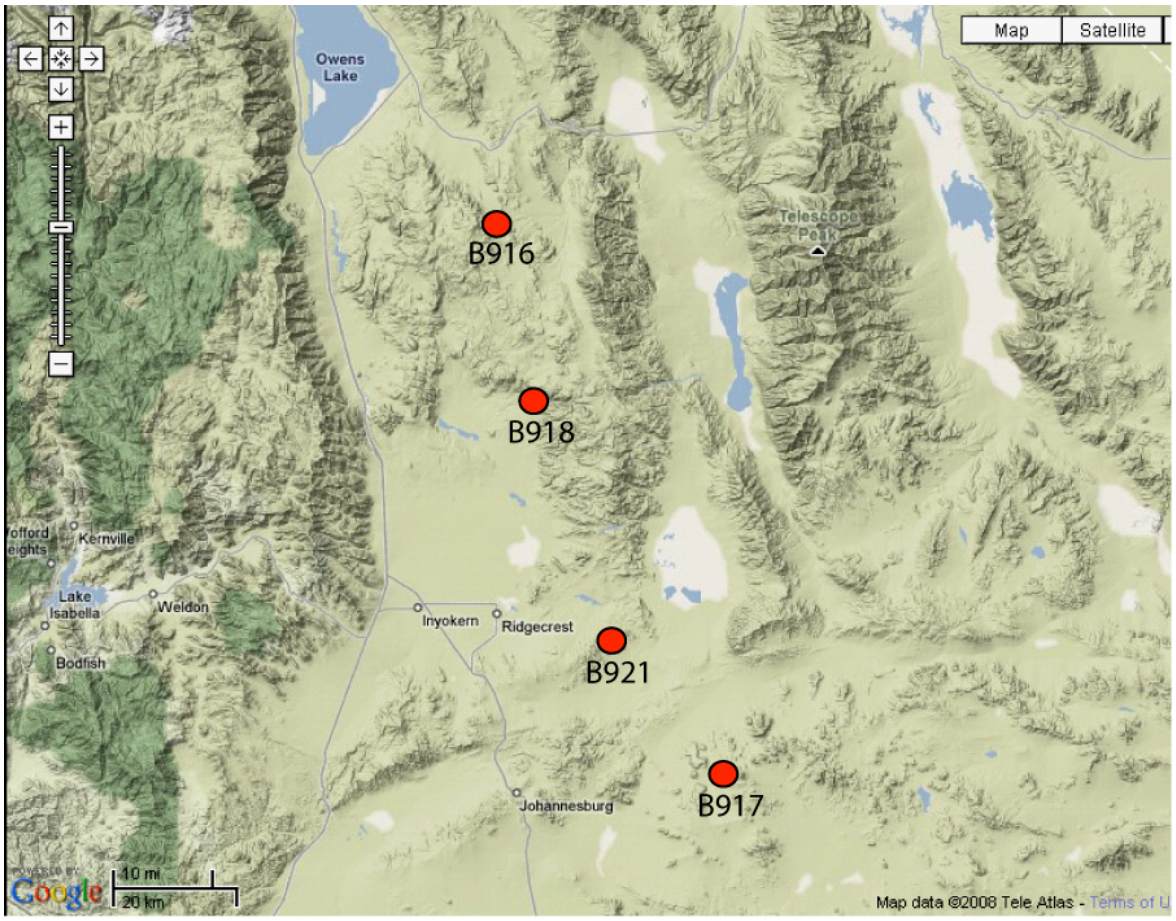
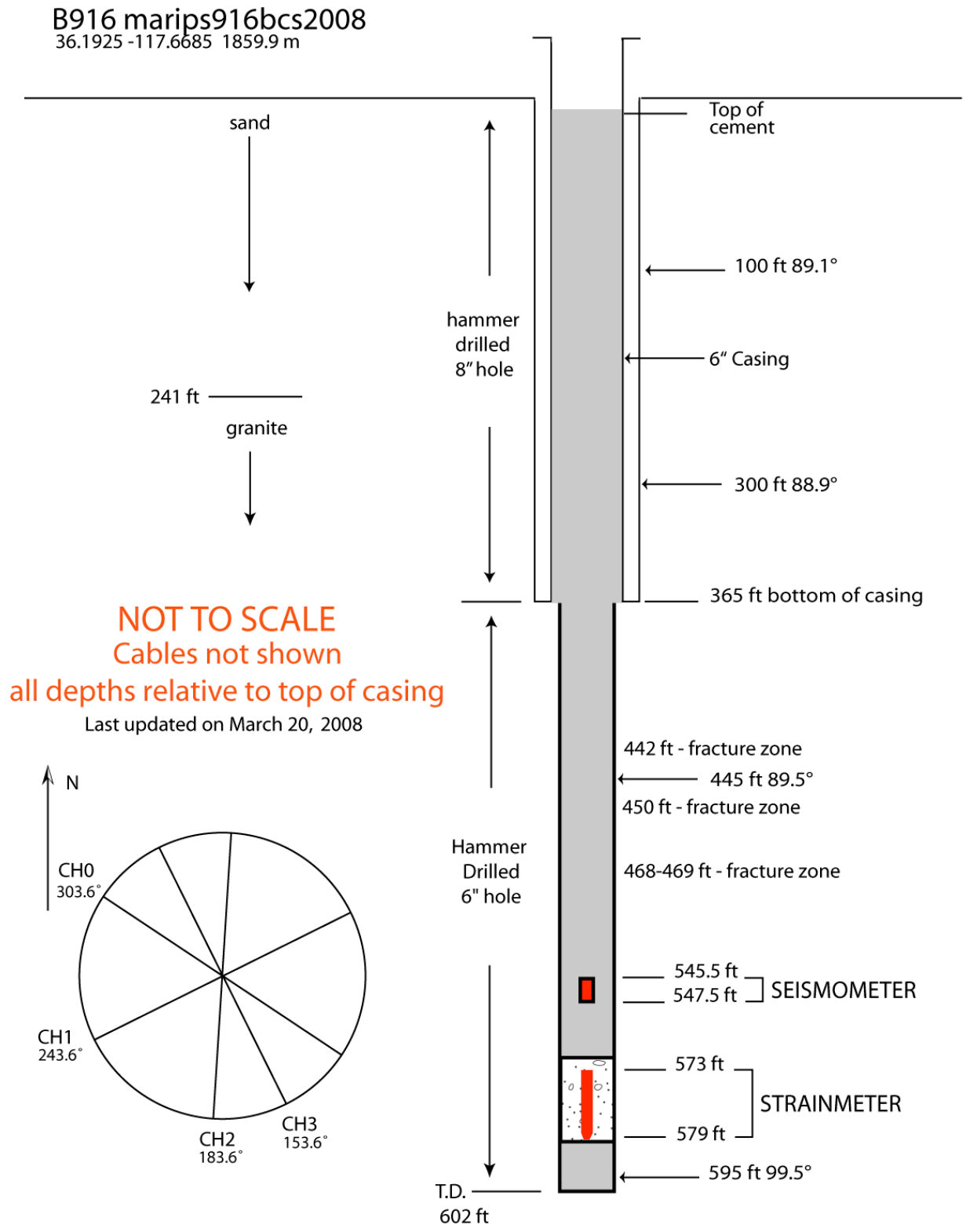
Station Notes for B916, marips916bcs2008

Latitude:	36.1925 (WGS 84)
Longitude:	-117.6685 (WGS 84)
Elevation:	1859.9 m / 6102 ft
Install Depth:[1]	176.5 m / 579 ft
Orientations:[2]	CH0=303.6, CH1=243.6, CH2=183.6, CH3=153.6
Install Date:	March 13, 2008
GTSM Technologies #:	US67
Executive Process Software:	Version 1.14
Logger Software:	Version 2.02.2
Home Page:	http://pboweb.unavco.org/stations/?checkkey=B916
Notes Last Updated:	April 30, 2012

[1]Install depth is from the top of the casing to the bottom of the strainmeter.
[2]Orientations are in degrees East of North.



Mojave strainmeter network, July 31, 2008


B916 marips916bcs2008
36.1925 -117.6685 1859.9 m
sand
241 ft
granite
hammer
drilled
8" hole
Hammer
Drilled
6" hole
Top of
cement
100 ft 89.1°
6" Casing
300 ft 88.9°
365 ft bottom of casing
442 ft - fracture zone
445 ft 89.5°
450 ft - fracture zone
468-469 ft - fracture zone
545.5 ft
547.5 ft
SEISMOMETER
573 ft
579 ft
STRAINMETER
595 ft 99.5°
T.D.
602 ft
NOT TO SCALE
Cables not shown
all depths relative to top of casing
Last updated on March 20, 2008
N
CH0
303.6°
CH1
243.6°
CH2
183.6°
CH3
153.6°

Instrumentation at Strainmeter

Instrument	Units	Bottle/ASCII Scale Factor	SEED Scale Factor
Pore Pressure	Hecto Pascals	None Installed	---
GTSM Barometer	Kilopascals	1.0	0.0001
Rain Gauge	Millimeters/hour	1.0	0.252
Down hole Temperature Sensor	Degrees Celsius	1.0	0.0001
Logger Temperature Sensor	Degrees Celsius	1.0	0.0001
Setra Barometer	Hecto Pascals	1.0	1.42925E-04

1. Installation notes

11 March 2008 UTC

14:00 - During the installation teleconference it was decide to go for the install zone at 600', at the total depth of the hole. Backup zones are 580-570' and 570-560'.
14:30 - Leave B. Mountain staging area for Mariposa Mine.
16:15 - Arrive at Mariposa Mine, setup equipment.
17:35 - US67 put on test, adjust quadratures, check temperature and compass, all looks good continue install setup.
19:15 - Leave Mariposa Mine before testing begins.

12 March 2008 UTC

14:30 - Meet with testing range official for range procedures brief at B. Mountain.
17:30 - Onsite at Mariposa, setup pump hoist, water, and dump bailer.
17:45 - Check GTSM surface test data through USB, looks good.
18:00 - Status check shows station is tracking 8 satellites, adjust quadratures.
18:20 - Attach centralizers to strainmeter.
18:25 - Measure hole total depth of 602' from the top of the casing.
18:45 - Shutdown GTSM and perform compass test. Xmin = 0.393, Xmax=1.473, Ymin=0.736, Ymax=1.776.
19:42 - Start mixing Penngrout using 5 qts of 80º distilled water per sack. Ambient air temperature is ~65º, dry, and very sunny.
19:48 - Stop mix for 1 minute then continue to mix for two minutes.
19:51 - Stop mix, pour into bailer, notice many grout clumps (1-2" diameter balls of dry, unmixed grout) being filtered out while pouring into bailer. Grout itself visually appears thicker than previous installs. No photos or video taken (none are allowed in the testing range).
19:54 - Lowering dump bailer, bailer slips twice on way down.
20:01 - Bailer tripped at total depth.
20:10 - GTSM lowering down the hole.
20:20 - GTSM cable becomes slack, will not lower any more at a depth of ~592'.
20:26 - Pull instrument out of the hole. Experience significant resistance at first. This is an indication that the instrument had to have penetrated the grout at least 12 inches, though probably closer to 24 inches.
21:05 - GTSM back on test in the truck, data looks fine. The grout sample has setup quite a bit.
21:15 - Measure new total depth with banger, 589' with some "fluff" on top.
21:45 - Successfully lower 10 gallons of neat cement using dump bailer, the new target zone is 580-570'.
22:20 Leave mariposa for B. Mountain.

The grout mix was visually thicker than the previous 2 successful installs. Mixing procedures were identical, but the mixing climate was not. It was warmer, dryer, and a higher (~8000' elevation) environment. It is not know what would cause the clumping. The PennGrout used is from the remaining pallet used in Boulder for testing.

13 March 2008 UTC

15:50 - On site. Total depth of hole is 579'2" (target zone is 580-570')
16:02 - PennGrout test I*.
16:28 - PennGrout test II*.
16:43 - PennGrout test III*.
17:00 - Look at continued surficial test data for GTSM, looks good after recovering from previous days failed installation.
17:10 - Shutdown GTSM and setup for installation.
17:44 - Start PennGrout mix using 10 bags mixed with 5 qts distilled water at 95º F. Grout was mixed for 5 minutes, let sit for 1 minute, then mixed for 2 minutes per previous installations.
17:52 - Pour grout, grout is too viscous with visible slump and still has similar "clumps" to yesterdays mix. It is certainly more viscous than the similar small batch test performed earlier, despite all the clumps present. Crew does not like the consistency and does not feel confident in a successful installation as compared to the 2 successful and 5 not-successful previous installation attempts using PennGrout (and countless small batch tests).
18:13 - Start mix of Masterflow 1341, Batch 161607629T7, using 8x55lb bags.
18:18 - Last distilled water added. 15.2 gal at ~50º F. Mix is on the thicker, more viscous end of MF1341 spectrum, but the crew were confident in its workability from previous experience.
18:24 - Stop mixing.
18:30 - Lowering bailer.
18:33 - Bailer at total depth.
18:39 - Bailer out of estimated grout column.
18:42 - Lowering US67.
18:53 - US67 at total depth of 579'.
18:55 - GTSM turned on.
18:56 - Downhole temperature is at 2.633V and dropping (measured from outside ports, instrument had been in sun before installation).
19:00 - Gains bouncing between gain 3 measure max and gain 2 out of bounds (good).
19:02 - Compass reading, X=1.494V and Y=1.456V.
19:05 - Rename B916, cleanup, prep for next day.
20:00 - Off site. Head to B. Mountain for solar panel welding, setup and prep seismometer for installation, and prepare for well backfilling the next day.

Grout Tests Summaries:

All small batch tests consisted of 2x52lb bags of PennGrout mixed with 5 qts of distilled water. Weather was sunny, breezy, dry, and warm the in sun (~50º F warming up to 65º F throughout day). All results are observations.

*Per Dave Mencin's request, the first test was attempted with the initial Carnegie PennGrout procedure. This test consisted of cold water (~45º F) mixed continuously for 20 minutes. This resulted in a well mixed homogenous grout with no clumps. However, the mix had a noticeable slump with consistent viscosity throughout the 20 minutes. When pouring, the mix was quite gritty and slumped out of the mixer. 40 minutes after mixing, the sample was thick and there was no confidence in a strainmeters' ability to penetrate.

**The second test was the considered the best choice based off of previous grout testing. In previous small batch tests conducted at headquarters in Boulder, viscosity over time was determined to be correlated to water temperature at the time of mixing. Higher water temperatures yielded less viscous grouts, a quality believed to be indicative of workability downhole. As such, test II was mixed with 100º F water using previous mixture procedure of 5 minutes mix, 1 minute sit, 2 minutes mix. As expected, this grout was much less viscous, with no clumping and very fluid. It poured evenly and smoothly and was similar to prior successful mixes. After 40 minutes the grout was still reasonably fluid and promising for installation.

***The final test was a confirmation of the previous days failed grout mix. This mix used 80º F water mixed using the 5-1-2 minute procedure. The mix appeared more viscous than the previous 100 º F test, though slightly less viscous than the previous days' mix. No significant clumps appeared in the pouring. At 40 minutes the grout was thickening. It was noted that it had similar viscosity to the previous test, despite being poured 15 minutes later.

Given the tests, it was decided to use the conditions of Test II for the installation.

A final note on the "clumping". It is unclear what is causing this phenomena in the large mixes. This phenomenon has not occurred in the small batches, nor in the large batches of previous mixes. The hypothesis is that it is somehow related to the mixer or the adding of the grout to the mixer. This mixer is smaller than the one used in the other UNAVCO setup, though from past experience with other grouts this makes for better mixes. The bulk of the water is being added first, then the dry grout, and then the final 10% of the water is added at the end. This has always been UNAVCO procedure. In any case, the clumps appear to be capsules of normal mix distribution, suggesting that this should merely be taking away dry mix from the overall mix, provided that they are strained out of the mix. Ultimately this should result in a wetter mix.

14 March 2008 UTC

16:30 - On site, setup cement, test seismometer #115, and setup solar racks.
-call in VSAT info to Warren for permission for installation
17:27 - Shutdown GTSM logger.
17:30 – 17:45 - Lower seismometer to 12' off the bottom (547'6").
17:34 - Adjust down hole temperature from 0.936v to 1.252V (measured at TP7) and restart logger.
18:00 – 19:45 - Trip in, tag bottom at 559'6" (19'6" grout).
19:45 – 22:30 - Pumping cement.
23:10 - Shutdown GTSM, dig pit, bury cable, pour pad, install VSAT post, and install solar panel posts.
02:15 - Restart GTSM, shuts down immediately on 3 batteries at 12.5volts. Setup temporary AC backpanel with generator.
02:37 - Restart GTSM, adjust quadratures for jumper cable extension.
02:44 - Off site.

15 March UTC
14:30 - Arrive at B. Mountain, wait for China Lake PD/Micro54 to open gate.
15:30 - CLPD opens gate, load batteries and head to Mariposa.
1715 - On site at Mariposa.
18:15 - VSAT pointed.
18:36 - Program Cisco router, anchor hut, and wire up solar panels.

19:35 - Shutdown GTSM.
21:27 - Restart GTSM inside hut on 6 batteries and using long jumper but it shuts off immediately. Have to rig up temporary AC setup again and adjust quadratures.
21:33 - Shutdown GTSM logger.
21:39 - Set down hole temperature to 1.254v.
21:49 - Set GTSM IP.
22:25 - Temporary AC setup is not adequately charging the GTSM battery bank. Shut down GTSM and wire Iota charge controller directly onto battery bank in an attempt to charge batteries with constant 18 amps under no load. Batteries still not getting above 12.69v, it is realized both Iota chargers are either bad or set wrong.
23:00 - Install rain gauge.
00:00 - Program Q330.
00:10 - Program Marmot and move Iota charger and generator over to the comms side to get the VSAT running (no sun). Confirm with Warren that all components are accessible remotely.
01:15 - Off site.

Revised Site Design notes:
This site is setup in accordance with the new plan for PBO solar strainmeter sites. This plan splits the uphole electronics in half, the strainmeter (GTSM) vs. everything else (comms side).

GTSM side:
6 solar panels feeding current through 2 braided 10 gauge wire pairs, in liquid tight shielded conduit, directly to the GTSM powerbox through the "solar" input. This box is on 6 batteries, which also power the fiber modem. All of this equipment is on one half of the hut.

Comms side:
6 solar panels feeding through 2 braided 10 gauge pairs, in liquid tight conduit, this time stubbed directly underneath the electronics rack and terminated onto a copper grounding plate attached at the base of the rack. The braided wire then has a short (~8") exposed run to the solar backpanel. The grounding plate has a copper wire running to the wellhead. The solar backpanel is then tied into another bank of six batteries, and is responsible for powering the Q330, Marmot, Fiber modem, Cisco and VSAT. This is all located on the other half of the hut, divided on a north/south axis, and all wires are as short and as far from the GTSM cable as possible.

All of this is an attempt to keep noise from the comms side (namely from the solar charge controller) from affecting the GTSM data.

Photos will be available when the field rep, at the base's schedule, allows him to visit the site when the installation crew returns to the area.

2. General Information

- Sensitivities of all EH channels corrected on March 4, 2010.

3. Strainmeter Maintenance

- 25 March 2008 – Tim Dittmann visited the site to try to minimize noise on the borehole strainmeter due to the solar charge controller.

18:25 - On site, test rain gauge.
18:29 - Test 89 ohm between grounding wire and wellhead.
18:37 - Set RV3 to 2.722 (altitude adjustment).
18:44 - Check rain gauge - good (15mm).
18:46 - Adjust quads.
19:00 - File down wellhead for grounding wire connection.
19:11 - Reconnect grounding wire, test 0.7 ohm on ground.
19:15 - Close all doors to site, call Warren and wait.
20:13 - Check with warren, decide to take grounding plate off of rack and grounding wire off well head.
20:26 - Replace solar input on GTSM to using both leads (before had both solar mounts going into the same lead).
20:30 - Check with Warren, decide to replace solar back panel with different panel.
21:00 - Off site.

- December 2, 2008 – Mike Gottlieb and Shawn Lawrence visited the site to check on power issues. Site had 6 batteries on strainmeter side, charged by 6 solar panels. Battery voltage plots showed these batteries were dropping too fast, causing the strainmeter to shut of after as little as 10 hrs without solar input. Conclusion was that batteries have a reduced capacity due to overcharging, and so Mike adjusted the charge voltage in the Powerbox down 0.1 V. This should help prevent excess current from damaging batteries. He did not have fresh batteries to add to site, so instead they swapped the strainmeter and coms batteries (6 for 6). Plan is to observe how these changes affect voltages, and proceed accordingly.

- January 15, 2009 – Mike Gottlieb moved this site back to the original power system. This has fixed the nightly shut-offs. Currently 9 panels are going into the power system, which is then charging the strainmeter. This allows all the batteries to charge the strainmeter, rather than just 6. There may be an increase in noise from the charge controller, but this was preferable to missing data.

- January 16, 2009 – Mike Gottlieb installed a Setra barometer.

- March 23, 2009 – Logger software upgraded to 2.02.2.

- July 29, 2009 – Mike Gottlieb visited the site. He replaced the router and upgraded the RT firmware to 1.20.

- November 7, 2009 – Mike Gottlieb visited the site to build a 5’ x 8’ roof over the electronics enclosure. He also moved the rain gage and adjusted the quadrature.

- July 12, 2010 - Adjusted the coms LVD to stay on at lower voltage. This adjustment involved powering off everything but the GTSM. The LVD now turns of f at 12V and turns on at 12.6.

- January 27, 2011 – Temporary broadband seismometer deployed.

- January 28, 2011 – Broadband seismometer locked and removed. Borehole seismometer metadata collected with the Birddog. Replaced jumpers on GTSM batteries with 4 gage wire.

- August 8, 2011 – Cisco had failed and needed to be replaced. SN in database was incorrect, I removed UNID 21342 not 25388. This is the second cisco to fail at this station. The DC power cord was also replaced.

- September 7, 2011 – Found cisco to be functional. The IDU however, had no lights on, and was not operational upon arrival. A power cycle brought the IDU back online, and communications to the site were restored. The timer that is supposed to power cycle the IDU 1x per day appeared to be set correctly and functional, so it was unclear why this problem had not resolved itself.

- October 3, 2011 – Replaced the cisco and IDU. Steve Alm was unable to get the IDU up and running, requiring an additional site visit.

- October 11, 2011 – Went through registration process on new IDU and got it running. Also noticed the GTSM was off, and restarted it by using the reset button on the powerbox. Voltages all looked good, so it was unclear why the GTSM had turned off.

- April 5, 2012 – Mike Gottlieb found the top was missing from the rain gage last week, and disconnected it so that garbage data was not recorded. Replaced original solar charge controller with Morningstar MPPT. Set quads and chop on GTSM.

- June 1, 2015 – Station had lost GPS time. The coldstart command was sent, which restored GPS time.

- January 23, 2018 – Fiber modem was not working. Cisco couldn't see any equipment and was replaced. Adjusted chops and quadrature. Looked at CH1 (was noisy before went offline). CH1 looks fine now, recent data also looks ok, no changes made. Replaced missing 2/3 of sun shade that had blown away.

- December 3, 2018 – CH1 had poor data quality. Status report showed gain 0 in event mode. Rebooted electronics. After reboot CH1 showed gain2 and was no longer in event mode. May be an OSC or RT board issue. Will monitor. May need to replace boards on next site visit.