2157
4073.sgy	6446	5500	810	2.8	UT2219
4073.sgy	6946	6000	814	2.8	UT2240
6092.sgy	7038	6092	815	2.9	UT2244 SOF
6092.sgy	7149	6203	?	?	UT2249 brute stack enabled - no printout
6092.sgy	7190	6244	799	3	UT2251 brute stack disabled - printout restored
6092.sgy	7446	6500	793	3.1	UT2302
6092.sgy	7946	7000	772	3	UT2322
6092.sgy	8446	7500	750	3.2	UT2343
6092.sgy	8946	8000	736	2.8	UT0003
8111.sgy	9057	8111	740	3.1	UT0008
8111.sgy	9446	8500	704	2.7	UT0024
8111.sgy	9574	8628	703	2.9	UT0030
8111.sgy	9946	9000	726	2.8	UT0046
8111.sgy	10262	9315	721	2.8	UT0059 Trigger time threshold exceeded
8111.sgy	10447	9500	742	2.9	UT0107
8111.sgy	10947	10000	744	2.8	UT0128
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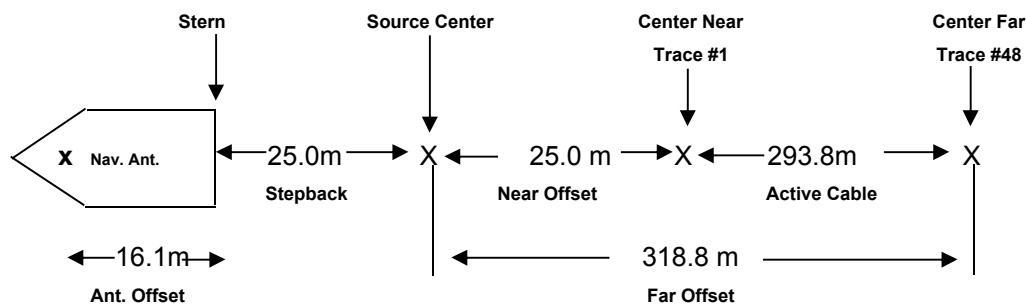
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Vessel: R/V New Horizon

Client	SCE	Date	24 Aug 2013
Area and / or Block	Offshore So Cal		
Line number	36		
Operator / Observer	Christine, Joe, Valerie		
Line Direction	315		



Instrumentation

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope					
Out		Out		Out				Group Layout
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

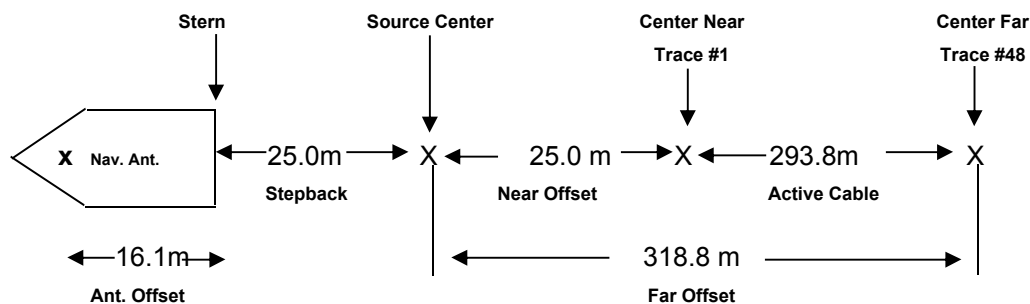
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks
					(Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas relatively calm, slight chop. Swell 1.5 - 2 m Wind W 9.0 knots
36.sgy	976	36	684	2.5	SOL 036 UT0229 SEQ:103 Local Time: 1930 Hrs
36.sgy	1440	500	760	2.9	UT0249
36.sgy	1940	1000	764	2.6	UT0310
36.sgy	2440	1500	744	3	UT0332
36.sgy	2940	2000	745	3	UT0353
2055.sgy	2995	2055	749	2.9	UT0355 file change
2055.sgy	3440	2500	777	2.9	UT0415
2055.sgy	3940	3000	804	3	UT0436
2055.sgy	4440	3500	809	2.8	UT0457
2055.sgy	4940	4000	839	3	UT0519
4074.sgy	5014	4074	813	3	UT0522 file change
4074.sgy	5440	4500	816	3	UT0540
4074.sgy	5940	5000	816	2.9	UT0601
4074.sgy	6440	5500	809	2.8	UT0622
4074.sgy	6940	6000	807	3	UT0643
6093.sgy	7033	6093	807	3	UT0647 file change
6093.sgy	7341	6401	801	2.9	UT0700 MIDNIGHT - 8/25/2013
6093.sgy	7440	6500	800	2.9	UT0704
6093.sgy	7940	7000	797	3	UT0724
6093.sgy	8079	7138	795	3.2	UT0730
6093.sgy	8440	7500	799	2.8	UT0745
6093.sgy	8940	8000	770	3	UT0805
8112.sgy	9052	8112	733	3	UT0810 file change
8112.sgy	10346	11590			UT 01:56 Last Shot before system crash
1032.sgy	10400	11071	619		UT 09:33 System Restart Line 36a
1032.sgy	11600	1569	733		EOL 36A UT 0955 SEQ: 103

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Vessel: R/V New Horizon

Client	SCE	Date	25 Aug 2013
Area and / or Block	Offshore So Cal		
Line number	37		
Operator / Observer	Gulsen/James/Kyle		
Line Direction	135		



Instrumentation

Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db		3	2.0 m	3.0 m	
	Sample Int.	Record Length	No. of channels				
Primary	0.5 ms.	2000 msec.	48				Signature Hydrophone depth
Secondary	ms.	Sec.					
Filter	Filter	60 HZ Notch	Other				Note: no aux channels recorded
Low	Slope	High	Slope				
Out	Out	Out					Group Layout
Recording Instruments	Type	Format	Tape Drives	Near TR No.	Near offset		
	Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk	1	25.0 m.		
Navigation System	Primary	Secondary		Far TR No.	Far offset		
	NavPoint Longliner DGPS			48	293.8 m.		
Boat speed	Navigation fix interval			Group Interval.	Shooting Interval		
~4.5 Knots	N/A			6.25 m	6.25 m.		

File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks
					(Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas relatively calm. Swell 1.5 - 2 m Wind W 0.7 knots
37.sgy	979	37	740	2.7	SOL 037 UT1021 SEQ: 104 Local Time: 0322 Hrs
37.sgy	1442	500	714	2.9	UT1041
37.sgy	1942	1000	715	3	UT1102
37.sgy	2442	1500	731	2.7	UT1133
37.sgy	2942	2000	760	3	UT1143
2056.sgy	2998	2056	776	2.8	UT1147 SOF
2056.sgy	3442	2500	807	2.9	UT1205
2056.sgy	3942	3000	810	3	UT1227
2056.sgy	3976	3034	810	3	UT1228 Nav. Serial String Not Detected
2056.sgy	4442	3500	809	3	UT1248
2056.sgy	4942	4000	807	3	UT1309
4075.sgy	5017	4075	807	2.9	UT1312 SOF
4075.sgy	5442	4500	810	2.9	UT1331
4075.sgy	5942	5000	821	3.1	UT1352
4075.sgy	6108	5166	821	3	UT1359 Begin Multiple Nav. Serial Strings Not Detected
4075.sgy	6164	5222	822	3	UT1401 End Multiple Nav. Serial Strings Not Detected
4075.sgy	6442	5500	818	3	UT1413
4075.sgy	6704	5762	818	3	UT1424 Nav. Serial String Not Detected
4075.sgy	6805	5863	819	3.1	UT1428 Nav. Serial String Not Detected
4075.sgy	6942	6000	818	2.9	UT1433
6094.sgy	7036	6094	817	3	UT1437 SOF
6094.sgy	7442	6500	832	2.9	UT1454
6094.sgy	7942	7000	825	3	UT1516
6094.sgy	8442	7500	826	3	UT1536
6094.sgy	8942	8000	805	2.9	UT1558
8113.sgy	9055	8113	800	3	UT1603 SOF
8113.sgy	9442	8500	780	2.9	UT1619

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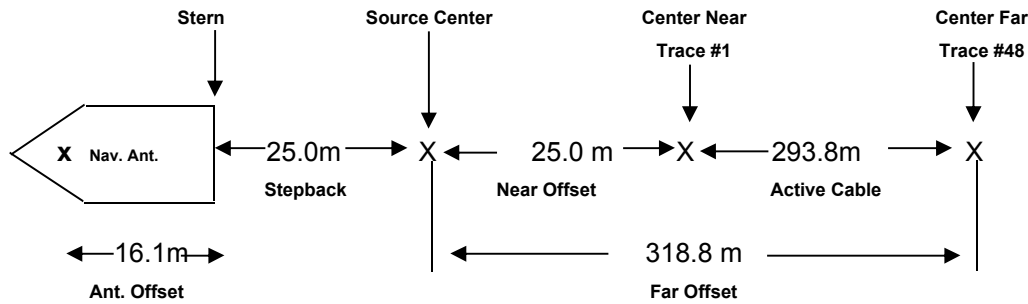
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Vessel: R/V New Horizon

Client	SCE	Date	25 Aug 2013
Area and / or Block			
Offshore So Cal			
Line number			
38			
Operator / Observer			
Kyle/James/Gulsen			
Line Direction			
315			



Instrumentation

Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db		3	2.0 m	3.0 m	
Sample Int.		Record Length		No. of channels			
0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary		ms.		Sec.			
Filter		Filter		60 HZ Notch		Other	
Low		High		Out			
Out		Out		Out			
Recording Instruments		Type		Format		Tape Drives	
		Geo-Eel		SEG Y(IBM)		Hard Disk/ USB Disk	
Navigation System		Primary		Secondary			
		NavPoint Longliner DGPS					
Boat speed		Navigation fix interval					
~4.5 Knots		N/A					
Near TR No.		Near offset					
1		25.0 m.					
Far TR No.		Far offset					
48		293.8 m.					
Group Interval.		Shooting Interval					
6.25 m		6.25 m.					

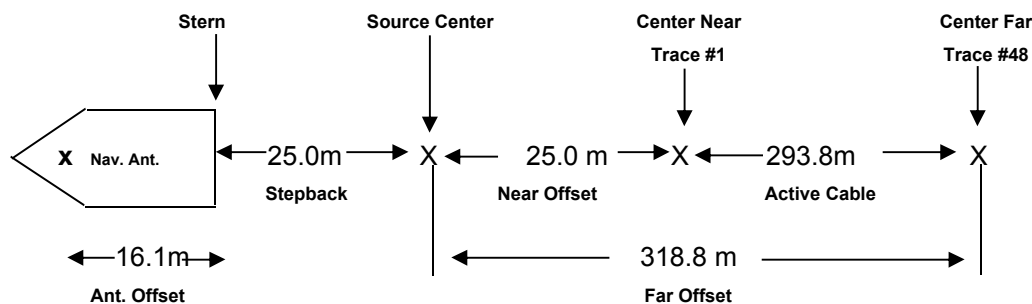
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas relatively calm. Swell 1.5 - 2 m Wind W 0.7 knots
38.sgy	924	38	790	2.8	SOL 038 UT1824 SEQ: 105 Local Time: 1128 Hrs
38.sgy	929	41	811	2.9	UT1824 Navigation error - lost shots 927-928, SEQ now 106
38.sgy	1388	500	778	3	UT1844
38.sgy	1888	1000	806	2.9	UT1907
38.sgy	2888	2000	719	3.1	UT1950
2057.sgy	2945	2057	730	3	UT1953
2057.sgy	3139	2251	765	2.9	UT2001 Multiple nav serial string errors - Didn't log shots
2057.sgy	3388	2500	808	3	UT2011
2057.sgy	3888	3000	834	3	UT2033
2057.sgy	4388	3500	844	2.9	UT2053
2057.sgy	4888	4000	845	2.8	UT2115
4076.sgy	4964	4076	849	3	UT2118 SOF
4076.sgy	5388	4500	708	2.8	UT2126
4076.sgy	5888	5000	747	3	UT2157
4076.sgy	6388	5500	816	2.8	UT2219
4076.sgy	6888	6000	823	3	UT2240
6095.sgy	6983	6095	775	2.9	UT2245
6095.sgy	7388	6500	817	2.9	UT2302
6095.sgy	7888	7000	830	3	UT2323
6095.sgy	8021	7133	825	3.2	UT2328 serial string not detected
6095.sgy	8388	7500	831	3.1	UT2343
6095.sgy	8888	8000	833	3.1	UT0004
8114.sgy	9002	8114	775	2.7	UT0009
8114.sgy	9888	9000	805	3	UT0047
8114.sgy	10388	9500	785	3.1	UT0108
8114.sgy	10888	10000	778	3	UT0130
10133.sgy	11021	10133	777	2.9	UT0136
10133.sgy	11388	10500	771	3	UT0151
10133.sgy	11607	10719	770	2.8	EOL 038 UT0201 SEQ: 106

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Vessel: R/V New Horizon

Client	SCE	Date	25 Aug 2013
Area and / or Block			
Offshore So Cal			
Line number			
39			
Operator / Observer			
Valerie/Joe/Christine			
Line Direction			
135			



Instrumentation

Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db		3	2.0 m	3.0 m	
Sample Int.		Record Length		No. of channels			
0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary		ms.		Sec.			
Filter		Filter		60 HZ Notch		Other	
Low		High		Out		Note: no aux channels recorded	
Out		Out		Out			
Recording Instruments		Type		Format		Tape Drives	
Geo-Eel		SEG Y(IBM)		Hard Disk/ USB Disk			
Navigation System		Primary		Secondary			
NavPoint Longliner DGPS							
Boat speed		Navigation fix interval		Group Interval.		Shooting Interval	
~4.5 Knots		N/A		6.25 m		6.25 m.	

File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas relatively calm. Swell 1.5 - 2 m Wind SW 5.4 knots
39.sgy	977	39	750	3	SOL 039 UT0227 SEQ:107 Local Time: 1927 Hrs
39.sgy	981	43	750	3	First good shot UT0226
39.sgy	1438	500	812	2.9	UT0245
39.sgy	1938	1000	822	2.8	UT0306
39.sgy	2164	1226	827	3	UT0317 Serial string not detected
39.sgy	2438	1500	825	3.1	UT0329
39.sgy	2938	2000	844	3.1	UT0350
2058.sgy	2996	2058	844	3.1	UT0353
2058.sgy	3438	2500	840	3.2	UT0412
2058.sgy	3938	3000	852	3	UT0433
2058.sgy	4438	3500	815	3	UT0455
2058.sgy	4938	4000	819	3	UT0516
4077.sgy	5015	4077	819	3	UT0519
4077.sgy	5438	4500	824	3	UT0537
4077.sgy	5938	5000	842	3	UT0558
4077.sgy	6438	5500	845	3	UT0620
4077.sgy	6938	6000	854	3	UT0642
6096.sgy	7034	6096	854	2.9	UT0646
6069.sgy	7352	6414	857	2.9	UT0700 Midnight
6096.sgy	7410-7421	6481-6483	858	3	UT0702 Serial string not detected
6096.sgy	7427-7429	6489-6491	858	3	UT0703 Serial string not detected
6096.sgy	7438	6500	858	3.1	UT0703
6096.sgy	7938	7000	864	3.2	UT0724
6096.sgy	8438	7500	863	3	UT0745
6096.sgy	8938	8000	872	3	UT0806
8115.sgy	9053	8115	853	3	UT0811
8115.sgy	9438	8500	918	3.2	UT0827

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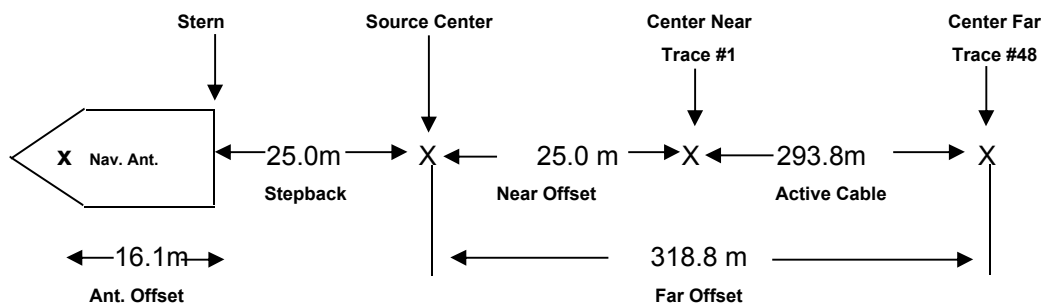
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Vessel: R/V New Horizon

Client	SCE	Date	26 Aug 2013
Area and / or Block	Offshore So Cal		
Line number	40		
Operator / Observer	Kyle/James/Gulsen		
Line Direction	315		



Instrumentation

Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db		3	2.0 m	3.0 m	
	Sample Int.	Record Length	No. of channels				
Primary	0.5 ms.	2000 msec.	48				Signature Hydrophone depth
Secondary	ms.	Sec.					
Filter	Filter	60 HZ Notch	Other				Note: no aux channels recorded
Low	Slope	High	Slope				
Out	Out	Out					Group Layout
Recording Instruments	Type	Format	Tape Drives	Near TR No.	Near offset		
	Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk	1	25.0 m.		
Navigation System	Primary	Secondary		Far TR No.	Far offset		
	NavPoint Longliner DGPS			48	293.8 m.		
Boat speed	Navigation fix interval			Group Interval.	Shooting Interval		
~4.5 Knots	N/A			6.25 m	6.25 m.		

File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas relatively calm. Swell ~1 - 1.5m Wind NW 9.9 knots
40.sgy	980	40	860	3	SOL 040 UT1025 SEQ: 108 Local Time: 0326 Hrs
40.sgy	1440	500	835	3.1	UT1044
40.sgy	1845	905	868	3.3	UT1101 Serial String not detected
40.sgy	1940	1000	877	3	UT1105
40.sgy	2336	1396	895	3	UT1122 Serial String not detected
40.sgy	2440	1500	905	2.7	UT1126
40.sgy	2490	1550	914	2.7	UT1128 Serial String not detected
40.sgy	2940	2000	941	3	UT1147
2059.sgy	2999	2059	943	2.6	UT1150 SOF
2059.sgy	3440	2500	948	2.9	UT1208
2059.sgy	3940	3000	915	2.8	UT1248
2059.sgy	4440	3500	873	3	UT1249
2059.sgy	4940	4000	859	2.8	UT1311
4078.sgy	5018	4078	642	2.3	UT1314 SOF
4078.sgy	5368	4427	850	2.5	UT1329 Serial String not detected
4078.sgy	5440	4500	853	2.6	UT1332
4078.sgy	5940	5000	848	2.6	UT1353
4078.sgy	6440	5500	843	2.5	UT1415
4078.sgy	6940	6000	839	2.5	UT1435
6097.sgy	7037	6097	740	2.6	UT1440 SOF
6097.sgy	7440	6500	620	2.6	UT1457
6097.sgy	7940	7000	647	2.6	UT1520
6097.sgy	8138	7197	657	2.3	UT1529 Nav serial string not detected alarm
6097.sgy	8440	7500	844	2.6	UT1542
6097.sgy	8940	8000	860	2.6	UT1604
8116.sgy	9056	8116	858	2.6	UT1609 SOF
8116.sgy	9440	8500	855	2.4	UT1626

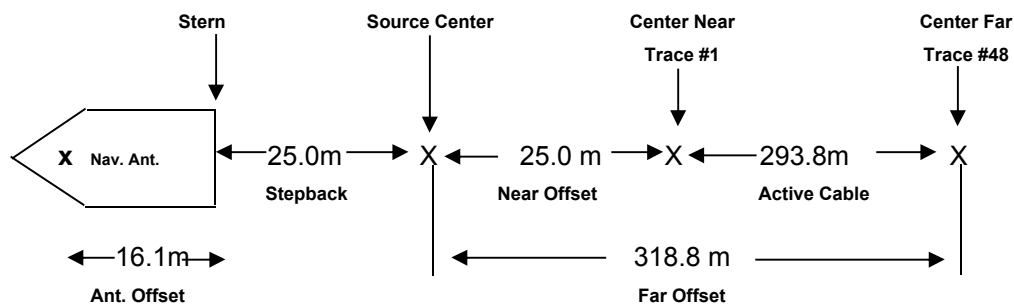
Continued on Page 2

FIELD LOG / OBSERVERS REPORT

Page 1

Vessel: R/V New Horizon

Client	SCE	Date	26 Aug 2013
Area and / or Block	Offshore So Cal		
Line number	41		
Operator / Observer	Kyle/James/Gulsen		
Line Direction	135		



Instrumentation

Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db		3	2.0 m	3.0 m	
	Sample Int.	Record Length	No. of channels				
Primary	0.5 ms.	2000 msec.	48				Signature Hydrophone depth
Secondary	ms.	Sec.					
Filter	Filter	60 HZ Notch	Other				Note: no aux channels recorded
Low	Slope	High	Slope				
Out	Out	Out					Group Layout
Recording Instruments	Type	Format	Tape Drives	Near TR No.	Near offset		
	Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk	1	25.0 m.		
Navigation System	Primary	Secondary		Far TR No.	Far offset		
	NavPoint Longliner DGPS			48	293.8 m.		
Boat speed	Navigation fix interval			Group Interval.	Shooting Interval		
~4.5 Knots	N/A			6.25 m	6.25 m.		

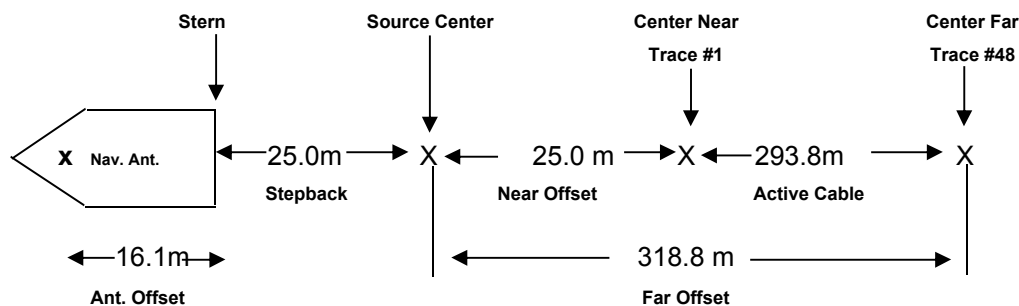
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
					Seas relatively calm. Swell ~1 - 1.5m Wind NW 9.9 knots
41.sgy	975	41	843	2.8	UT1826 SOL 041 SEQ: 109 Local Time: 1128 Hrs
41.sgy	1434	500	874	2.6	UT1846
41.sgy	1934	1000	849	2.8	UT1907
41.sgy	2434	1500	862	2.7	UT1928
41.sgy	2934	2000	871	2.5	UT1950
2060.sgy	2994	2060	868	2.6	UT1953 SOF
2060.sgy	3434	2500	873	2.7	UT2012
2060.sgy	3934	3000	717	2.4	UT2033
2060.sgy	4434	3500	609	2.6	UT2055
2060.sgy	4934	4000	597	2.5	UT2117
4079.sgy	5013	4079	554	2.5	UT2120 SOF
4079.sgy	5434	4500	746	2.7	UT2139
4079.sgy	5934	5000	830	2.5	UT2201
4079.sgy	6434	5500	810	2.3	UT2223
4079.sgy	6934	6000	804	2.9	UT2245
6098.sgy	7032	6098	805	2.7	UT2249 SOF
6098.sgy	7434	6500	771	2.8	UT2304
6098.sgy	7934	7000	832	3.2	UT2326
6098.sgy	8434	7500	808	3	UT2347
6098.sgy	8934	8000	922	3	UT0007
8117.sgy	9051	8117	958	3	UT0012 SOF
8117.sgy	9434	8500	956	2.9	UT0028
8117.sgy	9934	9000	946	3.2	UT0049
8117.sgy	10434	9500	888	2.9	UT0110
8117.sgy	10934	10000	881	3.3	UT0130
10136.sgy	11070	10136	915	3	UT0136
10136.sgy	11434	10500	915	3	UT0152
10136.sgy	11615	10681	904	3	UT0200 EOL UT0200 SEQ: 109

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Client

SCE

Date 29 Aug 2013



Area and / or Block
Offshore So Cal

Line number **50**

Operator / Observer
James/Gulsen/Kyle

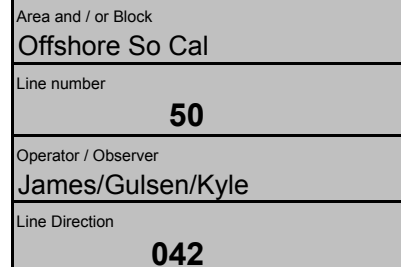
Line Direction **222**

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

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Page 1

Client	Date
SCE	29 Aug 2013



Source type	Source power	Pre amp gain	Number	Tips	Source depth	Streamer Depth		
Sparker	2 KJ	18 db	of	3	2.0 m	3.0 m		

Filter		Filter		60 HZ Notch	Other	Note: no aux channels recorded
Low	Slope	High	Slope			
Out		Out		Out		Group Layout

Group Layout

Navigation System	Primary	Secondary	Far TR No.	Far offset
	NavPoint Longliner DGPS		48	293.8 m.

Boat speed ~4.5 Knots	Navigation fix interval N/A	Group Interval. 6.25 m	Shooting Interval 6.25 m.
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File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
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Seas calm. Swell ~1m Wind NNW 0.5 knots

51.sqv	983	52	761	2.9	SOL: 051 UT1304 SEQ: 164 - File Number 51 = "Practice shot"
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51 sqv	1160	229	755	2.9	UT1312	Suspended survey due to whale shepanigans
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51.sqv	1254	230	764	2.9	UT1316	Resumed survey
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51.sqv	1524	500	770	2.7	UT1327
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51 say	2024	1000	691	29	UT1348
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51 say	2524	1500	562	2.8	UT1409
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51.5gy	2924	1999	392	2.9	UT1409
51.5gy	3034	2000	229	3	UT1430

3071 ggy	3024	2000	229	3	UT1450
3071 ggy	3005	2071	180	2.8	UT1433

2071.sgy	3095	2071	180	2.8	011433	SOF
2071.sgy	3234	2110	163	2.7	EOL: 051 UT: 1439 SEQ: 164	

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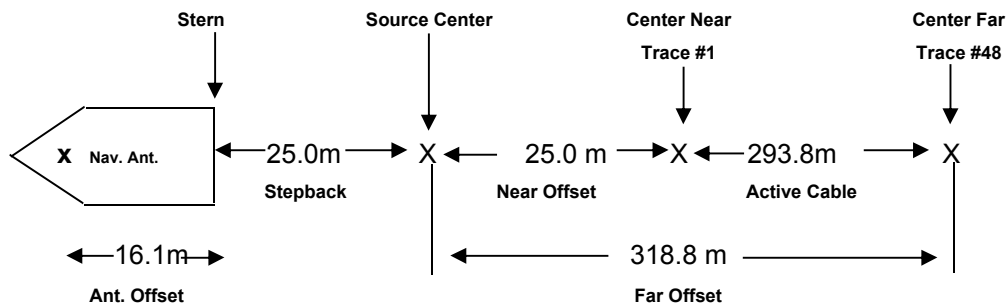
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Client	Date
SCE	29 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
52	
Operator / Observer	
James/Gulsen/Kyle	
Line Direction	
222	



Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

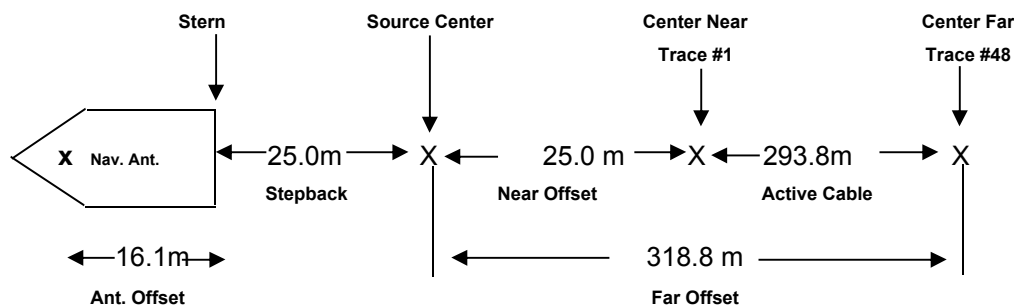
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Client

SCE

Date
29 Aug 2013



Area and / or Block
Offshore So Cal

Line number **53**

Operator / Observer
James/Gulsen/Kyle

Line Direction **042**

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other	Note: no aux channels recorded	
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

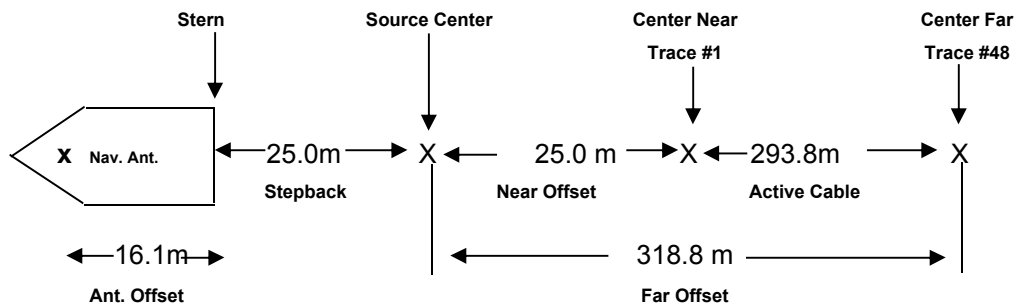
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Client

SCE

Date
29 Aug 2013



Area and / or Block
Offshore So Cal

Line number

Operator / Observer
James/Gulsen/Kyle

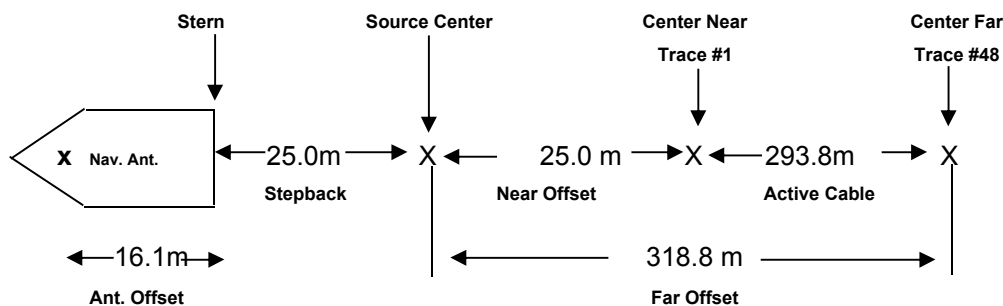
Line Direction **222**

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

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Client	Date
SCE	29 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
55	
Operator / Observer	
James/Gulsen/Kyle	
Line Direction	
042	



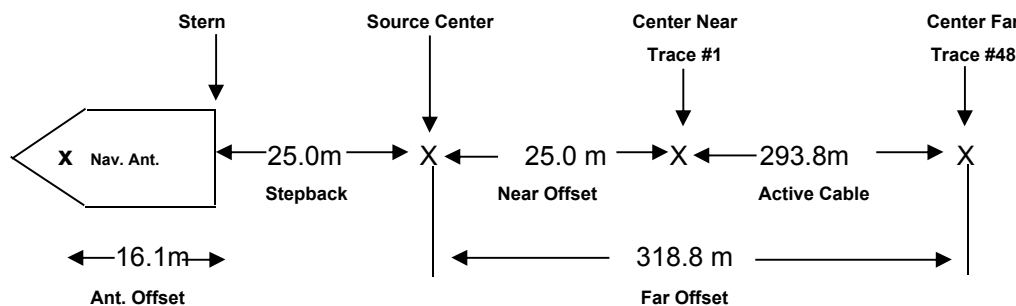
Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other	Note: no aux channels recorded	
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Client **SCE**

Date
29 Aug 2013



Area and / or Block
Offshore So Cal

Line number **56**

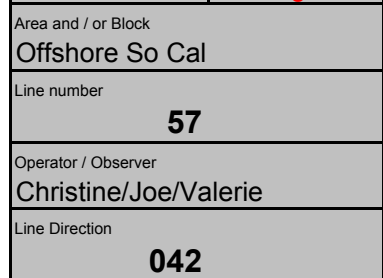
Operator / Observer
Christine/Joe/ValerieLine Direction **222**

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other	Note: no aux channels recorded	
Low	Slope	High	Slope	Out				
Out		Out						
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client	Date
SCE	29 Aug 2013



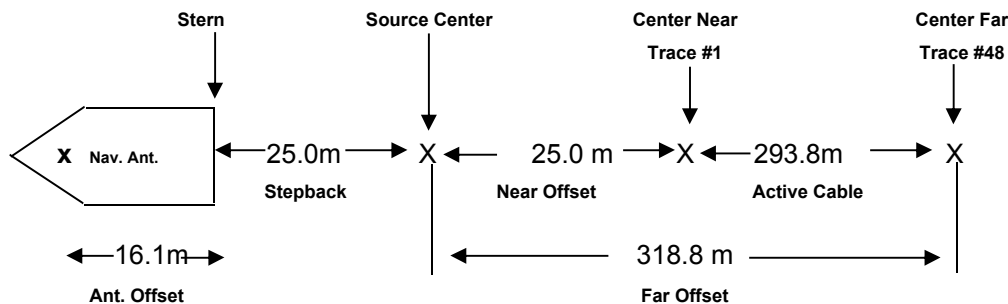
Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth		
Sparker	2 KJ	18 db		3	2.0 m	3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope					
Out		Out		Out				Group Layout
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Page 1

Client

Date
29 Aug 2013



Area and / or Block
Offshore So Cal

Line number **58**

Operator / Observer
Christine/Joe/Valerie

Line Direction **222**

Source type	Source power	Pre amp gain	Number	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db	of	3	2.0 m	3.0 m	

	Sample Int.	Record Length	No. of channels	
Primary	0.5 ms.	2000 msec.	48	Signature Hydrophone depth
Secondary	ms.	Sec.		

Filter		Filter		60 HZ Notch	Other	Note: no aux channels recorded
Low	Slope	High	Slope	Out		
						Group Layout

Recording Instruments	Type	Format	Tape Drives	Near TR No.	Near offset
	Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk	1	25.0 m.

Navigation System	Primary	Secondary	Far TR No.	Far offset
	NavPoint Longliner DGPS		48	293.8 m.

Boat speed ~4.5 Knots	Navigation fix interval N/A	Group Interval. 6.25 m	Shooting Interval 6.25 m.
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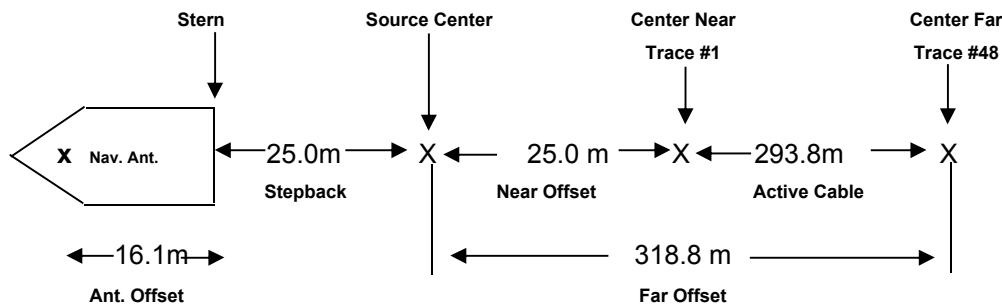
File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
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					Seas calm. Swell: ~1-1.5m, Wind: WNW @ 6.4 kn
58.sgy	1002	58	55	3.2	SOL: 058 UT:454 SEQ: 173
58.sgy	1444	500	250	3	UT0514
58.sgy	1602	658	323	3	UT0520
58.sgy	1944	1000	448	3.2	UT0535
58.sgy	2444	1500	731	3.2	UT0556
58.sgy	2944	2000	725	2.9	UT0618
2077.sgy	3021	2077	722	3	UT0621
2077.sgy	3381	2437	749	2.8	EOL 058 UT0636 SEQ: 173

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Date
30 Aug 2013

Client	Date
SCE	30 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
59	
Operator / Observer	
Christine/Joe/Valerie	
Line Direction	
042	

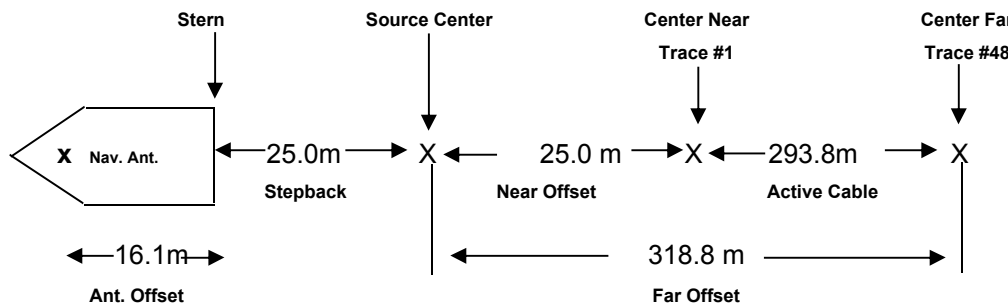


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client	Date
SCE	30 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
60	
Operator / Observer	
Gulsen/Kyle/James	
Line Direction	
222	

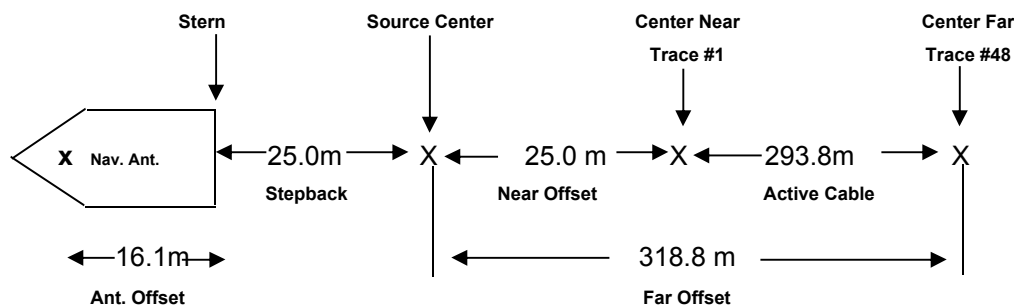


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other	Note: no aux channels recorded	
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client	Date
SCE	30 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
61	
Operator / Observer	
Gulsen/Kyle/James	
Line Direction	
042	



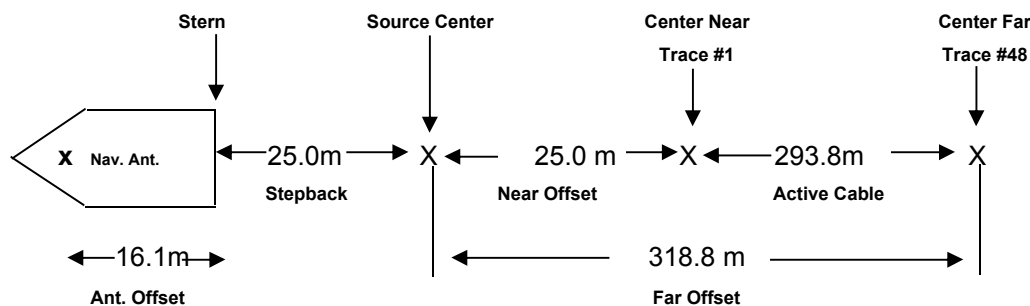
Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other	Note: no aux channels recorded	
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client **SCE**

Date
30 Aug 2013



Area and / or Block
Offshore So Cal

Line number **62**

Operator / Observer
Gulsen/Kyle/JamesLine Direction **222**

Source type	Source power	Pre amp gain	Number	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db	of	3	2.0 m	3.0 m	

	Sample Int.	Record Length	No. of channels	
Primary	0.5 ms.	2000 msec.	48	Signature Hydrophone depth

Secondary	ms.	Sec.		
Filter	Filter	60 HZ Notch	Other	Note: no aux channels recorded

Low	Slope	High	Slope			
Out		Out		Out		
						Group Layout

Recording Instruments	Type	Format	Tape Drives	Near TR No.	Near offset
	Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk	1	25.0 m.

Navigation System	Primary	Secondary	Far TR No.	Far offset
	NavPoint Longliner DGPS		48	293.8 m.

Boat speed ~4.5 Knots	Navigation fix interval N/A	Group Interval. 6.25 m	Shooting Interval 6.25 m.
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File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
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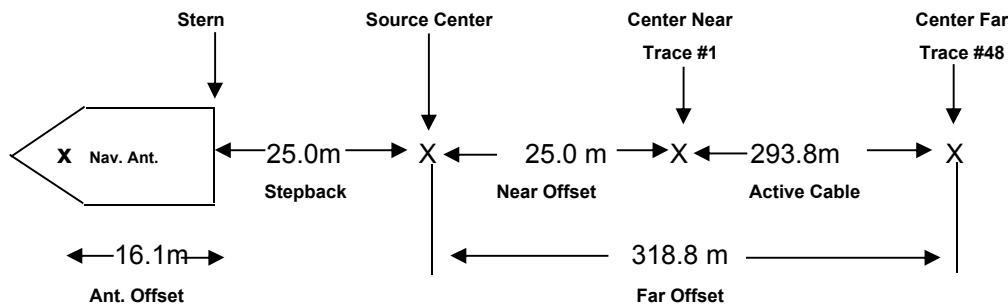
					Seas calm. Swell: ~1-1.5m, Wind: SW @ 2.9 kt	
62.sgy	995	62	150	2.6	SOL: 062	UT1557 SEQ: 177 Local Time: 0857 Hrs
62.sgy	1147	214	267	2.8	UT1603	Survey shutdown due to marine mammals
62.sgy	1213	215	287	2.8	UT1606	Resumed survey SEQ 178
62.sgy	1498	500	358	2.7	UT1618	
62.sgy	1998	1000	480	2.8	UT1641	
62.sgy	2498	1500	578	2.8	UT1702	
62.sgy	2998	2000	627	2.7	UT1724	
2081.sgy	3089	2081	639	2.9	UT1728	SOF
2081.sgy	3498	2500	684	2.8	UT1746	
2081.sgy	3735	2739	716	2.8	UT1756	Nav serial string not detected.
2081.sgy	3896	2898	729	2.8	UT1803	EOL SEQ 178

Page 1

Client

SCE

Date
30 Aug 2013



Area and / or Block
Offshore So Cal

Line number **63**

Operator / Observer
Gulsen/Kyle/James

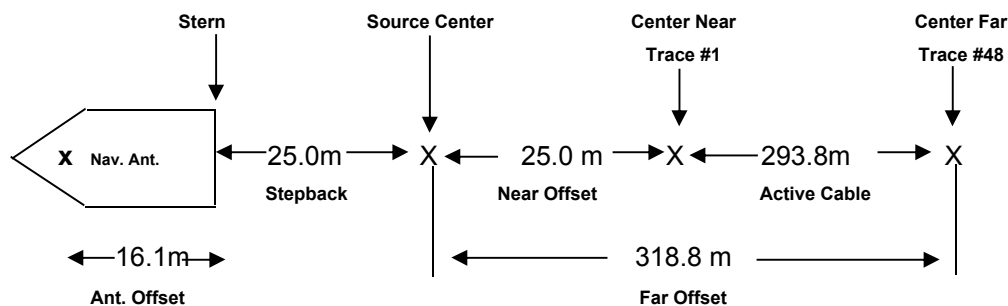
Line Direction **042**

Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth		
Sparker	2 KJ	18 db		3	2.0 m	3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope	Out				
Out			Out					Group Layout
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

Page 1

Client	Date
SCE	30 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
64	
Operator / Observer	
Gulsen/Kyle/James	
Line Direction	
222	

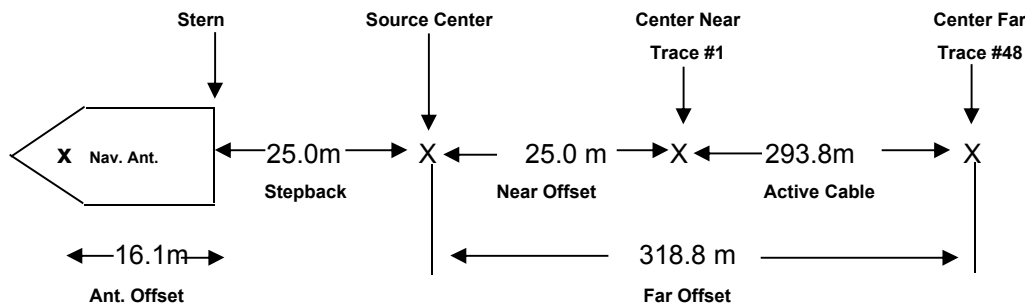


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type	Format		Tape Drives		Near TR No.	Near offset	
	Geo-Eel	SEG Y(IBM)		Hard Disk/ USB Disk		1	25.0 m.	
Navigation System	Primary	Secondary			Far TR No.	Far offset		
	NavPoint Longliner DGPS				48	293.8 m.		
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

[illegible]

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Client	Date
SCE	30 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
64B	
Operator / Observer	
Gulsen/Kyle/James	
Line Direction	
222	

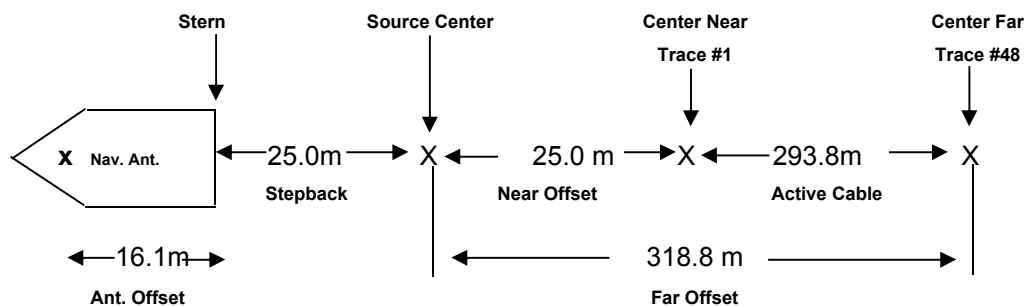


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval			N/A		Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

Page 1

Client	Date
SCE	30 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
65	
Operator / Observer	
Christine/Joe/Valerie	
Line Direction	
042	

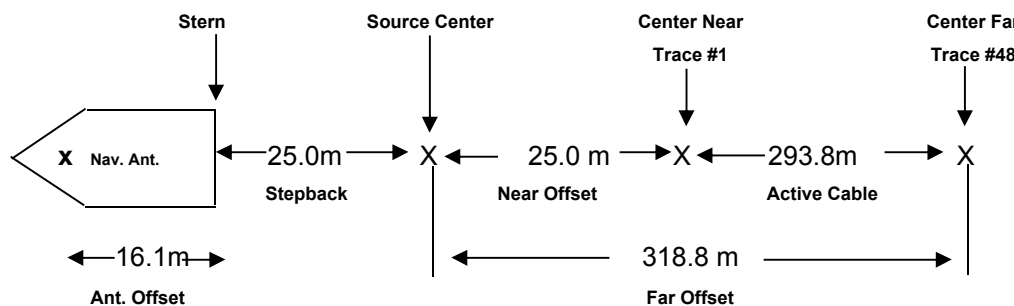


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client	Date
SCE	30 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
66	
Operator / Observer	
Christine/Joe/Valerie	
Line Direction	
222	

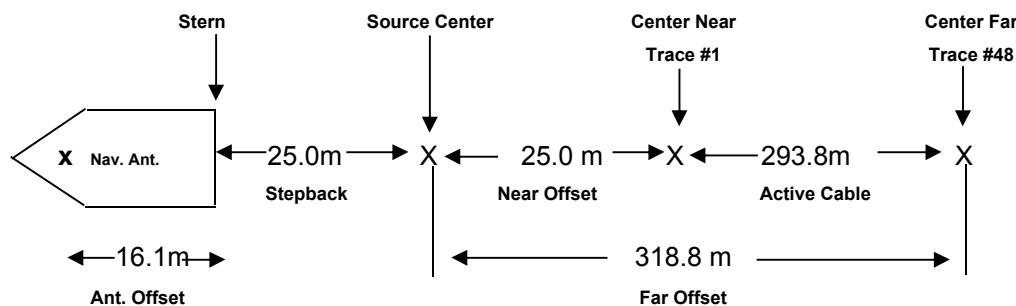


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client	Date
SCE	30 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
67	
Operator / Observer	
Christine/Joe/Valerie	
Line Direction	
042	



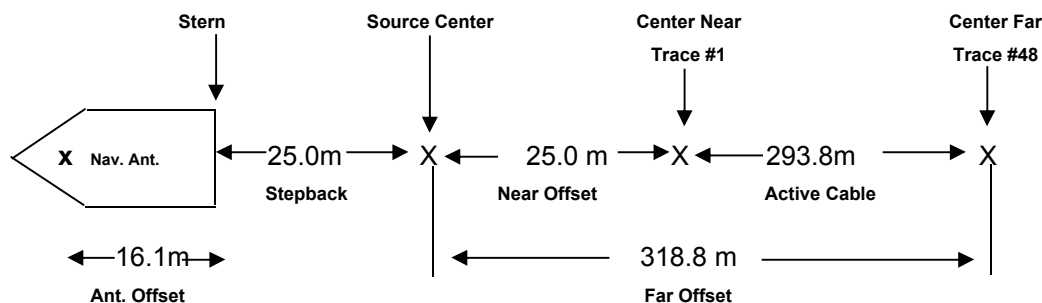
Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client **SCE**

Date
21 Aug 2013



Area and / or Block
Offshore So Cal

Line number **68a**

Operator / Observer
Valerie/JoeLine Direction **135**

Source type	Source power	Pre amp gain	Number	Tips	Source depth	Streamer Depth
Sparker	2 KJ	18 db	of	3	2.0 m	3.0 m

	Sample Int.	Record Length	No. of channels
Primary	0.5 ms.	2000 msec.	48

Signature Hydrophone depth

Filter		Filter		60 HZ Notch	Other
Low	Slope	High	Slope	Out	
Out		Out			

Note: no aux channels recorded

Group Layout

Recording Instruments	Type	Format	Tape Drives
	Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk

Near TR No. 1	Near offset 25.0 m.
------------------	------------------------

Navigation System	Primary	Secondary
	NavPoint Longliner DGPS	

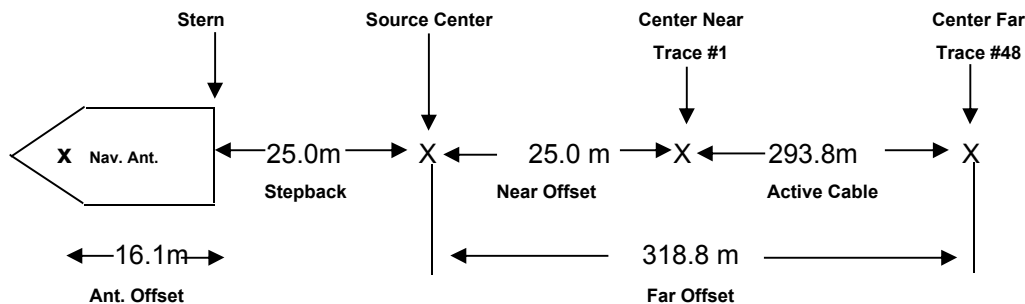
Far TR No.	Far offset
48	293.8 m.

Boat speed ~4.5 Knots	Navigation fix interval N/A	Group Interval. 6.25 m	Shooting Interval 6.25 m.
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[illegible]

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Client	Date
SCE	31 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
161	
Operator / Observer	
Christine/Joe/Valerie	
Line Direction	
222	



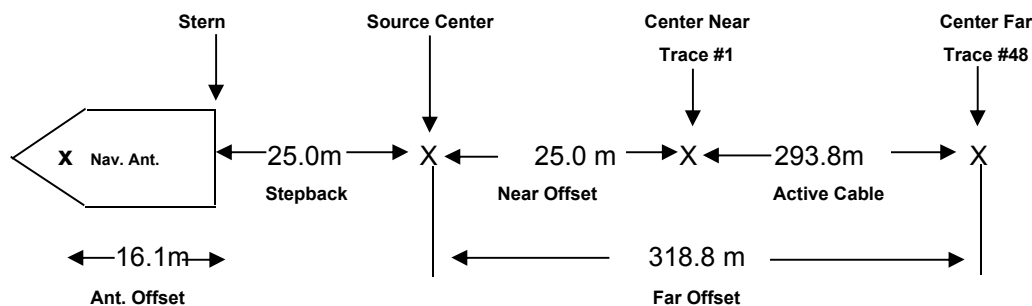
Source type	Source power	Pre amp gain	Number of	Tips	Source depth	Streamer Depth		
Sparker	2 KJ	18 db		3	2.0 m	3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low	Slope	High	Slope					
Out		Out		Out				Group Layout
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client SCE

Date
31 Aug 2013



Area and / or Block
Offshore So Cal

Line number 162

Operator / Observer
James/Gulsen/Kyle

Line Direction **042**

Source type	Source power	Pre amp gain	Number	Tips	Source depth	Streamer Depth	
Sparker	2 KJ	18 db	of	3	2.0 m	3.0 m	

	Sample Int.	Record Length	No. of channels	
Primary	0.5 ms.	2000 msec.	48	Signature Hydrophone depth
Secondary	ms.	Sec.		

Filter		Filter		60 HZ Notch	Other	Note: no aux channels recorded
Low	Slope	High	Slope			
Out		Out		Out		
						Group Layout

Recording Instruments	Type	Format	Tape Drives	Near TR No.	Near offset
	Geo-Eel	SEG Y(IBM)	Hard Disk/ USB Disk	1	25.0 m.

Navigation System	Primary	Secondary	Far TR No.	Far offset
	NavPoint Longliner DGPS		48	293.8 m.

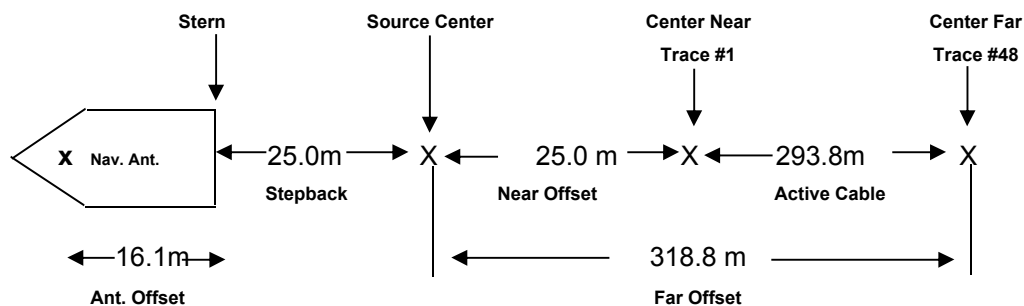
Boat speed ~4.5 Knots	Navigation fix interval N/A	Group Interval. 6.25 m	Shooting Interval 6.25 m.
--------------------------	--------------------------------	---------------------------	------------------------------

File Name	** S.P. (fix) Number	File Number	Water Depth Meters	Strmr depth Meters	Remarks (Changes in weather, sea state, operator, record delays, problems, etc.)
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[illegible]

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Client	Date
SCE	31 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
163	
Operator / Observer	
James/Gulsen/Kyle	
Line Direction	
222	



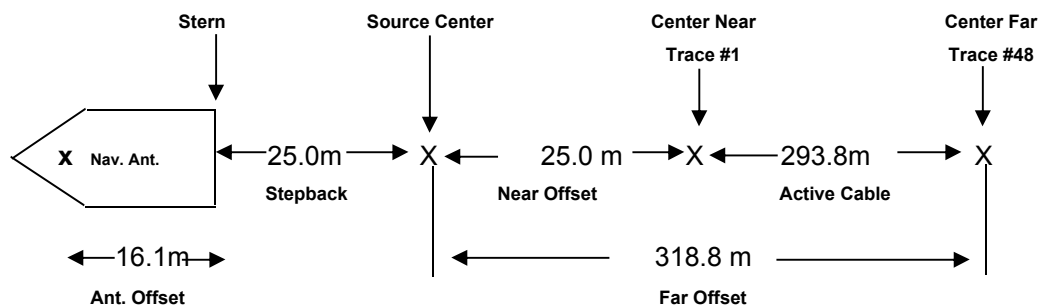
Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Page 1

Client **SCE**

Date
31 Aug 2013



Area and / or Block
Offshore So Cal

Line number 164

Operator / Observer
James/Gulsen/Kyle

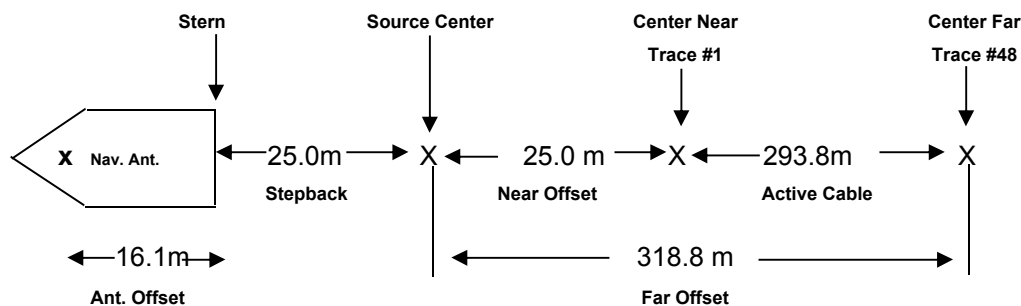
Line Direction **042**

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Client	Date
SCE	31 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
165	
Operator / Observer	
James/Gulsen/Kyle	
Line Direction	
222	



Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

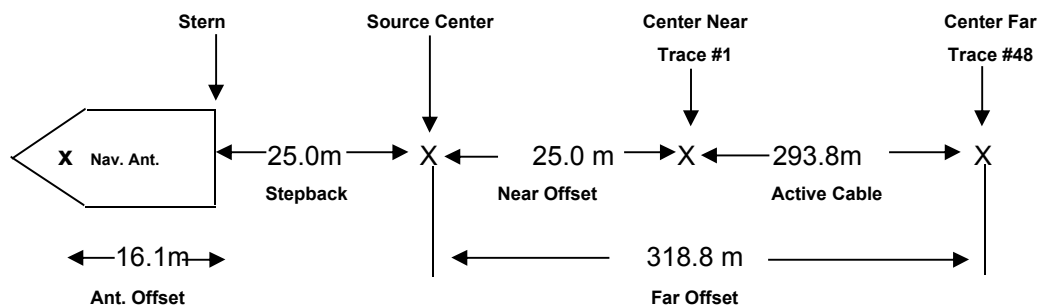
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Page 1

Client

SCE

Date
1 Sep 2013



Offshore So Cal

Line number **166**

Operator / Observer
Christine/Valerie/Joe

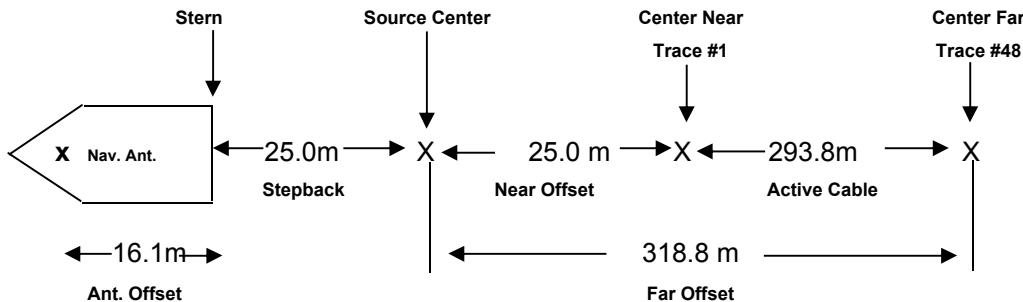
Line Direction **315**

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

[illegible]

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Client	Date
SCE	31 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
167	
Operator / Observer	
Christine/Valerie/Joe	
Line Direction	
135	

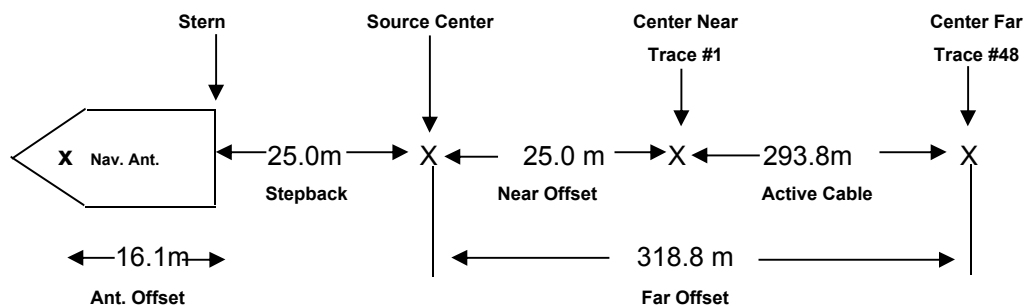


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type		Format		Tape Drives		Near TR No.	Near offset
	Geo-Eel		SEG Y(IBM)		Hard Disk/ USB Disk		1	25.0 m.
Navigation System	Primary			Secondary			Far TR No.	Far offset
	NavPoint Longliner DGPS						48	293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

[illegible]

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Client	Date
SCE	31 Aug 2013
Area and / or Block	
Offshore So Cal	
Line number	
168	
Operator / Observer	
Christine/Valerie/Joe	
Line Direction	
315	

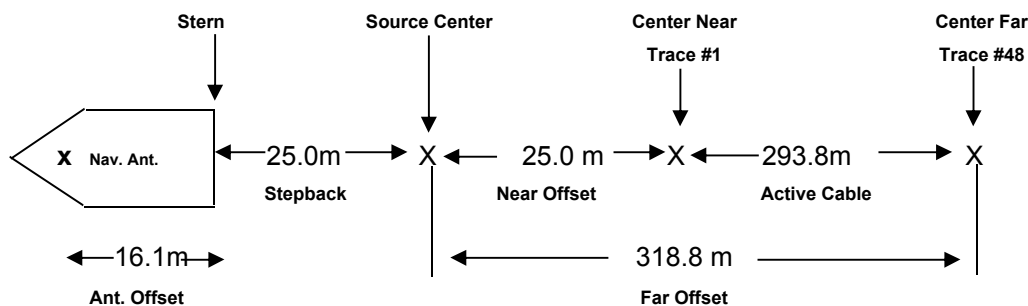


Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A					Group Interval. 6.25 m	Shooting Interval 6.25 m.

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Client	Date
SCE	31 Aug 2013
Area and / or Block	
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Operator / Observer	
Christine/Valerie/Joe	
Line Direction	
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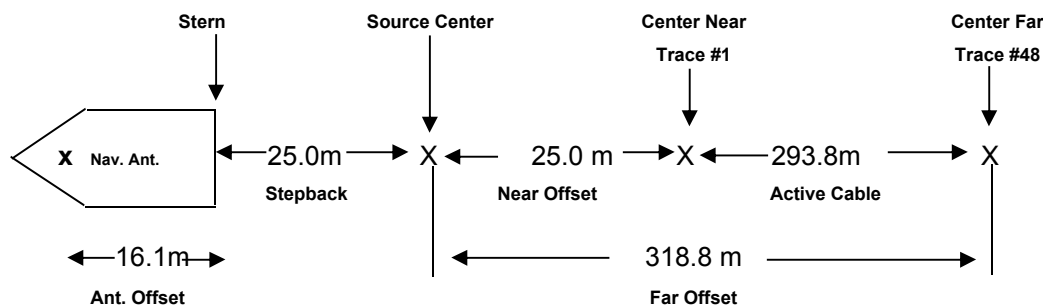
Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 m.
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

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Client

Date
31 Aug 2013



Area and / or Block
Offshore So Cal

Line number
170

Operator / Observer
Christine/Valerie/Joe

Line Direction **315**

Source type Sparker	Source power 2 KJ	Pre amp gain 18 db	Number of	Tips 3	Source depth 2.0 m	Streamer Depth 3.0 m		
	Sample Int.		Record Length		No. of channels			
Primary	0.5 ms.		2000 msec.		48		Signature Hydrophone depth	
Secondary	ms.		Sec.					
Filter		Filter		60 HZ Notch		Other		Note: no aux channels recorded
Low Out	Slope	High Out	Slope	Out				
Recording Instruments	Type Geo-Eel		Format SEG Y(IBM)		Tape Drives Hard Disk/ USB Disk		Near TR No. 1	Near offset 25.0 m.
Navigation System	Primary NavPoint Longliner DGPS			Secondary			Far TR No. 48	Far offset 293.8 s
Boat speed ~4.5 Knots		Navigation fix interval N/A				Group Interval. 6.25 m	Shooting Interval 6.25 m.	

[illegible]

APPENDIX H

**SUBSEA SYSTEMS, INC
QA/QC PROCEDURES**

**SONGS 2-D High Resolution Seismic Survey
Offshore Southern California**

August - September 2013

Subsea Systems GeoEel Streamer Array Hydrophone Calibration Procedure

Objective

The 3.125 meter GeoEel hydrophone arrays consist of eight channels that are grouped into subarrays of four hydrophones each. Each array is 25 meters in length. The 8 channel arrays can also be connected to form a 4 channel, 6.25 meter group interval array. The condition of each hydrophone subarray is determined by a measure of its capacitance and the leakage resistance to other wiring in the streamer. This procedure describes the method for measuring the capacitance and the leakage resistance of the hydrophone array. The objective is to verify that the capacitance of each subarray is between 57 and 70 nanofarads, and that its leakage resistance is greater than 1.0 megohms.

Frequency of Calibration

The calibration of each hydrophone array is done every twelve months or prior to use on each project.

Test Equipment Required

The following equipment is required.

1. Capacitance meter, Extech 380193
2. Megger, Biddle Instruments Model 212359
3. Capacitance test cable from Item 1 to subject hydrophone array
4. Resistance test cable from Item 2 to subject hydrophone array

Procedure

This procedure is designed to be performed using the accompanying Hydrophone Array Calibration Data Form. All data must be entered and the procedure signed by the technician performing the test.

A. Hydrophone Capacitance Test:

1. Record all identification data on the Hydrophone Array Calibration Data Form provided.
2. Install the capacitance test cable to the array under test. Connect the capacitance meter to each +/- pair of terminals designated as hydrophone outputs on the capacitance test cable
3. Measure and record the capacitance reading for each channel on the Hydrophone Capacitance Test section of the Hydrophone Array Calibration Data Form provided.

B. Hydrophone Leakage Test:

1. Install the leakage test cable to the array under test. It is important to use the correct test cable, as the hydrophones could be damaged if voltage from the megger is applied to them. The leakage test cable shorts each pair of hydrophone leads so as to prevent damage.
2. Set the megger scale to 100V/Mohm. Connect the positive (red) lead of the megger to Channel 1 hydrophone pair. Connect the negative (black) lead to Channel 2 pair.

3. Measure and record the resistance reading on the form.
4. Move the negative lead to Channel 3 hydrophone pair. Measure and record the resistance reading on the Hydrophone Leakage Test section of the Hydrophone Array Calibration Data Form provided.
5. Repeat this procedure until all eight channels are tested.
6. Connect the positive lead to Channel 2 hydrophone pair. Connect the negative lead to Channel 3 hydrophone pair. Measure and record the resistance reading on the form.
7. Repeat this procedure, testing the remaining channels (4 through 8).
8. Connect the positive lead to Channel 3 hydrophone pair. Connect the negative lead to Channel 4 hydrophone pair. Measure and record the resistance reading on the form.
9. Repeat this procedure, testing the remaining channels (5 through 8).
10. Connect the positive lead to Channel 4 hydrophone pair. Connect the negative lead to Channel 5 hydrophone pair. Measure and record the resistance reading on the form.
11. Repeat this procedure, testing the remaining channels (6 through 8).
12. Connect the positive lead to Channel 5 hydrophone pair. Connect the negative lead to Channel 6 hydrophone pair. Measure and record the resistance reading on the form.
13. Repeat this procedure, testing the remaining channels (7 and 8).

C. Supplemental Leakage Test

1. Install the leakage test cable to the array under test. It is important to use the correct test cable, as the hydrophones could be damaged if voltage from the megger is applied to them. The leakage test cable shorts each pair of hydrophone leads so as to prevent damage.
2. Connect the positive (red) lead of the megger to Channel 1 hydrophone pair. Connect the negative (black) lead to the "ALL" terminal of the test cable
3. Measure and record the resistance reading on the Supplemental Leakage Test section of the Hydrophone Array Calibration Data Form provided.
4. Leaving the negative lead on the "ALL" terminal, move the positive lead to Channel 2 hydrophone pair. Measure and record the resistance reading on the form.
5. Repeat this procedure until all 8 hydrophone channels are tested and recorded.

CRITERIA

The values for capacitance test (A) are between 57 and 70 nanofarads.

The values for the two leakage tests (B and C) are greater than 1.0 megohms

If the results are outside these ranges, the hydrophone array must be marked with a REJECT tag until it can be repaired and retested.

If results are acceptable affix label indicating the initials of the person performing the calibration, the date of calibration, and the due date for the next calibration (12 months).

PROCEDURE APPROVAL

Approved by: MICHAEL BARTH
Name

OPS MANAGER
Title


Signature

SEP 14, 2011
Date

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 06-702
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: SONGS 2-D
 Date: 7-22-13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	61.64
CH1+	
CH2-	61.05
CH2+	
CH3-	58.34
CH3+	
CH4-	62.04
CH4+	
CH5-	58.96
CH5+	
CH6-	60.58
CH6+	
CH7-	66.36
CH7+	
CH8-	59.95
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2		1	1	1	1	1	1
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by M. BARTU
 Witnessed by Mary Alaniz

Signature M. Bartu
 Signature Mary Alaniz

Date 7/22/13
 Date 7/22/13

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 06-703
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: SONGS 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	63.43
CH1+	
CH2-	62.60
CH2+	
CH3-	60.95
CH3+	
CH4-	63.63
CH4+	
CH5-	63.99
CH5+	
CH6-	68.05
CH6+	
CH7-	68.13
CH7+	
CH8-	65.56
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by Mike Barth
 Witnessed by Mary Alaniz

Signature M Barth
 Signature Mary Alaniz

Date 7/22/13
 Date 7/22/13

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 06-704
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: SONGS 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	64.47
CH1+	
CH2-	62.52
CH2+	
CH3-	66.16
CH3+	
CH4-	66.41
CH4+	
CH5-	67.72
CH5+	
CH6-	67.23
CH6+	
CH7-	66.57
CH7+	
CH8-	66.97
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by MIKE BARTH
 Witnessed by MARY ALANIZ

Signature [Signature]
 Signature MARY ALANIZ

Date 7/22/13
 Date 7/22/13

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 06-705
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: SONGS 2-DDate: 7/22/13**A: HYDROPHONE CAPACITANCE TEST**

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	63.00
CH1+	
CH2-	65.82
CH2+	
CH3-	61.63
CH3+	
CH4-	66.17
CH4+	
CH5-	64.89
CH5+	
CH6-	65.11
CH6+	
CH7-	67.52
CH7+	
CH8-	63.51
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by MIKE BARTH
Mary Alaniz
 Witnessed by

Signature M. Barth
Mary Alaniz
 Signature

Date 7/22/13
7/22/13
 Date

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 06-706
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: SONGS 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1	
Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	63.31
CH1+	
CH2-	65.01
CH2+	
CH3-	65.87
CH3+	
CH4-	66.26
CH4+	
CH5-	66.93
CH5+	
CH6-	65.79
CH6+	
CH7-	67.19
CH7+	
CH8-	68.35
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2							
Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2		1	1	1	1	1	1
CH3			1	1	1	1	1
CH4				1	1	1	1
CH5					1	1	1
CH6						1	1
CH7							1
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2							
Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by M. BARTH
Mary Alaniz
 Witnessed by

Signature M. Barth
Mary Alaniz
 Signature

Date 7/22/13
7/22/13
 Date

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 06707
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: SONGS 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	58.47
CH1+	
CH2-	58.42
CH2+	
CH3-	59.60
CH3+	
CH4-	59.2
CH4+	
CH5-	59.16
CH5+	
CH6-	38.51
CH6+	
CH7-	60.50
CH7+	
CH8-	64.47
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by MIKE BARTH
 Witnessed by Mary Alaniz

Signature [Signature]
 Signature Mary Alaniz

Date 7/22/13
 Date 7/22/13

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 06-708
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: SONGS 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	58.20
CH1+	
CH2-	62.93
CH2+	
CH3-	59.44
CH3+	
CH4-	58.48
CH4+	
CH5-	58.71
CH5+	
CH6-	58.80
CH6+	
CH7-	60.10
CH7+	
CH8-	62.21
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by M. BARTH
Mary Alaniz
 Witnessed by

Signature M. Barth
Mary Alaniz
 Signature

Date 7/22/13
7/22/13
 Date

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 06-709
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: SONGS 2-DDate: 7/22/13**A: HYDROPHONE CAPACITANCE TEST**

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	59.21
CH1+	
CH2-	59.62
CH2+	
CH3-	58.15
CH3+	
CH4-	59.90
CH4+	
CH5-	59.34
CH5+	
CH6-	62.31
CH6+	
CH7-	61.99
CH7+	
CH8-	60.4
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by MIKE BARTH
Mary Alaniz
 Witnessed by

Signature M. Barth
Mary Alaniz
 Signature

Date 7/22/13
7/22/13
 Date

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 0669-11
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: SONGS 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	65.75
CH1+	
CH2-	63.44
CH2+	
CH3-	65.08
CH3+	
CH4-	65.07
CH4+	
CH5-	64.42
CH5+	
CH6-	67.30
CH6+	
CH7-	65.56
CH7+	
CH8-	66.60
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by MIKE BARTH
Mary Alaniz
 Witnessed by

Signature M. Barth
Mary Alaniz
 Signature

Date 7/22/13
7/22/13
 Date

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 009-712
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: SONGS 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	64.45
CH1+	
CH2-	66.01
CH2+	
CH3-	63.90
CH3+	
CH4-	64.92
CH4+	
CH5-	64.02
CH5+	
CH6-	63.83
CH6+	
CH7-	64.11
CH7+	
CH8-	64.21
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by M. BARTH
 Witnessed by Mary Alaniz

Signature M. BARTH
 Signature Mary Alaniz

Date 7/22/13
 Date 7/22/13

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 0609-713
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: SONGS 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	6410
CH1+	
CH2-	64.47
CH2+	
CH3-	62.86
CH3+	
CH4-	62.59
CH4+	
CH5-	63.34
CH5+	
CH6-	63.84
CH6+	
CH7-	64.87
CH7+	
CH8-	63.94
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by MIKE BARTH
 Witnessed by Mary Alaniz

Signature M Barth
 Signature Mary Alaniz

Date 7/22/13
 Date 7/22/13

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 0609-714
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: Songs 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	62.94
CH1+	
CH2-	62.66
CH2+	
CH3-	62.97
CH3+	
CH4-	64.25
CH4+	
CH5-	64.13
CH5+	
CH6-	63.21
CH6+	
CH7-	63.40
CH7+	
CH8-	64.76
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2		1	1	1	1	1	1
CH3			1	1	1	1	1
CH4				1	1	1	1
CH5					1	1	1
CH6						1	1
CH7							1
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by Mike Barth
Mary Alaniz
 Witnessed by

Signature M. Barth
Mary Alaniz
 Signature

Date 7/22/13
7/22/13
 Date

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 0609-715
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: Songs 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	64.52
CH1+	
CH2-	64.39
CH2+	
CH3-	65.26
CH3+	
CH4-	64.93
CH4+	
CH5-	64.51
CH5+	
CH6-	64.66
CH6+	
CH7-	66.03
CH7+	
CH8-	66.51
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by MIKE BARTH
Mary Abniz
 Witnessed by

Signature M. Barth
Mary Abniz
 Signature

Date 7/22/13
7/22/13
 Date

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 0609-716
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: Songs 2-DDate: 7/22/13**A: HYDROPHONE CAPACITANCE TEST**

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	62.85
CH1+	
CH2-	62.08
CH2+	
CH3-	62.19
CH3+	
CH4-	63.71
CH4+	
CH5-	63.59
CH5+	
CH6-	63.75
CH6+	
CH7-	66.11
CH7+	
CH8-	65.67
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by Mike Barth
 Witnessed by Mary Alaniz

Signature M. Barth
 Signature Mary Alaniz

Date 7/22/13
 Date 7/22/13

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 0609-717
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: Songs 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	63.23
CH1+	
CH2-	62.87
CH2+	
CH3-	62.62
CH3+	
CH4-	65.90
CH4+	
CH5-	64.18
CH5+	
CH6-	64.27
CH6+	
CH7-	65.03
CH7+	
CH8-	65.98
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2		1	1	1	1	1	1
CH3			1	1	1	1	1
CH4				1	1	1	1
CH5					1	1	1
CH6						1	1
CH7							1
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by MIKE BARTH
Mary Alaniz
 Witnessed by

Signature M. Barth
Mary Alaniz
 Signature

Date 7/22/13
7/22/13
 Date

ACTIVE SECTION HYDROPHONE CALIBRATION DATA FORM

Serial Number: 0609-718
 Group Interval: 3.125 meters
 # Phones/Group: 4
 Phone Type: Benthos Geopoint

Project: Songs 2-D
 Date: 7/22/13

A: HYDROPHONE CAPACITANCE TEST

Procedure: Use Test Cable 1 Record Capacitance in nanofarads	
TERMINAL	CAPACITANCE(nf)
CH1-	63.25
CH1+	
CH2-	63.00
CH2+	
CH3-	64.27
CH3+	
CH4-	65.01
CH4+	
CH5-	63.79
CH5+	
CH6-	63.14
CH6+	
CH7-	63.56
CH7+	
CH8-	65.07
CH8+	

B: HYDROPHONE LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
CH1	INF	INF	INF	INF	INF	INF	INF
CH2							
CH3							
CH4							
CH5							
CH6							
CH7							
CH8							

C: SUPPLEMENTAL LEAKAGE TEST

Procedure: Use Test Cable 2 Record Resistance in Megohms							
TERMINAL	CH2	CH3	CH4	CH5	CH6	CH7	CH8
ALL	INF	INF	INF	INF	INF	INF	INF

Calibrate by MIKE BARTH
Mary Alaniz
 Witnessed by

Signature M. Barth
Mary Alaniz
 Signature

Date 7/22/13
7/22/13
 Date

Subsea Systems Streamer Depth Sensor Calibration Procedure

Objective

The depth sensors used in the Subsea Systems GeoEel streamer are mounted in housings in the streamer array. Part of this housing also contains a coil for controlling the streamer depth when cable levelers are used. The pressure sensor has a threaded port open to sea water which is used for the depth measurement. Each pressure sensor has a unique serial number and is connected to the monitoring computer through the streamer cable. The Geometrics CNT-2 software display the depth in meters of each sensor and also logs the depths in meters to computer file at user specified intervals. This procedure describes the method for measuring the pressure applied to each sensor and verifying that the depth is within +/- 0.14 meters (+/- 0.20 psi) at a depth of 7.03 meters (10.0 psi)

Frequency of Calibration

The calibration of each depth sensor is done every twelve months or prior to use on each project.

Test Equipment Required

The following equipment is required. Items 1 must have current NIST traceable calibration.

1. Digital Pressure Gauge, Ccomp Electronics Model DPG1000B15PSIG-5
2. Air hose and fittings to connect to the Model 57010-01 depth sensor module
3. Cables to connect to the acquisition computer running Geometrics CNT-2 software
4. Air compressor capable of supplying at least 25 psi pressure
5. GeoEel manual for reference to various menus being used

Procedure

This procedure is designed to be performed using the accompanying Depth Sensor Calibration Data Form. All data must be entered and the procedure signed by the technician performing the test.

1. Record all identification data on the Depth Sensor Calibration Data Form form provided.
2. Connect the sensor module under test to the streamer cable. Power on the GeoEel SPSU and acquisition computer. Record the serial number of the module being tested.
3. Install the pressure gauge, hose and fittings to the unit under test.
4. Start the CNT-2 software program and enter the serial number of the sensor module in the depth sensor field of the Configuration menu. Refer to the GeoEel manual, page 108 for additional information.
5. Open the program to the log file menu and enter the serial number of the sensor as the line number. In the acquisition menu, set the Interrogation rate to "0" (once per shot). Arm the system and begin recording data. Note the sensor number and depth in meters in the lower left corner of the screen. With zero pressure applied to the sensor module, record the depth reading on the calibration form. Record the FFID range of numbers with no pressure is applied.

6. Halt the program and adjust the pressure to 10.00 psi on the pressure gauge. Rearm the system and record the depth reading on the calibration form. Record the FFID range when 10.00 psi is applied.
7. Halt the program and open the log file with the depth reading for the line number (serial number). Verify that the depth readings are logged and that they show the readings (in meters) at zero pressure and at 10.00 psi at the FFID numbers that were previously logged.
8. Print the depth log file and attach to the calibration data form.
9. Repeat this test for each sensor to be used for the project, including any spares.

CRITERIA

The values for zero pressure are 0.00 +/- .10 meters

The values for 10.00 psi are 7.03 +/- 0.14 meters

If the results are outside these ranges, the sensor module must be marked with a REJECT tag until it can be repaired and retested.

If results are acceptable affix label indicating the initials of the person performing the calibration, the date of calibration, and the due date for the next calibration (12 months).

PROCEDURE APPROVAL

Approved by: _____

Name	Title
_____	_____
Signature	Date

Unit Mfr: Geometrics
Unit Model: 57010-01

[illegible]

Calibrated by: Mike Barz Date: 8/2/13 Signature: Mike Barz

Witnessed by: Mary Alaniz Date: 8/2/13 Signature: Mary Alaniz

Subsea Systems/Geometrics GeoEel Analog Performance Test Procedure

Objective

The GeoEel streamer system consists mainly of hydrophone arrays and in-water digitizers. Each digitizer accepts analog data from eight streamer channels, converts these signals to digital data and sends the data to the recording system on the seismic vessel via ethernet. This procedure describes the method for testing the analog front end of the digitizer and the digitization process so that gain accuracy, phase similarity, harmonic distortion and noise levels can be measured and reported.

Frequency of Testing

The performance testing of each digitizer is done monthly or prior to use on each project. It is also done when a digitizer is changed in the field.

Test Equipment Required

None: The test is performed internally by the digitizers and seismic controller software

Procedure

Start with the seismic controller software enabled and all streamers active. Disarm the system. In the "Testing/QC" menu, open the "Analog Performance Tests" menu. Perform the "DC Offset" test if prompted to do so. Highlight the tests to be done, or highlight all for a complete system test. For field repairs it is acceptable to perform only the tests that are relevant for the gain and sample rate that is being used, upon approval of the Party Chief or Client Representative.

CRITERIA

These are Pass/Fail criteria, which are reported by the recording system. In addition, a test report file is generated in the "Log File Folder".

If the test does not pass, the digitizer must be marked with a REJECT tag until it can be repaired and retested.

PROCEDURE APPROVAL

Approved by: _____

_____	_____
Name	Title
_____	_____
Signature	Date

TEST REPORT for BOOMER 24 CHANNEL STREAMER

DATE: 15/Aug/13 TIME: 16:01:51

TOTAL 24 OUT OF 24 CHANNELS TESTED

INTERNAL TEST SYSTEM Analysis Version (2.10)

60Hz power line frequencies rejected

*** indicates channels out of specification

TITLE: Geo-Eel Internal Test Characterization Rev 4 04/08/05

TEST 3 Noise/Offset X8.5, 1/4mS

FILE 2013

File Date: Aug/15/13 Time: 16:01:30

Sampling Rate: 250 usec Record Length: 0.512 sec Delay: 6 msec

Preamp Gain: 18 dB Acquisition Filters: OUT OUT

ANALYSIS NOISE 4 0.1 0.008

CHAN	DC OFFSET (mV)	AC RMS (mV)
1	-0.005955	0.002782
2	-0.002667	0.002427
3	-0.002586	0.002868
4	-0.000104	0.002775
5	-0.002435	0.002770
6	-0.001787	0.002861
7	-0.004233	0.002262
8	-0.002113	0.002023
9	-0.005256	0.002821
10	-0.004997	0.002642
11	-0.004576	0.002649
12	-0.003431	0.002242
13	-0.005458	0.002799
14	-0.004745	0.002411
15	-0.005604	0.002202
16	-0.004895	0.002292
17	-0.004487	0.002554
18	-0.003752	0.002499
19	-0.003225	0.002441
20	-0.004877	0.002532
21	-0.005539	0.002497
22	-0.006208	0.002604
23	-0.005508	0.002486
24	-0.004703	0.002483

ABSOLUTE MEAN: 0.004131 0.002539

WORST CASE CHN: 22 3

DC OFFSET SPECIFICATION (< 0.100000 mV)

PASSED

AC RMS SPECIFICATION (< 0.008000 mV)

PASSED

TEST 11 Gain, THD, Sim X8.5, 1/4mS, 100Hz

SIGNAL_TYPE SINE 100.000000 225.470642 0.000000 8

FILE 1013

File Date: Aug/15/13 Time: 16:01:48

Sampling Rate: 250 usec Record Length: 0.512 sec Delay: 6 msec

Preamp Gain: 18 dB Acquisition Filters: OUT OUT

ANALYSIS GAIN 5.0 3.0

INPUT PEAK AMPLITUDE IS 225.471 mV

CHAN NO.	TEST FREQ	PEAK AMPLITUDE (mV)	ACCURACY (%)	SIMILARITY (%)
1	100.000	226.614	0.50693	-0.30545
2	100.000	226.422	0.42193	-0.38976
3	100.000	227.574	0.93309	0.11727
4	100.000	226.664	0.52921	-0.28335
5	100.000	227.444	0.87535	0.05999
6	100.000	227.695	0.98648	0.17022
7	100.000	227.172	0.75438	-0.06000
8	100.000	227.954	1.10152	0.28434
9	100.000	224.990	-0.21318	-0.22489
10	100.000	226.662	0.52844	0.51665
11	100.000	225.128	-0.15213	-0.16384
12	100.000	225.425	-0.02009	-0.03182
13	100.000	225.569	0.04356	0.03182
14	100.000	225.688	0.09659	0.08484
15	100.000	226.977	0.66816	0.65635
16	100.000	224.692	-0.34554	-0.35724
17	100.000	224.869	-0.26705	-0.39844
18	100.000	225.894	0.18795	0.05596
19	100.000	225.642	0.07588	-0.05595
20	100.000	225.596	0.05564	-0.07618
21	100.000	225.447	-0.01048	-0.14220
22	100.000	226.623	0.51098	0.37857
23	100.000	226.806	0.59233	0.45982
24	100.000	226.358	0.39361	0.26135
MEAN:		226.246	0.34390	

WORST CASE CHN: 8 15

GAIN ACCURACY SPECIFICATION (< 5.00000%)

PASSED

GAIN SIMILARITY SPECIFICATION (< 3.00000%)

PASSED

ANALYSIS HARMONIC_DISTORTION 6 0.005

CHAN	FNDMTL	FIRST FIVE HARMONIC CONTENT (%)					RMS
TOTAL (%)							
NO.	FREQ	2	3	4	5	6	
1	100.000	0.00053	0.00044	0.00033	0.00044	0.00048	0.00104
2	100.000	0.00052	0.00045	0.00031	0.00047	0.00051	0.00106
3	100.000	0.00055	0.00046	0.00031	0.00049	0.00050	0.00108
4	100.000	0.00055	0.00042	0.00030	0.00048	0.00050	0.00105
5	100.000	0.00051	0.00043	0.00029	0.00048	0.00049	0.00103
6	100.000	0.00054	0.00044	0.00030	0.00047	0.00049	0.00105
7	100.000	0.00055	0.00042	0.00033	0.00047	0.00050	0.00106
8	100.000	0.00057	0.00045	0.00030	0.00049	0.00050	0.00108
9	100.000	0.00051	0.00044	0.00051	0.00044	0.00032	0.00105
10	100.000	0.00050	0.00046	0.00049	0.00044	0.00034	0.00104
11	100.000	0.00051	0.00048	0.00050	0.00041	0.00036	0.00106
12	100.000	0.00054	0.00047	0.00048	0.00042	0.00034	0.00106
13	100.000	0.00047	0.00047	0.00048	0.00042	0.00035	0.00102
14	100.000	0.00052	0.00046	0.00050	0.00043	0.00034	0.00106
15	100.000	0.00053	0.00047	0.00049	0.00042	0.00035	0.00106
16	100.000	0.00048	0.00044	0.00050	0.00043	0.00035	0.00103
17	100.000	0.00034	0.00058	0.00047	0.00055	0.00036	0.00116
18	100.000	0.00033	0.00056	0.00047	0.00056	0.00035	0.00114
19	100.000	0.00029	0.00058	0.00048	0.00056	0.00035	0.00114
20	100.000	0.00030	0.00059	0.00047	0.00054	0.00037	0.00115
21	100.000	0.00031	0.00057	0.00045	0.00056	0.00037	0.00114
22	100.000	0.00031	0.00057	0.00047	0.00054	0.00036	0.00113
23	100.000	0.00030	0.00057	0.00046	0.00054	0.00034	0.00113
24	100.000	0.00029	0.00058	0.00047	0.00056	0.00034	0.00113
MEAN:							0.00108
WORST CASE CHN:							17

HARMONIC DISTORTION SPECIFICATION (< 0.00500 %)

PASSED

FILE 1013

ANALYSIS PHASE 0.09

CHAN	TEST FREQ	SIMILARITY
	(HZ)	(DEGREE)

WORST CASE CHN: 17

PHASE SIMILARITY SPECIFICATION (< 0.090 DEG)

PASSED

TEST RESULT

ALL TESTS PASSED

TOTAL TIME: 38 SECONDS (36+2)

TEST REPORT August 27, 2013 After Changing Digitizer #2, 24 chl streamer
DATE: 27/Aug/13 TIME: 03:43:35
TOTAL 24 OUT OF 24 CHANNELS TESTED
INTERNAL TEST SYSTEM Analysis Version (2.10)
60Hz power line frequencies rejected
*** indicates channels out of specification

TITLE: Geo-Eel Internal Test Characterization Rev 4 04/08/05

TEST 3 Noise/Offset X8.5, 1/4mS

FILE 2013

File Date: Aug/27/13 Time: 03:43:13

Sampling Rate: 250 usec Record Length: 0.512 sec Delay: 6 msec

Preamp Gain: 18 dB Acquisition Filters: OUT OUT

ANALYSIS NOISE 4 0.1 0.008

CHAN	DC OFFSET (mV)	AC RMS (mV)
1	-0.000679	0.002796
2	-0.000296	0.002224
3	-0.000642	0.002864
4	-0.000698	0.002824
5	-0.000510	0.002773
6	-0.000444	0.002824
7	-0.000904	0.002379
8	-0.000096	0.001924
9	-0.000613	0.002674
10	-0.000625	0.002401
11	-0.000688	0.002562
12	-0.000307	0.002141
13	-0.000469	0.002795
14	-0.000267	0.002388
15	-0.000346	0.002269
16	-0.000199	0.002233
17	-0.000236	0.002459
18	-0.000291	0.002542
19	-0.000261	0.002376
20	-0.000318	0.002524
21	-0.000355	0.002561
22	-0.000369	0.002505
23	-0.000412	0.002551
24	-0.000317	0.002565

ABSOLUTE MEAN: 0.000431 0.002506

WORST CASE CHN: 7 3

DC OFFSET SPECIFICATION (< 0.100000 mV)

PASSED

AC RMS SPECIFICATION (< 0.008000 mV)

PASSED

TEST 11 Gain, THD, Sim X8.5, 1/4mS, 100Hz

SIGNAL_TYPE SINE 100.000000 225.470642 0.000000 8

FILE 1013

File Date: Aug/27/13 Time: 03:43:32

Sampling Rate: 250 usec Record Length: 0.512 sec Delay: 6 msec

Preamp Gain: 18 dB Acquisition Filters: OUT OUT

ANALYSIS GAIN 5.0 3.0

INPUT PEAK AMPLITUDE IS 225.471 mV

CHAN NO.	TEST FREQ	PEAK AMPLITUDE (mV)	ACCURACY (%)	SIMILARITY (%)
1	100.000	226.829	0.60233	-0.30222
2	100.000	226.642	0.51949	-0.38431
3	100.000	227.790	1.02873	0.12035
4	100.000	226.894	0.63133	-0.27348
5	100.000	227.643	0.96338	0.05559
6	100.000	227.895	1.07515	0.16635
7	100.000	227.390	0.85119	-0.05559
8	100.000	228.186	1.20439	0.29443
9	100.000	225.024	-0.19793	-0.23101
10	100.000	226.718	0.55331	0.51997
11	100.000	225.154	-0.14057	-0.17367
12	100.000	225.459	-0.00501	-0.03816
13	100.000	225.632	0.07134	0.03817
14	100.000	225.701	0.10213	0.06895
15	100.000	227.014	0.68440	0.65102
16	100.000	224.726	-0.33007	-0.36311
17	100.000	224.978	-0.21828	-0.39937
18	100.000	226.001	0.23507	0.05316
19	100.000	225.761	0.12857	-0.05315
20	100.000	225.719	0.11010	-0.07159
21	100.000	225.551	0.03546	-0.14609
22	100.000	226.735	0.56087	0.37837
23	100.000	226.918	0.64212	0.45946
24	100.000	226.473	0.44461	0.26232
MEAN:		226.368	0.39800	

WORST CASE CHN: 8 15

GAIN ACCURACY SPECIFICATION (< 5.00000%)

PASSED

GAIN SIMILARITY SPECIFICATION (< 3.00000%)

PASSED

ANALYSIS HARMONIC_DISTORTION 6 0.005

CHAN	FNDMTL	FIRST FIVE HARMONIC CONTENT (%)					RMS
TOTAL (%)							
NO.	FREQ	2	3	4	5	6	
1	100.000	0.00060	0.00032	0.00061	0.00048	0.00035	0.00119
2	100.000	0.00058	0.00032	0.00063	0.00048	0.00037	0.00122
3	100.000	0.00059	0.00031	0.00060	0.00050	0.00034	0.00121
4	100.000	0.00056	0.00031	0.00058	0.00050	0.00036	0.00118
5	100.000	0.00059	0.00033	0.00057	0.00051	0.00036	0.00120
6	100.000	0.00058	0.00032	0.00058	0.00051	0.00038	0.00120
7	100.000	0.00058	0.00032	0.00061	0.00051	0.00036	0.00122
8	100.000	0.00056	0.00033	0.00059	0.00053	0.00034	0.00120
9	100.000	0.00069	0.00035	0.00035	0.00018	0.00040	0.00096
10	100.000	0.00069	0.00038	0.00037	0.00022	0.00040	0.00099
11	100.000	0.00068	0.00038	0.00036	0.00020	0.00038	0.00096
12	100.000	0.00066	0.00039	0.00036	0.00022	0.00042	0.00097
13	100.000	0.00063	0.00038	0.00036	0.00018	0.00040	0.00094
14	100.000	0.00068	0.00041	0.00035	0.00019	0.00040	0.00097
15	100.000	0.00066	0.00038	0.00035	0.00018	0.00040	0.00096
16	100.000	0.00069	0.00038	0.00038	0.00020	0.00041	0.00100
17	100.000	0.00055	0.00021	0.00036	0.00034	0.00030	0.00093
18	100.000	0.00055	0.00020	0.00037	0.00033	0.00031	0.00092
19	100.000	0.00054	0.00021	0.00038	0.00034	0.00030	0.00093
20	100.000	0.00048	0.00021	0.00037	0.00035	0.00031	0.00089
21	100.000	0.00054	0.00020	0.00036	0.00035	0.00031	0.00093
22	100.000	0.00053	0.00019	0.00036	0.00033	0.00030	0.00091
23	100.000	0.00046	0.00017	0.00037	0.00035	0.00031	0.00088
24	100.000	0.00050	0.00019	0.00037	0.00033	0.00029	0.00089
						MEAN:	0.00103
						WORST CASE CHN:	7

HARMONIC DISTORTION SPECIFICATION (< 0.00500 %)

PASSED

FILE 1013

ANALYSIS PHASE 0.09

CHAN	TEST FREQ	SIMILARITY
	(HZ)	(DEGREE)

WORST CASE CHN: 7

PHASE SIMILARITY SPECIFICATION (< 0.090 DEG)

PASSED

TEST RESULT

ALL TESTS PASSED

TOTAL TIME: 37 SECONDS (36+1)

TEST REPORT: SONGS 48 channel August Monthly Test, 1/4 msec

DATE: 14/Aug/13 TIME: 09:33:34

TOTAL 48 OUT OF 48 CHANNELS TESTED

INTERNAL TEST SYSTEM Analysis Version (2.10)

60Hz power line frequencies rejected

*** indicates channels out of specification

TITLE: Geo-Eel Internal Test Characterization Rev 4 04/08/05

TEST 3 Noise/Offset X8.5, 1/4mS

FILE 2013

File Date: Aug/14/13 Time: 09:33:10

Sampling Rate: 250 usec Record Length: 0.512 sec Delay: 6 msec

Preamp Gain: 18 dB Acquisition Filters: OUT OUT

ANALYSIS NOISE 4 0.1 0.008

CHAN	DC OFFSET (mV)	AC RMS (mV)
1	-0.002392	0.002544
2	-0.001248	0.001985
3	-0.001591	0.002314
4	-0.001326	0.002040
5	-0.001382	0.002569
6	-0.001568	0.002318
7	-0.000058	0.003138
8	-0.001863	0.002315
9	-0.000188	0.002975
10	-0.000389	0.002426
11	-0.000560	0.001806
12	-0.000766	0.002300
13	-0.000584	0.003031
14	-0.001904	0.002392
15	-0.000593	0.002427
16	-0.000236	0.003036
17	-0.002060	0.002977
18	-0.001256	0.002699
19	-0.000656	0.002741
20	-0.000863	0.002198
21	-0.001317	0.002155
22	-0.001501	0.002322
23	-0.000641	0.002612
24	-0.001074	0.002519
25	-0.000798	0.002226
26	-0.001563	0.002443
27	-0.001299	0.002905
28	-0.002030	0.002519
29	-0.000766	0.001940
30	-0.000871	0.002505
31	-0.001542	0.002412
32	-0.000865	0.002256
33	-0.001114	0.002147
34	-0.000871	0.002633
35	-0.000908	0.002782

36	-0.001146	0.002379
37	-0.001863	0.002253
38	-0.001972	0.002438
39	-0.001255	0.002298
40	-0.000632	0.002310
41	-0.001675	0.002944
42	-0.000963	0.002333
43	-0.001132	0.002876
44	-0.001353	0.002694
45	-0.000734	0.002140
46	-0.001532	0.002288
47	-0.001305	0.002424
48	-0.002015	0.002567
ABSOLUTE MEAN:	0.001171	0.002470
WORST CASE CHN:	1	7

DC OFFSET SPECIFICATION (< 0.100000 mV)

PASSED

AC RMS SPECIFICATION (< 0.008000 mV)

PASSED

TEST 11 Gain, THD, Sim X8.5, 1/4mS, 100Hz

SIGNAL_TYPE SINE 100.000000 225.470642 0.000000 8

FILE 1013

File Date: Aug/14/13 Time: 09:33:30

Sampling Rate: 250 usec Record Length: 0.512 sec Delay: 6 msec

Preamp Gain: 18 dB Acquisition Filters: OUT OUT

ANALYSIS GAIN 5.0 3.0

INPUT PEAK AMPLITUDE IS 225.471 mV

CHAN NO.	TEST FREQ	PEAK AMPLITUDE (mV)	ACCURACY (%)	SIMILARITY (%)
1	100.000	227.185	0.76052	0.27425
2	100.000	227.036	0.69419	0.20824
3	100.000	226.305	0.37020	-0.11418
4	100.000	227.122	0.73256	0.24643
5	100.000	224.593	-0.38927	-0.86999
6	100.000	226.823	0.59968	0.11418
7	100.000	222.974	-1.10751	-1.58476
8	100.000	226.122	0.28907	-0.19493
9	100.000	223.438	-0.90161	-0.87135
10	100.000	223.261	-0.97997	-0.94973
11	100.000	224.259	-0.53719	-0.50682
12	100.000	225.926	0.20204	0.23264
13	100.000	225.390	-0.03555	-0.00502
14	100.000	226.014	0.24096	0.27158
15	100.000	225.413	-0.02551	0.00502
16	100.000	226.728	0.55764	0.58835
17	100.000	225.819	0.15447	-0.47527
18	100.000	225.701	0.10195	-0.52745
19	100.000	227.434	0.87061	0.23637

20	100.000	225.677	0.09131	-0.53803
21	100.000	227.273	0.79931	0.16552
22	100.000	227.279	0.80212	0.16831
23	100.000	227.032	0.69239	0.05927
24	100.000	226.763	0.57310	-0.05927
25	100.000	223.543	-0.85488	-0.20494
26	100.000	224.461	-0.44768	0.20494
27	100.000	225.511	0.01772	0.67338
28	100.000	223.490	-0.87831	-0.22852
29	100.000	224.786	-0.30352	0.35004
30	100.000	222.396	-1.36353	-0.71692
31	100.000	223.408	-0.91496	-0.26540
32	100.000	225.185	-0.12678	0.52794
33	100.000	226.735	0.56080	0.37501
34	100.000	226.117	0.28685	0.10157
35	100.000	224.195	-0.56577	-0.74948
36	100.000	225.669	0.08803	-0.09688
37	100.000	225.857	0.17150	-0.01356
38	100.000	226.373	0.40025	0.21476
39	100.000	223.889	-0.70162	-0.88508
40	100.000	225.919	0.19867	0.01356
41	100.000	224.147	-0.58691	-0.70912
42	100.000	226.691	0.54119	0.41760
43	100.000	225.777	0.13586	0.01277
44	100.000	224.062	-0.62469	-0.74685
45	100.000	226.434	0.42747	0.30402
46	100.000	225.634	0.07257	-0.05044
47	100.000	225.719	0.11029	-0.01277
48	100.000	226.464	0.44068	0.31722
	MEAN:	225.501	0.01331	

WORST CASE CHN: 30 7

GAIN ACCURACY SPECIFICATION (< 5.00000%)

PASSED

GAIN SIMILARITY SPECIFICATION (< 3.00000%)

PASSED

ANALYSIS HARMONIC_DISTORTION 6 0.005

CHAN	FNDMTL	FIRST FIVE HARMONIC CONTENT (%)						RMS
TOTAL (%)								
NO.	FREQ	2	3	4	5	6		
1	100.000	0.00047	0.00098	0.00020	0.00014	0.00030	0.00118	
2	100.000	0.00025	0.00024	0.00025	0.00012	0.00027	0.00059	
3	100.000	0.00024	0.00024	0.00027	0.00012	0.00027	0.00058	
4	100.000	0.00024	0.00022	0.00026	0.00013	0.00028	0.00057	
5	100.000	0.00026	0.00023	0.00024	0.00012	0.00028	0.00057	
6	100.000	0.00024	0.00026	0.00025	0.00013	0.00026	0.00057	
7	100.000	0.00026	0.00024	0.00026	0.00012	0.00029	0.00059	
8	100.000	0.00026	0.00025	0.00025	0.00014	0.00028	0.00060	
9	100.000	0.00048	0.00042	0.00038	0.00051	0.00044	0.00103	
10	100.000	0.00047	0.00041	0.00037	0.00053	0.00044	0.00103	
11	100.000	0.00048	0.00043	0.00037	0.00051	0.00044	0.00103	

12	100.000	0.00048	0.00042	0.00038	0.00051	0.00043	0.00103
13	100.000	0.00048	0.00043	0.00038	0.00051	0.00045	0.00103
14	100.000	0.00049	0.00042	0.00038	0.00049	0.00047	0.00104
15	100.000	0.00050	0.00040	0.00037	0.00050	0.00043	0.00102
16	100.000	0.00048	0.00041	0.00039	0.00051	0.00043	0.00103
17	100.000	0.00018	0.00032	0.00044	0.00028	0.00019	0.00081
18	100.000	0.00019	0.00034	0.00044	0.00030	0.00021	0.00083
19	100.000	0.00019	0.00033	0.00045	0.00027	0.00021	0.00083
20	100.000	0.00019	0.00033	0.00044	0.00027	0.00020	0.00082
21	100.000	0.00019	0.00033	0.00047	0.00029	0.00018	0.00085
22	100.000	0.00020	0.00033	0.00043	0.00027	0.00021	0.00082
23	100.000	0.00017	0.00034	0.00040	0.00028	0.00021	0.00080
24	100.000	0.00017	0.00033	0.00044	0.00028	0.00020	0.00082
25	100.000	0.00036	0.00049	0.00027	0.00047	0.00025	0.00110
26	100.000	0.00035	0.00050	0.00029	0.00047	0.00028	0.00109
27	100.000	0.00036	0.00050	0.00029	0.00046	0.00026	0.00109
28	100.000	0.00035	0.00050	0.00029	0.00048	0.00029	0.00110
29	100.000	0.00034	0.00050	0.00028	0.00047	0.00028	0.00110
30	100.000	0.00034	0.00049	0.00029	0.00046	0.00027	0.00109
31	100.000	0.00034	0.00049	0.00027	0.00049	0.00026	0.00108
32	100.000	0.00037	0.00049	0.00027	0.00045	0.00029	0.00109
33	100.000	0.00036	0.00028	0.00036	0.00018	0.00050	0.00081
34	100.000	0.00033	0.00030	0.00036	0.00020	0.00050	0.00081
35	100.000	0.00034	0.00029	0.00039	0.00018	0.00050	0.00082
36	100.000	0.00035	0.00029	0.00037	0.00021	0.00050	0.00083
37	100.000	0.00033	0.00030	0.00037	0.00021	0.00049	0.00082
38	100.000	0.00033	0.00028	0.00038	0.00020	0.00049	0.00082
39	100.000	0.00033	0.00029	0.00036	0.00020	0.00049	0.00080
40	100.000	0.00035	0.00028	0.00035	0.00018	0.00049	0.00080
41	100.000	0.00049	0.00040	0.00028	0.00037	0.00059	0.00101
42	100.000	0.00050	0.00043	0.00030	0.00036	0.00060	0.00103
43	100.000	0.00049	0.00043	0.00028	0.00038	0.00059	0.00102
44	100.000	0.00047	0.00042	0.00028	0.00035	0.00059	0.00101
45	100.000	0.00049	0.00042	0.00029	0.00038	0.00058	0.00102
46	100.000	0.00049	0.00044	0.00028	0.00037	0.00059	0.00102
47	100.000	0.00050	0.00041	0.00026	0.00037	0.00059	0.00101
48	100.000	0.00049	0.00041	0.00028	0.00037	0.00063	0.00104

MEAN: 0.00091

WORST CASE CHN: 1

HARMONIC DISTORTION SPECIFICATION (< 0.00500 %)

PASSED

FILE 1013

ANALYSIS PHASE 0.09

CHAN	TEST FREQ (HZ)	SIMILARITY (DEGREE)
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WORST CASE CHN: 1

PHASE SIMILARITY SPECIFICATION (< 0.090 DEG)

PASSED

TEST RESULT

ALL TESTS PASSED

TOTAL TIME: 40 SECONDS (39+1)

TEST REPORT: SONGS 48 Channel Streamer, September Monthly ¼ msec

DATE: 01/Sep/13 TIME: 11:14:00

TOTAL 48 OUT OF 48 CHANNELS TESTED

INTERNAL TEST SYSTEM Analysis Version (2.10)

60Hz power line frequencies rejected

*** indicates channels out of specification

TITLE: Geo-Eel Internal Test Characterization Rev 4 04/08/05

TEST 3 Noise/Offset X8.5, 1/4mS

FILE 2013

File Date: Sep/01/13 Time: 11:13:37

Sampling Rate: 250 usec Record Length: 0.512 sec Delay: 6 msec

Preamp Gain: 18 dB Acquisition Filters: OUT OUT

ANALYSIS NOISE 4 0.1 0.008

CHAN	DC OFFSET (mV)	AC RMS (mV)
1	-0.000230	0.002252
2	-0.000245	0.001978
3	-0.000487	0.002333
4	-0.000497	0.002342
5	-0.000036	0.002500
6	-0.000314	0.002261
7	-0.000207	0.003161
8	-0.000276	0.002228
9	-0.000437	0.003057
10	-0.000023	0.002268
11	0.000369	0.002009
12	0.000350	0.002153
13	0.000269	0.002903
14	0.000175	0.002234
15	0.000424	0.002341
16	0.000525	0.002975
17	-0.000385	0.002904
18	-0.000280	0.002768
19	-0.000294	0.002655
20	-0.000462	0.002241
21	-0.000413	0.002296
22	-0.000388	0.002288
23	-0.000552	0.002639
24	-0.000202	0.002473
25	-0.000248	0.002330
26	-0.000146	0.002353
27	-0.000109	0.002803
28	-0.000176	0.002517
29	-0.000372	0.002163
30	-0.000193	0.002453
31	-0.000754	0.002441
32	-0.000184	0.002177
33	-0.000568	0.002206
34	-0.000639	0.002781

35	-0.001028	0.002677
36	-0.000485	0.002245
37	-0.000257	0.002322
38	-0.000487	0.002536
39	-0.000349	0.002069
40	0.000087	0.002334
41	0.000124	0.002764
42	-0.000302	0.002430
43	0.000085	0.002939
44	-0.000172	0.002511
45	0.000705	0.002195
46	0.000132	0.002314
47	0.000204	0.002217
48	-0.000016	0.002772
ABSOLUTE MEAN:	0.000326	0.002454

WORST CASE CHN: 35 7
DC OFFSET SPECIFICATION (< 0.100000 mV)

PASSED

AC RMS SPECIFICATION (< 0.008000 mV)

PASSED

TEST 11 Gain, THD, Sim X8.5, 1/4mS, 100Hz

SIGNAL_TYPE SINE 100.000000 225.470642 0.000000 8

FILE 1013

File Date: Sep/01/13 Time: 11:13:56

Sampling Rate: 250 usec Record Length: 0.512 sec Delay: 6 msec

Preamp Gain: 18 dB Acquisition Filters: OUT OUT

ANALYSIS GAIN 5.0 3.0

INPUT PEAK AMPLITUDE IS 225.471 mV

CHAN NO.	TEST FREQ	PEAK AMPLITUDE (mV)	ACCURACY (%)	SIMILARITY (%)
1	100.000	227.174	0.75568	0.27434
2	100.000	227.054	0.70233	0.22124
3	100.000	226.300	0.36788	-0.11162
4	100.000	227.138	0.73947	0.25821
5	100.000	224.575	-0.39720	-0.87304
6	100.000	226.806	0.59218	0.11162
7	100.000	222.984	-1.10304	-1.57550
8	100.000	226.120	0.28783	-0.19128
9	100.000	223.384	-0.92541	-0.87489
10	100.000	223.237	-0.99075	-0.94026
11	100.000	224.232	-0.54952	-0.49880
12	100.000	225.888	0.18494	0.23604
13	100.000	225.343	-0.05661	-0.00564
14	100.000	225.983	0.22715	0.27826
15	100.000	225.368	-0.04534	0.00563
16	100.000	226.686	0.53911	0.59038
17	100.000	225.880	0.18135	-0.46701
18	100.000	225.761	0.12895	-0.51907

19	100.000	227.483	0.89247	0.23951
20	100.000	225.725	0.11269	-0.53522
21	100.000	227.323	0.82169	0.16918
22	100.000	227.328	0.82380	0.17129
23	100.000	227.073	0.71059	0.05881
24	100.000	226.806	0.59222	-0.05880
25	100.000	223.513	-0.86827	-0.20279
26	100.000	224.421	-0.46539	0.20279
27	100.000	225.481	0.00457	0.67591
28	100.000	223.453	-0.89478	-0.22948
29	100.000	224.745	-0.32174	0.34741
30	100.000	222.363	-1.37829	-0.71623
31	100.000	223.383	-0.92587	-0.26078
32	100.000	225.140	-0.14673	0.52360
33	100.000	226.715	0.55191	0.37172
34	100.000	226.102	0.27982	0.10012
35	100.000	224.196	-0.56526	-0.74345
36	100.000	225.657	0.08267	-0.09668
37	100.000	225.848	0.16714	-0.01236
38	100.000	226.351	0.39064	0.21073
39	100.000	223.872	-0.70892	-0.88685
40	100.000	225.903	0.19190	0.01236
41	100.000	224.185	-0.57005	-0.71346
42	100.000	226.754	0.56936	0.42430
43	100.000	225.829	0.15900	0.01453
44	100.000	224.105	-0.60588	-0.74925
45	100.000	226.477	0.44632	0.30144
46	100.000	225.691	0.09794	-0.04644
47	100.000	225.764	0.12990	-0.01452
48	100.000	226.504	0.45815	0.31325
MEAN:		225.502	0.01397	

WORST CASE CHN: 30 7

GAIN ACCURACY SPECIFICATION (< 5.00000%)

PASSED

GAIN SIMILARITY SPECIFICATION (< 3.00000%)

PASSED

ANALYSIS HARMONIC_DISTORTION 6 0.005

CHAN	FNDMTL	FIRST FIVE HARMONIC CONTENT (%)					RMS
TOTAL (%)							
NO.	FREQ	2	3	4	5	6	
1	100.000	0.00083	0.00080	0.00017	0.00043	0.00061	0.00146
2	100.000	0.00018	0.00034	0.00017	0.00042	0.00061	0.00097
3	100.000	0.00020	0.00033	0.00020	0.00043	0.00061	0.00098
4	100.000	0.00018	0.00034	0.00019	0.00045	0.00062	0.00100
5	100.000	0.00025	0.00032	0.00019	0.00044	0.00060	0.00098
6	100.000	0.00024	0.00031	0.00018	0.00044	0.00058	0.00096
7	100.000	0.00019	0.00032	0.00020	0.00044	0.00059	0.00096
8	100.000	0.00019	0.00032	0.00018	0.00043	0.00061	0.00097
9	100.000	0.00040	0.00027	0.00031	0.00021	0.00026	0.00093
10	100.000	0.00040	0.00029	0.00032	0.00021	0.00025	0.00093

11	100.000	0.00042	0.00028	0.00035	0.00020	0.00025	0.00095
12	100.000	0.00043	0.00028	0.00030	0.00019	0.00024	0.00094
13	100.000	0.00039	0.00029	0.00032	0.00023	0.00024	0.00094
14	100.000	0.00039	0.00027	0.00031	0.00022	0.00026	0.00092
15	100.000	0.00039	0.00026	0.00034	0.00020	0.00024	0.00093
16	100.000	0.00040	0.00028	0.00034	0.00019	0.00024	0.00094
17	100.000	0.00073	0.00020	0.00043	0.00034	0.00038	0.00107
18	100.000	0.00071	0.00022	0.00043	0.00033	0.00038	0.00106
19	100.000	0.00073	0.00020	0.00043	0.00035	0.00037	0.00107
20	100.000	0.00075	0.00020	0.00044	0.00036	0.00038	0.00109
21	100.000	0.00074	0.00023	0.00043	0.00037	0.00040	0.00110
22	100.000	0.00071	0.00021	0.00043	0.00036	0.00038	0.00106
23	100.000	0.00073	0.00022	0.00043	0.00036	0.00036	0.00107
24	100.000	0.00074	0.00021	0.00044	0.00036	0.00038	0.00109
25	100.000	0.00021	0.00014	0.00048	0.00039	0.00019	0.00073
26	100.000	0.00026	0.00014	0.00046	0.00040	0.00020	0.00072
27	100.000	0.00034	0.00016	0.00047	0.00038	0.00019	0.00077
28	100.000	0.00030	0.00011	0.00045	0.00041	0.00019	0.00074
29	100.000	0.00024	0.00013	0.00044	0.00041	0.00019	0.00072
30	100.000	0.00020	0.00012	0.00045	0.00040	0.00019	0.00070
31	100.000	0.00020	0.00012	0.00045	0.00039	0.00019	0.00070
32	100.000	0.00022	0.00011	0.00046	0.00038	0.00018	0.00070
33	100.000	0.00041	0.00049	0.00033	0.00037	0.00038	0.00101
34	100.000	0.00038	0.00048	0.00032	0.00037	0.00038	0.00099
35	100.000	0.00034	0.00047	0.00032	0.00035	0.00037	0.00097
36	100.000	0.00035	0.00048	0.00032	0.00036	0.00039	0.00097
37	100.000	0.00037	0.00049	0.00034	0.00039	0.00039	0.00101
38	100.000	0.00040	0.00048	0.00032	0.00038	0.00039	0.00100
39	100.000	0.00036	0.00048	0.00031	0.00038	0.00037	0.00098
40	100.000	0.00039	0.00047	0.00033	0.00035	0.00039	0.00099
41	100.000	0.00068	0.00025	0.00031	0.00051	0.00019	0.00104
42	100.000	0.00063	0.00027	0.00035	0.00053	0.00018	0.00103
43	100.000	0.00063	0.00027	0.00032	0.00051	0.00018	0.00101
44	100.000	0.00062	0.00026	0.00033	0.00052	0.00018	0.00102
45	100.000	0.00069	0.00022	0.00031	0.00050	0.00019	0.00103
46	100.000	0.00061	0.00028	0.00032	0.00047	0.00018	0.00098
47	100.000	0.00065	0.00029	0.00031	0.00051	0.00020	0.00104
48	100.000	0.00061	0.00025	0.00033	0.00052	0.00017	0.00101
MEAN:							0.00096
WORST CASE CHN:							1

HARMONIC DISTORTION SPECIFICATION (< 0.00500 %)

PASSED

FILE 1013

ANALYSIS PHASE 0.09

CHAN	TEST FREQ (HZ)	SIMILARITY (DEGREE)
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WORST CASE CHN: 1

PHASE SIMILARITY SPECIFICATION (< 0.090 DEG)

PASSED

TEST RESULT

ALL TESTS PASSED

TOTAL TIME: 41 SECONDS (39+2)