

## **PROGRAM OBJECTIVES – Seismic Networks**

The National Earthquake Hazards Reduction Program (NEHRP) through the Advanced National Seismic System (ANSS) promotes the development and operation of seismic monitoring systems, implementation of system hardware and software for effective earthquake response, and the collection of seismic data for hazard assessments. In this context, regional and national networks supported by the United States Geological Survey (USGS) will be considered parts of an Advanced National Seismic System (USGS Circular 1188, *An Assessment of Seismic Monitoring in the United States: Requirement for an Advanced National Seismic System*), and will be supported, operated, and managed within this framework. Technical developments to improve network response and delivery of earthquake information and products must be consistent with the goals outlined in *Technical Guidelines for the Implementation of the Advanced National Seismic System-Version 1.0, Open-File Report 02-92*.

The USGS NEHRP recognizes that seismic networks are evolving rapidly due to new instrumentation, improved processing, and better distribution mechanisms and interfaces. The tasks outlined here represent a snapshot of what is expected from USGS-supported seismic networks. It is the intent of the USGS to establish an ANSS standards committee to develop and/or adopt policies, procedures, and common software/algorithms for use by all USGS-supported regional seismic networks. Upon acceptance of an award, the receiving institution agrees to participate in the activities and functions of the Advanced National Seismic System. Expenditure of funds provided by this award is authorized for participation in meetings called to discuss network operations, policy and procedures.

Operations of regional seismic networks falls into three broad tasks: 1) continued network operations (field hardware and central recording systems), 2) real-time integration and exchange of network generated data and information, and 3) distribution of earthquake data and information through the use of common interfaces, protocols and procedures.

### Task 1: Seismic Network Operations

Operate seismic monitoring stations and processing systems for improved delineation and evaluation of hazards associated with earthquakes through efficient and effective processing and distribution systems that provide robust and easy access to earthquake data and information products or transmission to appropriate archiving centers for distribution.

1. Monitor regional seismicity and active tectonic structures in the United States to form a foundation for assessment of earthquake potential and earthquake hazards.
2. USGS-supported regional networks will adhere to standardized maintenance and operational procedures developed and/or adopted by ANSS to assure accurate collection and processing of data.

### Task 2: Real-time Integration of Regional and National Networks

Comprehensive seismic monitoring across the Nation requires that regional and national networks exchange time-critical waveform and parametric data to ensure accurate reporting of an earthquake's location, magnitude, and its effects. Coordinated response also requires the adoption of system-wide business rules that guide the reporting (including appropriate attribution)

of the authoritative earthquake location and magnitude for emergency response activity and dissemination to the general public and media.

1. Regional networks must adhere to common protocols and formats for the routine exchange of waveform and parametric data to provide cost-effective coverage of seismically active areas. Data exchange protocols must be compatible with those used by NEIC, NSMP, and the California Integrated Seismic Network.
2. Regional networks are required to adhere to ANSS standards and to adopt the ANSS business rules being developed for authoritative reporting of an earthquake location and magnitude. Development of system-wide business rules and standard operating procedures is necessitated by repeated problems and corresponding confusion over the distribution of multiple locations and magnitudes for the same earthquake.
3. Upon request, regional seismic networks must provide strong motion data of engineering interest to NSMP for appropriate processing and distribution to the engineering community.
4. Regional networks must adhere to network security standards being developed to ensure continuing operation and data exchange as host institutions become more secure.

#### Task 3: Access and Distribution of Earthquake Information Products

To promote effective dissemination of earthquake data and information derived from regional networks, NEIC, and NSMP, the USGS will require adherence to standardized formats and procedures for the distribution of earthquake information products and data via the Internet, delivery of waveform data to permanent archival facilities, and adoption of common web-interfaces and distribution systems.

1. Earthquake locations and magnitudes produced by regional seismic networks must be contributed to the real-time ANSS composite earthquake catalog within 10 minutes of occurrence. Reviewed earthquake locations and magnitudes are to be submitted within one month after occurrence of the earthquake. Regional networks must use the QDDS (Quick Data Distribution System) software for distributing contributed earthquake locations and magnitudes and add-on URLs for response activities and distribution to electronic interfaces (e.g. Recent Earthquakes, “Did You Feel It”, “ShakeMap). All supported networks must be able to run the Earthquake-in-the-News “listening” software for linking to news worthy earthquakes or network-related information.
2. Regional networks must provide public web pages describing their network services and products with links to services and products common to all networks (e.g. Recent Earthquakes, Earthquake-in-the-News, Did You Feel It?).
3. Regional networks must provide an annual update of their seismic station inventory, which will include station name, location, instrument types, dates of operation, and a basic description of the processing system and its main attributes. ANSS will develop a standardized format for the station inventory.
4. Regional networks are required to submit their digital waveform data for archiving to one of the following three data management centers - Southern California Earthquake Center, the Northern California Earthquake Data Center, or the IRIS Data Management Center. Waveform

data must be submitted no more than 90 days behind real-time. Each network must provide easy access to up-to-date station metadata that at a minimum contains instrument location, type (sensor and datalogger), and complete instrument response (including sensor poles and zeros, sensor and datalogger sensitivities, and datalogger output sample rates for each channel).

5. Completion of Tasks 2.1 through 2.4 and Tasks 3.1 through 3.4 is required for annual renewal of funding for regional seismic networks.

**PROGRAM OBJECTIVES – Geodetic Networks**

The USGS Earthquake Hazards Program (EHP) has recognized the importance of conducting long-term geodetic monitoring studies to evaluate strain in earthquake prone regions of the U.S. Previously, funding for the operation and maintenance of geodetic networks has come in the form of one- or two-year grants from the USGS NEHRP regional grants panels. The geodetic monitoring studies that have been supported are those which closely coordinate with and meet the long-term goals of the EHP in reducing earthquake hazards in the U.S.

However, in the venue of the NEHRP research grants process, these proposals have had to compete with other earthquake research project proposals even though the main expenses for these projects were for ongoing operation and maintenance. The EHP has decided that evaluation and funding decisions for proposals to maintain and operate long-term geodetic monitoring instruments and/or networks, e.g., borehole strainmeters, creep meters, and GPS networks, would be best accomplished in a way that is similar to the regional seismic network support is funded: with three-year cooperative agreements. This Networks Announcement is being sent out to soliciting proposals for support of long-term geodetic monitoring. These proposals will be evaluated by a separate review panel. At this time, the EHP intends to support only those ongoing geodetic monitoring efforts that it currently funds through the research grants process and does not have the resources to expand support to new efforts or to new areas. Proposals for short-term geodetic research or for research using the data from long-term studies will still be considered by the appropriate regions/topical panels.

Proposals from the following specific established strain and creep networks are solicited in support of the objectives of the EHP:

- Continued measurements of fault creep in the San Francisco Bay area
- Continued support of the BARD network in northern California
- Continued operation of borehole strain network and replacement of failed instrumentation in Parkfield, California
- Continued operation of long baseline and borehole strainmeters in both northern and southern California
- Continued operation of GPS strain monitoring in the Wasatch Front region of Utah.