

Quarterly Report to the Harry Reid Center
UCCSN-DOE Cooperative Agreement

Task ORD-FY04-006: Seismic Monitoring
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Report Period: 4/01/2006 – 6/30/2006

Progress:

During this reporting period (April 1 – June 30, 2006), we have maintained seismic operations with 40 real-time SGBDSN stations under the QA procedures that have been established with the HRC. Data is managed and archived in an Antelope data management system. Network uptime has been at greater than 99% over the three months. In addition, we have maintained QA data collection from 9 accelerometers in 3 boreholes on the ESF pad and from 3 accelerometer/seismometer installations in the ESF itself. Supplement 1 (below) summarizes the regional seismicity for the Quarter.

Installation of instrumentation and stations under the upgrade of the seismic network to an IP communications environment continues. Interference between the 900 MHz, IP network communications, and the 200 Mhz systems (analog network) has been addressed and reliable data communications to both IP and analog microwave is in place. A Harris IP radio was installed at Skull Mountain for communications to Angel Peak outside of Las Vegas; once the Angel to Skull link is in place we will have a redundant IP communications path from Skull Mtn. to Las Vegas. Redundant communications are a component of the network upgrade.

Technical reviews of Scientific Notebook UCCSN-UNR-053 vol. 1 have been completed and QA reviews are underway. IP-001, Operation of the Yucca Mountain Digital Network, is now being supported under Scientific Notebook UCCSN-UNR-053 vol. 2.

The SAP for software db2hypo.pl has been approved and software testing is underway. This will replace application db2phs for use in developing the YM seismicity catalog and simplify QA software maintenance for this particular application. The SAP for software EQ2ORB (receives data from datalogger at UZ-16 can integrates into Antelope) has been approved and testing is underway.

The SAP for Antelope network operations software “Antelope Real-Time System Data Acquisition and Processing v. 4.8, has been submitted. This SAP is intended to consolidate a number of software applications for real-time network operations that have previously been managed independently. This will simplify implementation of yearly Antelope software upgrades from the vendor under the QA program.

Borehole UZ-16 Multi-channel data collection

Data from the UZ-16 borehole (64 channels) continues to be received in real-time and managed in an Antelope system at NSL. The system has been in continuous operation since May 2005. All data is reviewed and event data are extracted and archived. Technical and QA reviews of UCCSN-UNR-064 vol. 1 for UZ-16 borehole have been completed and comments resolved. Acceptable system check input voltages for UZ-16 have been established and system checks were performed. Authorization for installation of three three-component surface seismometers was received. These instruments have been installed and system checks were performed. Geotechnical studies at YM under the M&O may require a comprehensive check of all UZ-16 geophones. Software to accommodate UZ-16 systems checks, current Q software CALIB 3.0 (STN NSHE-3.0-012-1), is being modified to address these needs. The SAP for software to receive data from UZ-16 into the Antelope system has been approved and testing is underway.

Kappa Project:

The kappaAH SIR was completed and submitted for review. Review comments to the kappaAH SIR have been received and are being addressed.

Divine Strake Experiment on NTS:

The Divine Strake experiment, originally scheduled for June 30, has been delayed several times. The date for the experiment is at this time uncertain. Planning for the experiment has included installation of surface geophones at borehole UZ-16 and permitting for deployment of Texan recorders. We have requested permission for each of these activities from the project. UZ-16 installation has been approved and completed, and permitting for the Texan recorders is in place.

Yucca Mountain Free-Field Strong Motion Network:

There is only 1 remaining station in the free-field strong motion network that was installed in 1995. Systems checks for station FOCS were performed according to IP-004, Operation of the Yucca Mountain Strong Motion Network. This network of 16-bit TerraTech strong motion recorders is being replaced by telemetered RefTek RT-130 dataloggers and MEMS accelerometers. The TerraTech free-field strong motion instruments are no longer supported; they have performed remarkably well. Technical and QA reviews of Scientific notebook UCCSN-UNR-057 have been completed and comments resolved.

Problems:

GPS clock upgrades at RT-130 upgrade stations revealed a problem with the vendor's equipment; the vendor supplied a solution and the field clocks at affected stations were modified. Also, an inconsistency between spec sheets and tests of the input impedance on a number of the high-gain channels of the RT-130 dataloggers indicated that some RT-130's will need to be modified. These tests were conducted following observations that system check pulses were significantly underdamped (damping resistance incorrect) at a number of stations; the vendor recognizes the need for a modification. All RT-130's for the current FY have been installed; procurements for additional RT-130 dataloggers for installation in FY07 are underway. The Skull Mtn. State microwave network was out for approximately 1 week in May due to equipment failure; this was repaired by State technicians. This did not impact earthquake monitoring efforts since the majority of the network continues to operate under the analog microwave and addition data backup had been established on the ESF pad. Until redundant communication paths are implemented, outages like this reduce the number of stations available for real-time earthquake location, but do not affect our final catalog.

Status of Funds:

Funding has been received for FY06. All major equipment purchases for FY06 network upgrade activities were completed; delays in FY06 funding has delayed some equipment purchases and will impact network upgrade schedules.

Plans and Notes:

We will be developing test suites and low-level reports in support of conversion to the 4.8 version of the Antelope Real-Time System. Testing will demonstrate suitability of this commercial application for Project uses.

Supplement 1, *Seismicity: April 1 through June 30, 2006 (FY2006 3rd Quarter).*

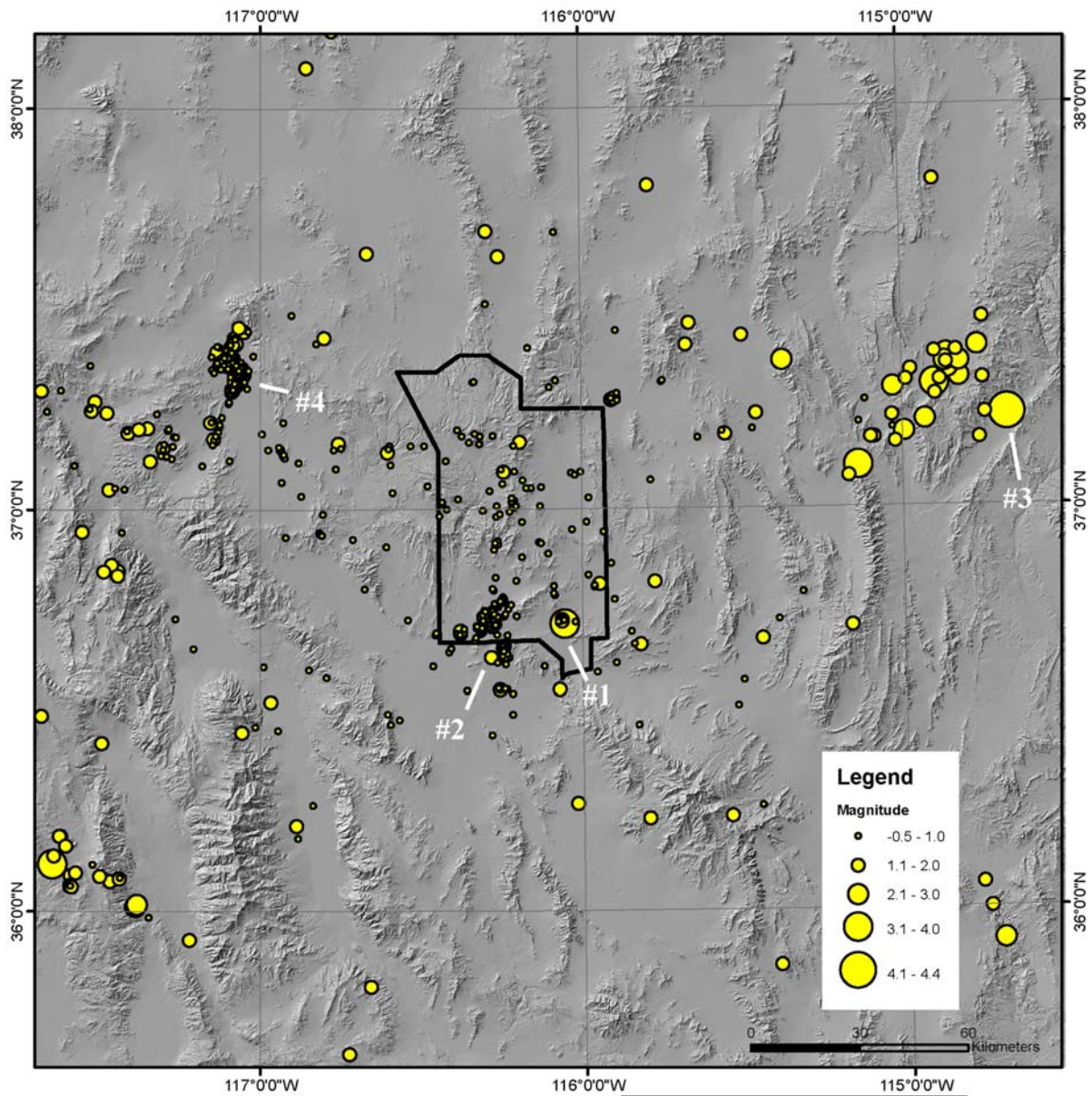
Figure 1 is a plot of earthquakes located by the Nevada Seismological Laboratory in southern Nevada during the 3rd Quarter of FY06 (all identified mine blasts and explosions have been removed). Seismicity in the Yucca Mountain-NTS area has followed the general pattern of activity that has been observed since the June 29, 1992, Magnitude (M) 5.6 Little Skull Mountain (LSM) earthquake. The LSM event took place approximately 20 SE of Yucca Mountain adjacent to the Rock Valley fault zone. The most significant event during the Quarter in the vicinity of Yucca Mountain was an M 3.3 event on April 17, 2006 (Origin Time: 20:14:51 GMT ; 13:14:51 PST; Latitude: 36.7144; Longitude: -116.0555; Depth: 5.56 km; Figure 1, #1). This earthquake took place in the Red Mountain area south of the Rock Valley fault zone and east of Frenchman Flat. Figure 1 includes the focal mechanism for the Red Mountain event.

Of the seismicity shown in Figure 1, 358 earthquakes have been located within 65 km of Yucca Mountain. Of these 23 earthquakes have a preliminary magnitude of greater than or equal to 1.0 (162 events have estimated magnitudes of less than 0.0). The most events on one day occurred on May 13, 2006 in a small sequence south of LSM (Figure 1, #2); the largest of these 23 earthquakes was M 1.45. In Figure 1 (#2) this small sequence straddles the NTS border approximately 10 km west of the M 3.3 Red Mountain event. The sequence is south of the aftershock zone of the 1992 LSM earthquake. Typical of seismicity patterns in the NTS area, small magnitude earthquakes (most < 1.0) are observed through central NTS generally trending along the eastern and northern boundaries of the Timber Mountain Caldera structure. The cluster of small magnitude earthquakes striking approximately NE-SW in SW NTS, are within the aftershock zone of the LSM earthquake and considered LSM aftershocks. LSM aftershock activity has diminished significantly but continued since 1992. The fact that we are still able to identify and locate LSM aftershocks is a result of operating a dense network of very sensitive seismograph stations in the Yucca Mountain area. This is also reflected in the increased numbers of small magnitude events that can be located in the NTS area relative to other areas of southern Nevada and southeastern California where station coverage is poor.

The most notable activity during this period has been sequence of earthquakes (largest M 4.4) approximately 120-150 km NE of Yucca Mountain in the Paranaghat Shear Zone region. This has been an area of persistent seismic activity throughout the historical earthquake monitoring period. Because of the poor station coverage locations are not well constrained in this area of the state; i.e., the geographic distribution of this sequence of earthquakes may be less than what is implied in the figure.

Another notable sequence of small magnitude earthquakes took place near Scottys Junction along the Highway 95 corridor (Figure 1, #4). These events define a lineation approximately 10 km long and are located about 5-10 km south of the aftershock zone of the August 1, 1999, M 5.6 Scottys Junction earthquake.

Shown in Figure 1 are preliminary earthquakes locations and magnitude and should not be considered for quality affecting work.



- #1. Magnitude 3.3 in the Red Mountain area.
- #2. Sequence south of LSM, May 13th.
- #3. Magnitude 4.4, June 20th.
- #4. Sequence near Scottys Junction.

Figure 1.

