MARCH 1991 MONTHLY REPORT

Scientific Observation Hole (SOH) Program

Geothermal Resource Permit: GRP 89-1

Lilewa, Kapoho, and Halekamahina, Hawaii

TMK: 1-2-10:01; 1-4-01:02; and 1-4-02:32

Hawaii Natural Energy Institute

University of Hawaii

April 1991

SUMMARY

A number of cement jobs were performed by Halliburton Services beginning February 28 through March 3, 1991, to set cement plugs in an attempt to stabilize a fractured zone in the rock formation between 1,688-1,765 feet, which was causing a total loss of drilling fluids. On March 5, geophysical logs were run in the hole by personnel from the United States Geological Survey (USGS). Logs included: temperature, gamma, caliper, spinner and televiewer (bottom hole temperature was 85° F). Rotary drilling of the 8-1/2" hole proceeded from 1,871-1,901 feet in a fairly competent formation until a number of drill collar failures occurred due to a sudden deviation ("dog leg") in the hole in the 1,870-1,900 foot interval. 7 inch casing was run to 1,896 feet and cemented and coring with HQ equipment began on March 17 and advanced from 1,909-1,924 feet in dense basaltic intrusive rock. Due to short core runs through poorly consolidated, fragmented rock, core drilling was abandoned and rotary drilling resumed on March 20, 1991, with a 5-7/8" rotary bit. Rotary drilling proceeded from 2,046-2,966 feet and will continue until a more competent formation is encountered and then casing will be run in the hole and core drilling resumed. A fence was erected around the SOH-1 wellhead on March 29 and the sump material is being analyzed to determine if it is suitable for disposal at the County landfill or if it should be buried on site. SOH-3 remains in the permitting stage awaiting a grading and grubbing permit.

I. INTRODUCTION

This document presents a monthly report to the County of Hawaii Planning Department to support the Scientific Observation Hole (SOH) program in the Kilauea Middle and Lower East Rift Zones. The SOHs are for scientific observation purposes only. The holes will not be flow-tested or produced. The information to be gained from the SOHs will provide an assessment of subsurface geological conditions, groundwater level and composition, temperature, drilling conditions, an inventory of possible mineral and geothermal resources, and an eruptive history of the island to the depth drilled.

This report addresses: occurrence and duration of any start-up, shut-down, and operation mode of any SOH/facility; performance testing, evaluation, calibration checks, and adjustment and maintenance of the continuous emission monitor(s) that have been installed; and emission measurements.

II. BACKGROUND

The County of Hawaii Planning Commission approved, on August 8, 1989, a geothermal resource permit application (GRP 89-1) to drill Scientific Observation Holes (SOHs) in the Kilauea Middle and Lower East Rift Zone. This document presents a monthly report, as required in Condition 6:

> "The petitioner shall maintain a record in a permanent form suitable for inspection and five (5) copies shall be filed with the Planning Department on a monthly basis during drilling and for six (6) months after the completion of drilling to establish a hole specific baseline and such record shall be available to the community. The record shall include:
>
> a. Occurrence and duration of any start-up, shut-down, and operation mode of any SOH/facility.
>
> b. Performance testing, evaluation, calibration checks, and adjustment and maintenance of the continuous emission monitor(s) that have been installed.
>
> c. Emission measurements reported in units compatible with applicable standards/guidelines."

As designated, four holes are planned to be drilled along the Kilauea East Rift Zone on the Big Island of Hawaii. Three of the Big Island holes (SOHs 1, 2, and 4) are on agriculture land and have been permitted by the County of Hawaii Planning Commission. The fourth hole, designated SOH-3, is on

conservation land. SOH activities under Conservation District Use Permit (HA 12/20/85 - 1830) issued to the Estate of James Campbell have been approved.

III. SOH-1 SITE

Drilling Activity

Drilling is complete. The County of Hawaii, Department of Water Supply removed the water meter, which had monitored the water usage for the drilling operations at the SOH-1 site, on March 25, 1991. A fence was erected around the SOH-1 wellhead on March 29, 1991. The sump material is being analyzed to determine if it is suitable for disposal at the County landfill or if it should be buried on site. The site will be reclaimed to its original state after testing and monitoring are completed.

Monitoring Program -

Air Quality, Meteorological, Noise and Emissions are not monitored, as drilling has been completed at this site.

IV. SOH-2 SITE

Tonto Drilling Services continued drilling activities from 1,871 to a depth of 2,966 feet (1,095 feet) for this reporting period. A number of cement jobs were performed by Halliburton Services beginning February 28 through March 3, 1991, to set cement plugs in an attempt to stabilize a fractured zone in the rock formation between the depth of 1,688-1,765 feet, which was

causing a total loss of drilling fluids. On March 5, geophysical logs were run in the hole by personnel from the United States Geological Survey (USGS). These logs included: temperature (bottom hole temperature 85° F), gamma, caliper, spinner and televiewer. Rotary drilling of the 8-1/2" hole proceeded from 1,871-1,901 feet in fairly competent formation until a number of drill collar failures occurred due to a sudden deviation ("dog leg") in the hole in the 1,870-1,900 foot interval. 7 inch casing was run to a depth of 1,896 feet and cemented. Core drilling with HQ equipment began on March 17, 1991, and advanced from 1,909-1,924 feet in dense basaltic intrusive rock. Due to short core runs through poorly consolidated, fragmented rock, core drilling was abandoned and rotary drilling resumed on March 20, 1991, with a 5-7/8" rotary bit. Rotary drilling proceeded from 2,046-2,966 feet and will continue until a more competent formation is encountered and casing will then be run in the hole and core drilling resumed.

Monitoring Program - Air Quality

The air quality monitoring station provides a continuous record of atmospheric H_2S concentrations when interfaced with a data logger or chart recorder. The unit is located in a utility container on-site and power is provided by the drill rig system.

This station required minor adjustment and the replacement of some components during this report period. On March 22, 1991,

an extensive calibration adjustment was made and for the rest of the month the monitor operated normally (see appendix for details).

Monitoring Program - Meteorological

Continuous wind speed and directional measurements are being made with a recording wind speed/direction sensor system. A data logger and back-up pressure-sensitive recorder is being used to record the wind speed and direction data. The unit is located in a utility container on-site and power is provided by the drill rig system.

This station operated normally through the month with minor adjustment and calibration. A chart jam occurred on March 13, 1991, resulting in the loss of some data (see appendix for details).

Monitoring Program - Noise

One noise monitoring station is located at the SOH-2 site during drilling and is operated by power provided by the drill rig system. This station operated normally through the month with minor adjustment and calibration. On March 22, 1991, a new battery was installed (see appendix for details).

A second noise station is located at the Perry residence,

about a third of a mile north of the SOH-2 drill site. The instrument at this station is powered by solar charged batteries and operated normally for the month with minor adjustments and calibrations (see appendix for details).

A third noise monitoring station is located at the Hedtke residence, about 0.4 of a mile east of the SOH-2 site. This monitor is powered by solar charged batteries, which required replacement due to a weak charge. All five (5) batteries were replaced on March 15, 1991 (see appendix for details).

Emissions Reports

An H_2S monitor is located on-site. The average H_2S level measured is about 1 ppb due to natural causes resulting from the decay of vegetation. Colortek sensor canisters are located around the perimeter of the SOH-2 drill site and are replaced weekly as a matter of routine. The sensors showed no indication of any emissions from the well.

V. SOH-3 SITE

No drilling activity has been initiated. Access to the SOH-3 site has not been constructed, nor has the site been cleared or graded. SOH-3 is scheduled to be located at the True/Mid-Pacific alternate drill site 2 (approximately 3,000 feet north-north-west of the present drill site). All necessary reports have been submitted to DLNR for review and approval. An

expanded archaeology survey on the Buffer Zone surrounding the proposed SOH-3 site has been completed and was submitted to DLNR on March 19, 1991.

VI. SOH-4 SITE

Drilling Activity

Drilling is completed. No activity was performed during this period. The Landowner, Campbell Estate, has seeded the site with experimental Mamaki, Kopiko, and Ohia seeds collected from plants in the nearby area.

Monitoring Program -

Air Quality, Meteorological, Noise and Emissions are not monitored, as drilling has been completed at this site.

J-060 Friday, 3-1-91 3.00

SOH-2 H2S

Operating normally. Replaced chart & Lead-Acetate. Ran zero and span calibration. Minor adjustments to range, optics, zero and span.

SOH-2 MET

Operating normally. Renewed chart. Checked calibration

SOH-2 SOUND

Operating normally. Renewed chart. Full calibration. No adjustments to meter. Minor adjustment to recorder.

PERRY SOUND

Chart jammed. A few hours data lost. Replaced chart and ran full calibration. No adjustment to sound meter but minor adjustment to recorder.

HEDTKE SOUND

Operating normally. Renewed chart. Full calibration. Adjusted meter to 110.0 from 110.2. No adjustments required for recorder. Pen and batteries O.K.

COLORTEK

Replaced colortek cards. No color change visible.

SUPPLEMENTARY BILLING

		HOURS
J-063	Monday, 3-4-91 SOH-2 H2S Operating normally. No adjustments required SOH-2 MET Operating normally. No adjustments required. SOH-2 SOUND Operating normally. Renewed chart. PERRY SOUND Operating normally. No adjustments required. HEDTKE SOUND Operating normally. Replaced chart.	2.00
	NOTE: Went to the mainland 3-5-91 to 3-12-91. Kim Born tended the stations, performed calibrations, etc.	6.00
J-067	Friday, 3-8-91 SOH-2 H2S Operating normally. No adjustments required. SOH-2 MET Operating normally. No adjustments required. SOH-2 SOUND Chart was jammed. There was some data loss. PERRY SOUND Operating normally. No adjustments required. HEDTKE SOUND Station inoperative--Batteries dead. Unknown amount of data lost. Batteries replaced with spares, but they are also weak.	
J-070	Monday, 3-11-91 SOH-2 H2S Operating normally. Minor adjustments were required for the Optics system. SOH-2 MET Operating normally. No adjustments required. SOH-2 SOUND Operating normally. No adjustments required. PERRY SOUND Pen ran dry. Some data was lost. Installed spare batteries, but due to no sun, they are very weak. HEDTKE SOUND Operating normally, but batteries very weak.	2.00
J-072	Wednesday 3-13-91 SOH-2 H2S Operating normally. Renewed chart and replaced Lead Acetate. No other adjustments necessary. SOH-2 MET Chart jammed. Some data was lost. Noticed wind gusts to 35 MPH. Calibration check was O.K. SOH-2 SOUND Operating normally. Chart and pen O.K. PERRY SOUND Operating normally but batteries very weak. HEDTKE SOUND Inoperative. Batteries completely dead. Removed all 5 batteries for charge at home. Station will be off line till Friday.	2.00

J-074 Friday, 3-15-91 3.00

SOH-2 H2S

Inoperative. Instrument accidentally left in check mode. 48 hours data lost. Restored operation and ran full calibration. 4% adjustment required for span.

SOH-2 MET

Operating normally. Recalibrated. 5 degree North adjustment was required.

SOH-2 SOUND

Operating normally. Full calibration. Adjusted meter to 110.0 from 110.4. Adjusted recorder down 3 db. Replaced recorder battery with temporary spare to attempt a re-charge. I believe the battery is kaput.

PERRY SOUND

Operating normally. Replaced batteries with freshly charged batteries and removed for home charge. Ran full calibration. Adjusted meter to 110.0 from 109.6 and adjusted recorder down 2db. Replaced chart.

HEDTKE SOUND

Station off-line. Installed set of fully charged batteries and ran full calibration. Adjusted both meter and recorder. Station now back on-line.

COLORTEK

Replaced colortek cards. No visible color change.

J-077 Monday, 3-18-91

SOH-2 H2S 2.00

Operating normally. No adjustments were necessary

SOH-2 MET

Operating normally. Replaced chart paper.

SOH-2 SOUND

Operating normally. Recorder battery defective. Ordered a replacement.

PERRY SOUND

Operating normally. Replaced batteries.

HEDTKE SOUND

Operating normally. Replaced pen and batteries.

J-079 Wednesday 3-20-91 2.00

SOH-2 H2S

Operating normally. Minor adjustments made.

SOH-2 MET

Operating normally. Adjustments made to Wind direction sensor.

SOH-2 SOUND

Operating normally. No adjustments.

PERRY SOUND

Operating normally. No adjustments.

HEDTKE SOUND

Operating normally. No adjustments, replaced batteries.

J-081 Friday 3-22-91 3.00 34.80

SOH-2 H2S

Operating normally. Renewed chart. Extensive calibration adjustments were required.

SOH-2 MET

Operating normally. Renewed chart. Adjusted wind direction sensor again, tightened mast clamps.

SOH-2 SOUND

Operating normally. Replaced chart, installed new battery. Full calibration. Adjusted meter and recorder.

PERRY SOUND

Operating normally but previous chart jam caused some data loss. Replaced batteries, ran full calibration.

Adjustments required for meter and recorder.

HEDTKE SOUND
Operating normally. Renewed chart, replaced batteries. Full calibration. Adjusted meter and recorder.

COLORTEK
Replaced colortek cards. No color change was visible.

J-084 Monday 3-25-91 2.00

SOH-2 H2S
Operating normally. Replaced Lead Acetate. Made minor calibration adjustment.

SOH-2 MET
Operating normally. Chart O.K.

SOH-2 SOUND
Operating normally. Chart, pen and batteries O.K.

PERRY SOUND
Operating normally. Chart, pen and batteries O.K.

HEDTKE SOUND
Operating normally. Chart & pen O.K. Replaced main battery.

J-086 Wednesday, 3-27-91 2.00

SOH-2 H2S
Operating normally. No adjustments required.

SOH-2 MET
Operating normally. No adjustments required.

SOH-2 SOUND
Operating normally. Heavy rain.

PERRY SOUND
Operating normally. Replaced pen. Heavy rain.

HEDTKE SOUND
Operating normally. Replaced chart. Heavy rain.

J-088 Friday, 3-29-91 3.00

SOH-2 H2S
Operating normally. Renewed chart. Full Calib. No adjustments necessary.

SOH-2 MET
Operating normally. Renewed chart. Full Calib. No adjustments necessary.

SOH-2 SOUND
Operating normally. Chart & Pen O.K. Full Calib. Meter O.K., minor adjustment to recorder.

PERRY SOUND
Operating normally. Chart & Pen O.K. Replaced battery. Full calib. No adjustments required.

HEDTKE SOUND
Chart jammed. Lost 46 data hours. Repaired jam, Replaced batteries, full Calib. No adjustments.

J-091 Monday, 4-1-91 2.00

SOH-2 H2S
Operating normally. Minor adjustment. Renewed chart.

SOH-2 MET
Operating normally. Renewed chart.

SOH-2 SOUND
Operating normally. Renewed chart. Replaced battery.

PERRY SOUND
Operating normally. Renewed chart. Replaced battery.

HEDTKE SOUND
Chart jammed. Lost 36 hours. Renewed chart. Replaced one of the spare batteries.

Metecrology Station Log
SOH-2
3-1-91 to 3-31-91

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0301		0302		0303		0304	
0000	190	2	40	2	45	3	275	3
0100	195	2	40	2	45	2	270	4
0200	200	2	40	2	45	2	270	3
0300	200	2	40	2	45	2	260	4
0400	200	2	40	3	200	3	265	4
0500	200	2	40	2	335	8	270	4
0600	200	2	40	2	360	9	270	4
0700	200	2	40	2	355	10	275	5
0800	200	2	40	2	340	8	270	5
0900	135	3	40	3	325	7	300	4
1000	50	4	40	3	325	6	35	10
1100	50	4	40	3	325	7	40	12
1200	90	5	40	3	320	5	45	15
1300	40	6	40	2	330	6	45	17
1400	35	6	40	3	325	7	45	18
1500	15	5	50	4	325	6	40	16
1600	45	4	70	4	335	6	40	17
1700	20	6	120	5	330	5	30	8
1800	10	5	135	5	280	4	360	6
1900	15	5	130	5	285	5	45	7
2000	20	4	115	4	270	4	50	8
2100	30	3	95	5	270	4	40	7
2200	40	2	135	4	285	4	45	7
2300	40	2	125	3	265	3	35	6

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0305		0306		0307		0308	
0000	35	5	45	13	45	12	315	4
0100	45	7	50	8	40	7	275	3
0200	35	5	45	7	30	4	310	7
0300	25	5	45	7	280	3	35	6
0400	20	4	40	7	260	4	295	3
0500	10	3	40	7	260	4	275	5
0600	250	3	45	5	265	3	270	5
0700	245	4	50	9	60	2	285	5
0800	25	3	50	8	50	3	295	5
0900	40	8	35	6	270	5	310	9
1000	45	11	50	10	295	5	315	9
1100	50	13	50	12	40	17	330	9
1200	45	14	45	14	50	10	20	14
1300	40	12	40	15	360	8	40	16
1400	50	14	40	14	10	7	25	14
1500	50	16	45	15	45	15	20	10
1600	55	15	45	15	40	11	10	9
1700	25	17	50	16	40	10	350	7
1800	50	17	45	18	40	7	35	5
1900	50	19	45	14	35	3	15	3
2000	40	17	45	13	35	8	265	3
2100	15	15	45	10	20	6	300	3
2200	30	8	45	10	15	6	325	3

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0309		0310		0311		0312	
0000	45	10	260	6	50	3	265	4
0100	50	8	265	7	50	2	265	3
0200	65	8	265	5	10	3	-	-
0300	50	8	280	5	265	7	-	-
0400	65	8	255	5	265	7	-	-
0500	65	2	265	4	255	5	-	-
0600	85	7	255	4	260	5	-	-
0700	80	10	285	5	265	5	-	-
0800	75	12	310	7	270	5	-	-
0900	105	11	-	-	55	11	-	-
1000	95	7	-	-	60	11	-	-
1100	90	6	-	-	65	13	-	-
1200	75	8	-	-	65	14	-	-
1300	70	7	-	-	65	9	-	-
1400	60	5	-	-	65	9	-	-
1500	300	3	-	-	115	5	-	-
1600	295	3	-	-	210	3	-	-
1700	290	5	-	-	95	2	-	-
1800	280	7	-	-	85	2	-	-
1900	35	4	-	-	270	5	-	-
2000	290	3	-	-	280	5	-	-
2100	305	5	-	-	265	5	-	-
2200	260	5	65	6	260	5	-	-
2300	275	5	60	5	260	5	-	-

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0313		0314		0315		0316	
0000	-	-	50	10	50	10	40	8
0100	-	-	55	10	50	12	50	8
0200	-	-	45	8	45	11	310	2
0300	-	-	45	8	50	13	35	5
0400	-	-	45	8	60	14	40	7
0500	-	-	55	11	55	12	60	13
0600	-	-	50	10	50	13	55	14
0700	-	-	50	9	50	12	60	12
0800	-	-	45	9	50	13	60	13
0900	45	11	45	11	55	13	50	15
1000	45	10	50	13	50	14	60	15
1100	55	15	50	13	45	13	55	14
1200	45	15	45	13	45	12	65	15
1300	40	12	45	14	40	9	50	14
1400	25	15	55	14	30	7	50	14
1500	55	13	60	14	140	8	45	13
1600	50	17	45	15	15	6	40	10
1700	55	15	55	13	5	5	30	6
1800	60	15	50	13	25	5	45	9
1900	50	11	55	10	40	6	35	6
2000	55	13	60	10	25	6	40	5
2100	55	14	65	11	30	6	40	7
2200	50	14	55	9	40	7	45	8
2300	65	13	45	10	30	6	40	9

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0317		0316		0319		0320	
0000	45	9	265	4	130	3	110	6
0100	35	7	255	3	90	4	95	5
0200	35	8	255	3	115	4	115	4
0300	35	6	255	3	90	5	90	3
0400	50	8	255	3	40	5	95	5
0500	70	11	255	3	95	5	125	3
0600	65	10	255	3	95	6	115	4
0700	60	12	250	3	110	6	120	5
0800	60	13	-	-	120	7	130	6
0900	60	13	240	3	135	8	145	8
1000	65	11	250	3	105	3	150	8
1100	65	12	285	3	115	4	150	8
1200	55	13	330	5	110	6	150	8
1300	60	12	35	4	115	7	155	8
1400	55	12	50	5	120	8	150	8
1500	50	12	50	5	115	7	145	7
1600	50	10	65	7	115	8	145	6
1700	40	9	85	6	120	6	140	5
1800	45	8	75	7	115	5	135	5
1900	35	6	50	5	110	5	120	5
2000	20	5	85	6	120	4	360	3
2100	310	3	90	5	115	4	45	3
2200	280	4	85	6	100	5	95	3
2300	270	4	80	6	105	5	90	2

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0321		0322		0323		0324	
0000	65	3	130	4	90	2	135	3
0100	70	2	170	2	90	2	90	2
0200	70	2	225	2	80	2	95	2
0300	70	2	170	3	90	3	90	2
0400	70	2	145	2	90	3	70	2
0500	70	2	95	2	110	2	45	2
0600	70	2	130	2	130	2	50	2
0700	70	3	135	2	135	2	55	2
0800	70	3	135	3	115	5	75	4
0900	70	2	130	4	125	5	90	5
1000	125	3	125	6	130	6	120	5
1100	150	4	130	5	130	7	120	5
1200	160	5	130	6	135	7	125	5
1300	165	6	120	6	130	6	115	5
1400	160	7	125	5	130	5	120	5
1500	165	7	125	5	140	5	125	4
1600	175	4	120	4	150	4	115	4
1700	185	3	100	4	135	3	120	4
1800	190	3	95	3	125	3	100	3
1900	220	3	90	4	95	2	95	2
2000	200	2	90	3	95	2	95	2
2100	140	3	90	3	100	2	90	2
2200	160	2	90	3	95	3	90	2
2300	180	3	95	3	105	3	90	2

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0325		0326		0327		0328	
0000	100	2	270	2	55	2	250	2
0100	90	2	270	2	55	3	250	3
0200	90	2	220	2	50	3	250	2
0300	90	2	135	2	250	3	250	2
0400	90	2	160	2	260	3	250	2
0500	90	2	190	2	260	3	55	6
0600	85	2	220	3	265	3	60	7
0700	85	2	255	2	270	3	55	6
0800	85	2	300	3	50	4	55	8
0900	75	4	40	4	95	4	55	10
1000	65	5	10	5	55	8	55	11
1100	70	5	20	5	55	10	55	13
1200	80	6	25	5	60	12	55	13
1300	75	7	35	5	55	11	60	13
1400	70	8	60	7	45	10	55	13
1500	75	8	65	8	45	9	50	13
1600	65	7	60	8	40	8	70	12
1700	65	7	60	7	25	5	50	10
1800	60	5	60	5	20	3	45	9
1900	40	3	55	3	30	3	45	8
2000	40	2	50	2	15	3	55	9
2100	40	2	50	2	35	4	55	9
2200	335	2	50	2	360	2	50	8
2300	270	2	55	2	260	3	55	8

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0329		0330		0331			
0000	60	8	45	4	45	6		
0100	55	6	35	3	350	3		
0200	55	6	40	3	270	2		
0300	55	5	20	3	325	3		
0400	50	5	330	3	270	2		
0500	45	6	270	4	295	3		
0600	45	4	280	3	265	4		
0700	45	4	265	3	270	4		
0800	45	5	280	2	265	4		
0900	40	7	45	7	275	2		
1000	35	10	55	9	290	3		
1100	35	8	45	8	25	7		
1200	40	10	50	12	40	9		
1300	40	11	45	13	35	9		
1400	40	10	45	14	35	9		
1500	35	9	40	12	35	10		
1600	35	9	30	8	35	9		
1700	35	8	40	8	35	8		
1800	45	9	40	8	45	9		
1900	40	8	40	8	20	7		
2000	30	5	40	8	45	8		
2100	40	6	40	8	360	4		
2200	40	7	50	8	310	3		
2300	45	4	45	8	300	3		

H2S CHART REDUCTION -- SOH-2 Station

3-1-91 to 3-31-91

HOUR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Avg	Max	Total
0301	2	2	2	1	2	2	1	2	1	1	1	2	2	2	1	1	1	1	0	0	0	1	1	1	1	2	30
0303	1	2	1	1	0	0	1	1	1	1	0	1	1	2	2	‡	‡	‡	1	2	2	2	2	1	1	2	25
0304	0	1	1	1	1	1	2	1	2	2	2	1	2	2	1	1	‡	‡	2	2	1	1	1	2	1	2	30
0305	2	1	1	2	2	1	2	1	1	1	‡	2	2	2	2	1	‡	1	2	2	1	1	1	1	1	2	32
0306	1	1	1	1	2	‡	1	0	1	1	2	2	2	3	2	3	3	2	2	2	2	1	1	0	2	3	36
0307	1	1	2	1	1	0	0	1	1	1	‡	‡	2	1	2	2	2	2	1	1	1	2	2	2	1	2	29
0308	1	1	0	1	1	1	2	2	2	1	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	1	2	12
0309	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	0	0	0
0310	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	0	0	0
0311	‡	‡	‡	‡	‡	‡	‡	‡	‡	1	1	1	2	2	2	2	‡	2	1	1	0	0	1	0	1	2	16
0312	1	1	0	0	1	0	0	1	1	1	1	1	2	2	2	2	1	2	2	2	2	2	2	1	1	2	30
0313	1	1	1	0	0	0	0	1	0	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	0	1	4
0314	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	0	0	0
0315	‡	‡	‡	‡	‡	‡	‡	‡	‡	‡	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	2	16
0316	0	1	0	1	1	0	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	0	1	2	25
0317	0	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	2	1	1	0	1	0	0	1	2	19
0318	1	0	0	0	0	0	0	0	0	1	1	1	1	‡	1	1	1	1	1	1	1	1	1	0	1	1	14
0319	0	1	0	1	1	0	0	1	1	1	1	0	1	2	2	1	1	1		1	1	1	1	1	1	2	20
0320	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	10
0321	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	0	1	0	1	1	1	1	2	23
0322	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	2	1	1	1	0	0	0	1	2	19
0323	0	1	0	0	0	0	0	0	1	1	1	1	2	1	1	2	1	1	1	0	0	0	0	1	1	2	15
0324	0	0	1	0	0	0	0	0	1	1	1	1	2	2	2	1	1	1	1	1	1	0	0	0	1	2	17
0325	0	0	0	0	0	0	1	1	1	2	2	3	2	3	2	3	2	2	2	2	2	1	2	1	1	3	34
0326	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	0	1	1	2	1	1	1	1	1	2	25
0327	1	1	0	0	1	1	0	0	0	0	1	0	1	2	2	2	1	1	1	1	1	1	1	1	1	2	20
0328	0	1	0	1	1	1	1	0	0	1	1	1	1	1	1	‡	‡	1	1	1	1	0	0	0	1	1	15
																											516
AVG.	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
MAX.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		3	

‡‡ = power or equipment failure; ‡ = calibration

Note: H_2S is measured in points per billion (ppb).

J-060 Friday 3-1-91

SDH-2 H2S Range 0-200pb

Flow adj to 3.0, Replaced Chart - Replaced Lead Acetate
Tygon Dry - Pump + Bubbler OK
Check Steady @ 30.2 - Adj to 32.8%
Optics 2330-2340 - up 10-2, adj to 2340-2340
Range - High 1:1 Low 1000 Low, adj For 1:1
Zero Calib 32 - 0 5 - 0 (Zero Top Track Right) 0
Span Calib Exp 50 50 50 50 (Span Left) 50
Act 26 39 47 48 (1/2 Right) 50

SDH-2 Met
Operating Normally - Removed Chart - Calibration O.K.

SDH-2 Sound clouds 10% WS + DIR 350° @ 4-5
Operating Normally - Removed Chart - Pen OK. Full Calib -
No Adj to Meter - Adj Recorder down 2 dB

Perry Sound. 0845 No Clouds - Calm
Chart Jammed - A few hours data was lost. Replaced Chart,
Pen OK - Main Batt O.K. @ 12.37 - Meter Batt 11.78-11.59 Replaced
with Spares @ 12.37-12.37 Full Calib - only minor Adj to Recorder

Hadley Sound 0840 No Clouds Calm.
Operating Normally - Removed Chart - Pen OK - All Batteries
O.K. - Full Calib - Adj Meter to 110.0 From 110.2

DATE EXPERIMENT ID.

J-063 Monday 3-4-91

SOH-2 Met H_2S Range 0 - 2 ppb

Flow Steady @ 3.0, Chart & Lead Acetate O.K.

Tygon Dry - Pump & Bubbler O.K.

Check 32.2%, down .6%

Optics Steady @ 2320 - 2320

Range - High 1:1 Low 1:1

Zero Calib - 0 8 2 0

SOH-2 Met

Operating Normally - Chart O.K.

SOH-2 Sound 0900 Clouds 90% WS & DIR 25 @ 2-3

Operating Normally - Renewed Chart

Perry Sound 0820 Clouds 95% WS & DIR 10 @ 3-4

Operating Normally - Chart, Pen & Batt O.K.

Hedtke Sound 0800 Clouds 95% WS & DIR 25 @ 2-3

Operating Normally - Replaced Chart

3-5-91 to 3-12-91 - Went to Mainland - Kim Been Checked Stations

J-067 Friday 3-8-91

SOH-2 H_2S

Flow Steady @ 3.0, Chart & Lead Acetate O.K.

Tygon Dry - Pump & Bubbler O.K.

Check 31.6%, down 1.2%

Optics Steady @ 2430 - 2430

Range - High 1:1 Low 1:1

Zero Calib - Stable

SOH-2 Met

Operating Normally - Chart O.K.

SOH-2 Sound 0845 Clouds 95% WS & DIR 60 @ 5-6

Chart Jammed - Some Data lost

Perry Sound 0805 Clouds 100% WS & DIR 360 @ 5

Operating Normally - Chart & Pen O.K.

Hedtke Sound 0750 Clouds 100% WS & DIR 360 @ 5

Station Inoperative - Batteries Dead due to No Sun for Recharge - Unknown amount of Data lost - Replaced Batts with Spares, but Spares also low.

J-070 Monday 3-11-91

SOH-2 H_2S

Flow Steady @ 3.0, Chart + Lead Acetate OK

Tygon Dry - Pump + Bubbler OK

Check 31.6% - Steady

Optics 2310-2320, up 10 a, adj to 2320-2330

Range - High 1:1 Low 1:1

Zero Calib - Normal

SOH-2 Met

Operating Normally - Chart OK

SOH-2 Sound Clouds 100%, Rain WS + Dir 270 @ 2-3

Operating Normally

Rainy Sound Clouds 95% Calm

Pen Ran Dry - Some Data Lost - Replaced Pen + Installed

Some Batteries - Weak due to No Sun.

Hattie Sound 0845 - Clouds 95% WS + DIR 300 @ 2-3

Operating Normally - But Batteries very weak.

J-072 Wednesday 3-13-91

SOH-2 H_2S Range 0-2ppb

Flow Steady @ 3.0, Removed Chart - Replaced Lead Acetate

Drained Tygon - Pump + Bubbler OK

Check Steady @ 31.6%

Optics 2330-2310, down 20 a, adj to 2310-2310

Range - High 1:1 Low 1:1

Zero Calib 22 5 1 0

SOH-2 Met

Chart Jammed - Some Data Lost - Noticed Winds to 35 MPH.

Replaced Chart. Checked Calib - OK

SOH-2 Sound Clouds 100% · Rain WS & Dir 360 @ 6-8

Operating Normally - Chart & Pen OK

Rainy Sound Clouds 100% - Rain WS & Dir 360 @ 6-8

Operating Normally but Batteries weak.

Hattie Sound Clouds 100% Rain WS & DIR 360 @ 6-8

Inoperative - Batteries Dead - Lost Considerable Data.

Removed all Batteries for Charge - Station Off Line.

J-074 FRIday, 3-15-91
Inoperative - Instrument accidently left in check Mode.
Flow steady @ 3.0 - Chart + Lead Acetate O.K
Tygon Dry - Filled Bubbler - Pump O.K
Check Steady @ 31.6%
Optics steady @ 2340-2340
Range - High 1:1 Low 1:1
Zero Calib 32 6 7 0 0
Span Calib Exp 50 50 50 50 (Span Pot 1/4 Right) 50
Act 33 39 46 48 50

SOH-2 Met
Operating Normally - Re-Calib. - Adj. WD 5° North.
SOH-2 Sound 0928 Clouds 100% WS + DIR 355 @ 8-10
Operating Normally - Full Calibration - Adj. Meter to 110.0 From 110.4. Recorder Was 3dt High - Adjusted - Replaced Chart Recorder Battery with Spare.
Perry Sound 0900 Clouds 100% WS + DIR 25 @ 5-6
Operating Normally. Main Batt (11.63) was Replaced with (12.49) Meter Batteries (11.78-11.79) Replaced with (12.44-12.46) Batteries were Removed for Some Reason - Full Calibration - Adjusted Meter to 110.0 From 109.6 - Adj. Recorder down 2dt. Replaced Chart.
Heathe Sound 0835 Clouds 100%-Rain WS+DIR 15°@ 4-5
Station off-line - No Batteries. Installed Main Batt (12.64) Installed Meter Batt. (12.56-12.67) - Station Now on line. Full Calibration - Meter O.K. @ 110.0 - Adj Recorder down 1dt.
Colortek
- Replaced Colortek Cards - No visible color change.

J-077 Monday 3-18-91
SOH-2 HALE Range 0-2 p.p.b
Flow steady @ 3.0, Chart + Lead Acetate OK
Check 32.6%, up .6%
Optics 2330-2320, Down 10-2, No Adj.
Range - High 1:1 Low 1:1
Zero Calib 30 8 0 -1 0

SOH-2 Met
Operating Normally - Replaced Chart.

NAME EXPERIMENT NO.

J-077 Monday - 3-18-91 (Cont)

SOH-2 Sound 0900 Clouds 100% WS+DIR 280 @ 2

Operating Normally but Left Range switch at 20-80 db

Instead of 40-100 - Reset - Unable to change Recorder Batt

Perry Sound 0842 Clouds 100% Calm

Operating Normally - Main Batt 1189, Replaced with 1295

Meteor Batt 1205-1214 — Spare (one) 1256

Hatteras Sound 0825 Clouds 100%, Rain Calm

Operating Normally - Replaced Pen - Main Batt 1181

Meteor Batt 1200 - 1203 Spares 1261-1271

J-078 Wednesday 3-20-91

SOH-2 HAI Range 0-3 ppb

Flow steady @ 30, Chart & Lead Acetate OK

Tygon Dry - Pump + Bubbler OK -

Check - Adjusted down to 32.3% from 32.7%

Optics 2340-2330, down 10 ea, No Adj:

Range - High 1:1 Low 1:1

Zero Calib 50 30 5 2 (Zero Adj down 3 ea) - 0 0

SOH-2 Met

Operating Normally - Adj W.D. sensor 10° more Eastwardly.

SOH-2 Sound 0850 Clouds 100% WS+Dir 110 @ 8-10

Operating Normally - Chart & Pen O.K.

Perry Sound 0838 Clouds 100% WS+Dir 110 @ 5-6

Operating Normally - Main Batt 1229 - Meteor 1187, 1202 - Spares 1259-1263 - Chart + Pen O.K.

Hatteras Sound 0820 Clouds 100% WS+DIR 90 @ 5-6

Operating Normally - Main Batt 1182, Replaced with 1254

Meteor Batt 1180-1177, Spares 1247-1256 - Chart + Pen OK

J-081 Friday 3-22-91

SOH-2 HAI Range 0-3 ppb

Flow steady @ 3.0, Renewed Chart, Lead Acetate O.K.

Tygon Dry - Pump + Bubbler O.K.

Check 32.2%, adj to 32.4%

Optics 2350-2340, down 10 ea, adj to 2340-2340

Range - High 1:1 Low 4 ppb Low, adj for 1:1

Zero Calib 29 1 1 0 (Zero Pot 1/4 Right)

Span Calib - Exp 50 50 50 50 (Span Pot 1/4 Right) 50

Act 37 40 46 48 50

NAME EXPERIMENT NO.

J-081 (cont)

SOH-2 Met

Operating Normally - Removed Chart - Recalibrated WS + W.D. W.D. Adjusted 10° Northerly. Tightened Adjustment Clamps

SOH-2 Sound 0900 Clouds 70% WS+DIR 110 @ 5-6

Chart Rm out - Little data lost - Replaced Chart & installed New Back-up Battery - Full Calibration - Adj meter To 110.0 From 109.6. Adj. Recorder up 4 db.

Perry Sound 0825 Clouds 70% WS+Dir 135° @ 2-3

Operating Normally now, but a chart jam several hours previously caused some data loss. Main Batt 12.25 - Meter Batt. 11.51-1175, Replaced with Spares @ 1224-1228

Full Calib. Adj Meter to 110.0 From 108.9, Adj Recorder down 2 db.

Heathe Sound 0807 Clouds 50% WS+Dir 75° @ 2-3

Operating Normally - Removed Chart - Pen OK - Main Batt 12.17 Meter Batt 1148-1172, Replaced with Spares 1233-1241

Full Calibration - Adj Meter to 110.0 From 110.2 - Adj Recorder down 2db

Colortek

Replaced Colortek Cards. No Visible Color Change.

J-084 Monday 3-25-91

SOH-2 HAI Range 0-1 ppb

Flow steady @ 3.0 Chart OK - Replaced Lead Acetate Tygon Dry - Pump & Bubbler OK

Check 32.6%, down .8%

Optics 2350-2370, up 20-a, adj - To 2370-2370

Range - High L.L Low L.L

Zero Calib 32 1 2 1 (Zero Trim R Pot Right) 0

SOH-2 Met

Operation Normally - Chart OK

SOH-1 Sound 0830 Clouds 95% WS+Dir 60° @ 2

Operating Normally - Chart + Pen OK

Perry Sound 0810 Clouds 90% WS+DIR - Calm

Operating Normally - Pen OK - Main Batt 12.10

Meter Batt 1175-1210, Spares 1230-1250

Heathe Sound 0755 Clouds 95%, Calm

Operating Normally - chart + Pen OK - Main Batt 11.69

Replaced With 12.35 + Meter Batt 1196-1198 - Spares 1248-1232

J-086 Wednesday 3-27-91

SOH-2 HAI Range 0-2ppb

Flow Steady @ 3.0, Chart + Lead Acetate O.K

Tygon Dry - Pump + Bubbler O.K

Check 32.9%, up .3%

Optics 2370-2360, down 10 ea, No Adj.

Range - High 1:1 Low 1:1

Zero Calib 31 4 0 0

SOH-2 Met

Operating Normally - Chart O.K

SOH-2 Sound 0855 Clouds 100% - Rain WS + Dir 11/ @ 3-4

Operating Normally - Chart + Pen O.K - Reset Meter

Perry Sound 0840 Clouds 100% - Rain WS + Dir 11/ @ 3-4

Operating Normally - Chart O.K - Replaced Pen Batt O.K.

Hedtke Sound 0820 Clouds 100% - Rain WS + Dir 11/ @ 3-4

Operating Normally - Replaced Chart - Pen O.K

Main Batt 1192 - Meter Batt 1182-1182 - Spares 1230-1226

J-088 Friday 3-29-91

SOH-2 HAS Range 0-3 ppb

Flow Steady @ 3.0 - Removed Chart - Lead Acetate O.K

Drained Tygon - Pump + Bubbler OK

Check 32.5%, down .4%

Optics 2380-2370, down 10 ea, No Adj.

Range: High 1:1 Low 1:1

Zero Calib 30 5 1 0 0

Span Calib Exp 50 50 50 60 50

Act 26 39 48 50 59

SOH-2 Met

Operating Normally - Renewed Chart - Calib Check Normal

SOH-2 Sound ~~0700~~ 0700 Clouds 45% WS + Dir 35° @ 5-6

Operating Normally - Chart + Pen O.K. Full Calibration.

Meter O.K @ 110.0, Recorder was down 3 dit - Adjusted.

Perry Sound 0835 Clouds 35% WS + DIR 350 @ 3-4

Operating Normally - Chart + Pen O.K Main Batt 1269 - Meter Batt 1158 (replaced) - 12.03 - Spares 1230 - 1237, Full Calib.

No Adjustments Required for Meter or Recorder

Hedtke Sound 0810 Clouds 35% WS + Dir 350 @ 3-4

Chart was jammed - Lost 46 hours data - Main Batt 12.16

Meter Batt 1182-1173, Replaced with Spares 1227-1246

Full Calib - No Adjustments Required for Meter or Recorder

J-091 Monday 4-1-91

SOH-2 H2S Range 0-2ppb

Flow steady @ 3.0, Replaced Chart, Lead Acetate OK

Tygon Dry - Pump + Bubbler OK

Check 32.4%, down .1%

Optics 2370-2380, down 10 ea, adj to 2380-2380

Range - High 1:1 Low 1:1

Zero Calib 31 4 ea

SOH-2 Met

Operating Normally - Removed Chart

SOH-2 Sound 0910 Clouds 80% WS & DIR 10 12 @ 45°

Operating Normally - Removed Chart - Replaced Batt.

Perry Sound 0835 clouds 85% WS & DIR 10° @ 6-8

Operating Normally - Replaced Chart - Main Batt 12.65

Meteo Batt 12.05-1187, Replaced Low Batt with spare (1249)

Hewlett Sound 0815 Clouds 85% WS & DIR 30° @ 6-8

Chart Jammed - Lost 36 Hours - Removed Chart - Main Batt 11.69

Replaced with 1228 - Meteo Batt 1226-1223 - Spares 1189-1184

Replaced one - 1249.