Management and Operation of the National Geophysical Observatory for Geoscience (NGEO)

PROGRAM SOLICITATION
NSF 16-546

National Science Foundation

Directorate for Geosciences
Division of Earth Sciences

Letter of Intent Due Date(s) ***(required)*** (due by 5 p.m. proposer's local time):

August 01, 2016

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

December 30, 2016

IMPORTANT INFORMATION AND REVISION NOTES

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 16-1), which is effective for proposals submitted, or due, on or after January 25, 2016.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Management and Operation of the National Geophysical Observatory for Geoscience (NGEO)

Synopsis of Program:

NSF hereby solicits proposals to manage and operate one or more components of the National Geophysical Observatory for Geoscience (NGEO). NGEO would comprise a distributed, multi-user, national facility for the development, deployment, management, and operational support of modern geodetic, seismic, and related geophysical instrumentation and services to serve national goals in basic research and education in the Earth sciences. In addition, NGEO would support mission goals of the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), and U.S. Geological Survey (USGS) for global real-time earthquake, volcano, and tsunami observations, early warning and hazard mitigation efforts, nuclear test ban verification, precise positioning and timing, and other Earth observation needs. NGEO would also support commercial and international groups that depend on NGEO capabilities for an increasingly wide range of applications.

Awardee(s) would work closely with NSF and the scientific community to ensure that NGEO facility capabilities support, sustain, and advance frontier science. In cooperation with NSF and within available resources, the Awardee(s) would plan and execute a viable, coherent, and inclusive program to support multi-user research and education, consistent with guidance and oversight by the scientific community.

Proposals should describe how the proposing institution(s) would: (1) provide observing capabilities and scientific data; (2) support the needs of NSF-funded, peer-reviewed research and education projects; (3) foster an integrated program of education, workforce development, and outreach; (4) develop, manage, and maintain facility capabilities; (5) manage and develop a skilled and diverse workforce; and (6) establish appropriate partnerships with universities, industry, private organizations, other Federal agencies, and the international community to support the NGEO mission.

NSF anticipates that successful proposal(s) for NGEO management and operations would be awarded as cooperative agreement(s), or a master cooperative agreement with cooperative support agreements. Any such award(s) would commence 1 October 2018 and would have a duration of ten years contingent on the availability of funds and the successful outcome of comprehensive external reviews of Awardee(s) performance and facility success. As necessary, the Awardee(s) will define and execute a budgeted, scheduled, and tracked project plan to manage any transition from the current to the proposed model of NGEO management and operations. Any such transition period would commence with a transition award, under this cooperative agreement, on or after 1 April 2018 and conclude no later than 12 months thereafter.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- Gregory J. Anderson, telephone: (703) 292-4693, email: greander@nsf.gov
- Russell C. Kelz, telephone: (703) 292-4747, email: rkelz@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.050 --- Geosciences

Award Information

Anticipated Type of Award: Cooperative Agreement or Master Cooperative Agreement with Cooperative Support Agreement(s)

Estimated Number of Awards: 1 to 5

Anticipated Funding Amount: $387,000,000

This is the projected total amount of NSF funding for the 10-year duration of any NGEO award(s), starting 1 October 2018, subject to the availability of funding. NSF anticipates any award(s) would be for an initial duration of five years, with the possibility of renewal for a further five years contingent on the availability of funds and the successful outcome of comprehensive external reviews of Awardee(s) performance and facility success during the third or fourth year of the period of initial support.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI:

There are no restrictions or limits.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Submission of Letters of Intent is required. Please see the full text of this solicitation for further information.
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**
  - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
  - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- **Cost Sharing Requirements:**

  Inclusion of voluntary committed cost sharing is prohibited.

- **Indirect Cost (F&A) Limitations:**

  Not Applicable

- **Other Budgetary Limitations:**

  Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

- **Letter of Intent Due Date(s)** ***(required)*** (due by 5 p.m. proposer's local time):

  August 01, 2016

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

  December 30, 2016

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions:

Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements:

Additional reporting requirements apply. Please see the full text of this solicitation for further information.

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I. INTRODUCTION

The National Science Foundation (NSF) is authorized by the National Science Act of 1950, as amended, to initiate and support basic and applied scientific research and to initiate and support programs to strengthen scientific research potential. To achieve these goals, NSF supports facilities that provide research capabilities in various scientific disciplines. One such facility, the National Geophysical Observatory for Geosciences (NGEO), will provide services and infrastructure to support research and education in the Earth sciences.

This competition is the second stage in a two-stage integration and recompetition process that NSF's Division of Earth Sciences (EAR) originally developed, presented to the National Science Board (NSB), and described to the community in 2009 (Dear Colleague Letter NSF 10-021); EAR informed the community of the timeline for the formal recompetition in April 2015 (Dear Colleague Letter NSF 15-076). This two stage process was designed to comply with NSB policy on periodic recompetition of NSF facilities; implement EAR strategic programmatic goals for supporting Earth science over the next decade; accommodate the changing needs of the EAR-supported community; preserve high-priority components of EAR's facility portfolio; encourage management and operational efficiencies; and to do so under constrained budget projections.

This solicitation is solely for the management and operation of NGEO. Management and operation of other facilities and/or research infrastructure supported by the Directorate for Geosciences (GEO) is not included in this solicitation. Proposing organizations are encouraged to present creative but realistic plans to deal with the budget constraints imposed on NGEO.

II. PROGRAM DESCRIPTION

A. Background

EAR has long supported facilities to provide geodetic, seismic, and related geophysical facility capabilities to the scientific community. In the mid-1980s, EAR began supporting "core" seismic facility capabilities built, operated, and currently maintained by the Incorporated Research Institutions for Seismology (IRIS; http://www.iris.edu) and "core" geodetic facility capabilities built, operated, and currently maintained by UNAVCO (http://www.unavco.org). These "core" facilities comprised global and regional networks of continuously-operating geodetic and seismic instruments; pools of portable instruments available for a wide range of PI-driven studies largely funded via the NSF merit review process; data collection, quality assurance, archiving, curation, and distribution systems that provide free and open access to high-quality geophysical data products; and education and outreach activities that enable broad audiences to access and use geophysical data and research results for educational purposes and to promote the training of the next-generation geoscience workforce.

In 2003, EAR initiated the EarthScope program to explore the four-dimensional structure of North America; the program is planned to continue until October 2018. The EarthScope Facility was a multi-purpose array of instruments that greatly expanded the observational capabilities of the Earth sciences and enabled research that advanced our understanding of the structure, evolution, and dynamics of North America. The EarthScope Facility comprised the Plate Boundary Observatory (PBO), which recorded Earth deformation with geodetic systems; the San Andreas Fault Observatory at Depth (SAFOD), which defined the conditions and physics of an active plate boundary fault at depth, and USArray, a continental-scale network which mapped Earth's interior in three dimensions using seismic and magnetotelluric systems. UNAVCO constructed and managed PBO; IRIS constructed and managed USArray; and Stanford University constructed SAFOD with assistance from the US Geological Survey, after which UNAVCO operated SAFOD.

In 2009, EAR developed a plan to integrate under one award NSF support for operations and management of the "core" seismic facility and the USArray component of EarthScope, and to integrate under a separate award NSF support for operations and management of the "core" geodetic facility and PBO component of EarthScope. Following a five-year period of integrated operations of those two unified facilities, EAR planned to recompete the operations and management of the facilities; that is the purpose of this current solicitation. The fundamental goals for this overall two-stage plan are to (1) maintain alignment with National Science Board (NSB)-approved plans (NSB-03-62 and NSB-07-116) for IRIS and UNAVCO operation of the EarthScope Facility through FY18, subject to regular NSF review and continued good performance; (2) achieve financial and managerial efficiencies in Facility operations and management and NSF Facility oversight; and (3) maintain alignment with NSB-08-16 and related policies on periodic recompetition of awards. This plan was presented to, and concurred with by, the National Science Board in December 2009 (NSB/CPP 09-49).

In 2012, IRIS and UNAVCO submitted parallel, but separate, proposals for operations and management of the two parallel, but separate, integrated facilities outlined in the 2009 plan. The proposals underwent NSF merit review, after which NSF entered into Cooperative Agreements to support UNAVCO to manage and operate the Geodesy Advancing Geosciences and EarthScope (GAGE) Facility and to IRIS to manage and operate the Seismological Facilities for the Advancement of Geosciences and EarthScope (SAGE). These two facilities provide geodetic, seismic, and related geophysical instrumentation, data, and educational capabilities to a wide range of EAR-supported communities.

Geodesy Advancing Geosciences and EarthScope (GAGE) Facility

GAGE comprises a distributed, multi-user, national facility for the development, deployment, and operational support of modern geodetic and related geophysical instrumentation to serve national goals in basic research and education in the Earth sciences. GAGE also plays a significant role in providing geodetic infrastructure support to National Aeronautics and Space Administration (NASA) investigators, the international community, and commercial surveyors and engineering firms, all of whom use geodetic data from GAGE to support precise positioning for an increasingly wide range of uses.

UNAVCO currently manages GAGE under a cooperative agreement with NSF that began 1 October 2013 and is anticipated to end 30 September 2018. NSB has authorized maximum five-year total funding of $92 million for GAGE, but actual funding levels have been lower over the first three years of GAGE operations. Total funding for GAGE in FY2015 was $14.95 million from all sources, including $1.5 million from NASA.

GAGE is comprised of 7 major elements (percentages may not add to 100% due to rounding):

- **Management and governance (15%),** which includes all direct costs associated with management and the advisory committees for the three UNAVCO directorates: Geodetic Infrastructure (GI), Geodetic Data Services (GDS), and Education and Community Engagement (ECE). In addition, the Office of the President, Business Affairs, liability and other insurance, and costs associated with the UNAVCO Board of Directors are included here.

- **Plate Boundary Observatory (36%),** which includes all costs associated with GI and GDS management of the PBO Global Positioning System (GPS), Borehole Strainmeter (BSM), and Long Baseline Laser Strainmeter (LSM) networks, including field engineering; telemetry; permitting; software development and maintenance, and related costs.

- **PI support, engineering, and research and development (7%),** which includes all engineering support for EAR PIs for campaign GPS and Terrestrial Laser Scanning (TLS) deployments as well as continuously operated GPS (cGPS) installations and ongoing operations and maintenance costs for non-PBO cGPS networks.

- **Polar operations (9%),** which includes engineering, technical, and logistical support for NSF Division of Polar Programs (PLR) PIs and the principal cGPS networks of the Greenland cGPS Network (GNET) and Antarctic cGPS Network (ANET). Costs include the purchase and maintenance of the PLR GPS equipment pool.

- **Global and regional networks excluding PBO (3%)** which includes general IT support and infrastructure software development and maintenance for all network operations for NSF (EAR and PLR) and NASA, excluding PBO; NASA Global GPS Network (GGN) operations, including engineering support, network monitoring, telecommunications costs, and O&M for specific stations; and support for the International GNSS Service (IGS) Central Bureau.

- **Data Management (25%),** which includes all data and metadata management, archival, and quality checking for GPS (and now GNSS) data; all costs associated TLS and Interferometric Synthetic Aperture Radar (InSAR) data and metadata management and curation; and associated software development.

- **Education and Community Engagement (6%),** which includes all ECE activities except those funded through independent awards like Research Experiences in Solid Earth Sciences for Students (RESESS). Staff are responsible for creating and maintaining UNAVCO science and engineering highlights for the UNAVCO website, providing PI support for Broader Impacts on NSF proposals, coordinating workshops and short courses, development of museum display materials, and development of undergraduate and graduate curricular materials in coordination with community PIs.

Seismological Facilities for the Advancement of Geosciences and EarthScope (SAGE)

SAGE comprises a distributed, multi-user, national facility for the development, deployment, and operational support of modern digital seismic and related geophysical instrumentation to serve national goals in basic research and education in the Earth sciences, global real-time earthquake monitoring, and nuclear test ban verification. SAGE also supports activities undertaken by the U.S. Geological Survey (USGS) and the National Oceanic and Atmospheric Administration (NOAA) in global earthquake, volcano, and tsunami monitoring and warning.

IRIS currently manages SAGE under a cooperative agreement with NSF that began 1 October 2013 and is anticipated to end 30 September 2018. NSB has authorized maximum five-year total funding of $152 million for SAGE, but actual funding levels have been lower over the first three years of SAGE operations. Core SAGE support in FY2015 was $25.2 million, including $24.35 million from EAR and $850,000 from PLR.

SAGE is comprised of four major elements (percentages may not add to 100% due to rounding):

- **Instrumentation Services (71%)**
    - **Management and governance (6%)**, which includes management, oversight, and governance for all Instrumentation Services activities, including planning; performance, personnel, and subaward management; procurements; budget planning and tracking, reporting and compliance oversight; and community outreach and engagement.
    - **Portable instrument pool and PI support (16%)**, which provide investigators with experimental planning, logistics, training, and field support; hardware, software, and engineering services; data collection and management support; and education and outreach. Portable seismology staff also maintain the broadband, short-period, and high-frequency sensors and data loggers in the instrument pool, and work with manufacturers and the community to develop equipment to meet evolving needs. SAGE currently supports approximately 60 active experiments each year worldwide via the Portable program.
    - **Global Seismographic Network (GSN; 10%)**, which provides a global network of continuously operating stations that record with high fidelity the full spectrum of Earth motion, from the most fundamental normal models to tens of Hertz. These stations provide critical geophysical observations for Earth science research and education; earthquake, volcano, and tsunami warning; and nuclear test ban treaty verification. GSN is operated as an international collaboration with multiple countries, in partnership with the US Geological Survey. This activity also includes atmospheric, geodetic, and related auxiliary sensors; data management and communications systems; and oversight and management activities.
    - **Polar Support Services (3%)**, which provides enhanced capabilities for geophysical observations in severe polar environments. This includes a variety of specialized cold-hardened instruments, enclosures, power systems, and telemetry systems; coordination and planning with PIs; and research and development. Funding for this element comes from PLR.
    - **Transportable Array (TA; 32%)**, which comprises a continental-scale observatory that has provided integrated geophysical data across the lower 48 states and southern Canada, and is now migrating to Alaska. The TA activity includes siting, permitting, construction, and operation of geophysical stations in Alaska; development, purchase, and installation of sensors, power and telemetry systems, and station enclosures; data collection, quality assurance, and delivery to the SAGE data management system; and outreach and education. This element also includes support for prior stations that have been "adopted" by another organization, but are still operated via SAGE.
    - **Magnetotellurics (MT; 2%)**, which includes both data collection on a regular regional grid, similar to the TA deployment, and support for PI-driven research using MT equipment and methods. MT support includes operation of an instrument depot; training and logistical support; and data collection, quality control, reduction, and delivery to the SAGE data management system.
    - **Other community activities (0.8%)**, which includes coordination with the science community regarding needs for instruments to support very large, dense seismic deployments; research and development to support such needs; and planning for demonstration experiments.
- **Data Services (22%)**, which includes collecting, archiving, curating, and distributing geophysical data from other elements of SAGE and from international network partners; developing and distributing higher-level derived data products; developing and maintaining hardware and software systems necessary for these activities; providing support and training for the global community of SAGE data users; and management, oversight, and governance activities.
- **Education and Public Outreach (7%)**, which includes education, workforce development, and outreach activities targeting K-12 teachers and students, undergraduate and graduate students and faculty within the Earth sciences, and the public. Those activities include an undergraduate summer internship program and graduate student training; professional development for K-12 teachers and college faculty; development of educational products; public outreach; and dissemination of these materials via the Web and social media. It also includes assessment, management, oversight, and governance activities.
- **Other Activities (0.4%)**, designed to facilitate SAGE community engagement and oversight and governance of SAGE activities by the scientific community.

B. NGEO Baseline Scope

NGEO will provide the geophysical capabilities – including instrumentation, cyberinfrastructure, expert professional staff, and scientific community governance – needed to support a wide variety of Earth science problems in the coming decade. NGEO will act as a *Center of Excellence* to advance the scientific goals of the EAR-supported research and education community, as articulated in

multiple guiding documents, including *Unlocking the Secrets of the North American Continent: An EarthScope Science Plan for 2010-2020 (Williams et al., 2010); New Research Opportunities in the Earth Sciences (NRC, 2012);* and the recent report on *Future Geophysical Facilities Required to Address Grand Challenges in the Earth Sciences (Aster et al. 2015)*.

NSF will entertain proposals to provide one or more of the desired capabilities described below, provided those proposals meet all requirements described in this solicitation. **Note that estimated annual budget amounts given below should be viewed as guidelines subject to revision and the availability of funding, and that budgetary and other resource requests in any given proposal must be commensurate with the scope of work therein proposed.**

NGEO is intended to provide the following **Foundational capabilities**, which include both current and emergent capabilities that the community has identified as key to the science of the next decade.

- **Management and operations (M&O) of global and regional networks of continuously operating geodetic, seismic, and related geophysical instrumentation ($8.5 million/year)**

  These networks will provide fundamental long-term observations of the full spectrum of Earth deformation from secular plate motions to tens of hertz. NGEO continuous networks should include at minimum full GNSS observations, borehole strainmeters, broadband and very broadband seismometers, and strong motion sensors; not all observables need be collected at each station. Data from all NGEO continuous stations will be made freely available to any user without artificial delay or restriction.

- **M&O of portable geodetic, seismic, and related geophysical instrumentation primarily for use by NSF-funded investigators for targeted research projects ($6.9 million/year)**

  The NGEO portable instrument pool will provide equipment; logistics, field, and data ingestion support; and user training to enable investigator-driven research worldwide, including in the harsh polar environments. The NGEO pool should include seismic systems capable of recording with high fidelity and at high rate the spectrum of ground motion from Earth's fundamental normal modes to hundreds of hertz, including full-wavefield techniques; full GNSS-capable geodetic systems with high rate recording; portable geodetic imaging systems such as terrestrial laser scanning and structure-from-motion photogrammetry; and power, telemetry, and ancillary systems. The number of available systems of each type should be sufficient to meet the needs of peer-reviewed experiments without unduly disruptive waiting periods. In aggregate, the NGEO portable instrument pool should include the ability to support deployments ranging from a few to a few thousand sensors, with durations ranging from weeks to a few years, and with station densities capable of resolving Earth processes of interest. The NGEO portable instrument pool should include significant capabilities to support research in harsh environments and a capacity for rapid deployments in response to significant geophysical events. The pool will also provide necessary expertise in experimental planning; logistics, field, and data ingestion support; user training; and equipment maintenance.

- **Data management systems for collection, quality assurance, curation, management, and distribution of a large volume of diverse geophysical data products ($8.2 million/year)**

  NGEO data management activities should include:

  - Ingestion of geophysical data and metadata from the NGEO facility, PI-driven experiments using the NGEO facility, and other sources with agreement from NSF;
  - Generation of low-level data products that the community has determined are appropriate for facility responsibility, such as GNSS position time series and velocity fields; derived strain time series and strain fields; raw and quality-controlled seismic data; and InSAR, TLS, photogrammetry, and other geodetic imagery;
  - Hosting of community-provided geophysical data products such as tomographic models, earthquake finite-fault models, etc.;
  - Curation and management of these diverse geophysical data products; and
  - Distribution methods that will support a range of users from experts to non-specialists.

- **Education, workforce development, and public outreach programs (EWO; $2.8 million/year)**

  NGEO will incorporate a range of high-impact programs designed to disseminate Earth science results to a wide range of audiences through innovative public outreach; K-12 education and teacher professional development; and undergraduate, graduate, and faculty education and workforce development. NGEO EWO programs should foster integration between researchers, educators, and other experts to ensure those programs are carried out in accordance with applicable national and community standards and foster greatly expanded participation of underrepresented groups. Examples of such programs may include, but are not limited to, workshops and short courses; internships across academia, industry, government, and the non-profit sector; development of educational materials; social media, software tools, and other distribution methods; museum displays and public lectures; and mentorship across all areas of the Earth science enterprise.

- **Management and business systems, processes, and structures required to support NGEO activities ($3.2 million/year)**

  NSF believes that multiple viable NGEO management structures may exist, but any viable structure will require professional management by highly dedicated and expert staff, carried out in direct collaboration with the NGEO community through a community-based oversight and governance structure. NGEO management and oversight activities include, but are not limited to, scientific and technical planning; budget, performance, personnel, and subaward management; permitting, liability, and other legal issues; reporting and compliance; and community outreach and engagement.

NSF also intends NGEO to provide a range of **Frontier capabilities** that will support experiments targeting future scientific goals **(up to $9.0 million/year)**. Capabilities of interest include, but are not limited to, those that would provide support for cross-coastal Earth systems science; near-surface and critical zone geophysics; and atmospheric and cryosphere studies informed by geophysical methods. In addition, NGEO should provide enhanced capabilities to explore, develop, and apply next-generation and emerging instrumentation and methods to problems of community interest.

C. Description of Awardee(s) Responsibilities

Responsibilities

The Awardee(s) shall be responsible for the management, operation, and maintenance of the National Geophysical Observatory for Geoscience (NGEO) in accordance with the proposal(s) submitted in response to this solicitation and Annual Program Operating Plans approved by NSF prior to each year of work. The Awardee(s) shall ensure that NGEO capabilities enable world-class

research, education, and related activities in the geosciences by:

1. Operating and maintaining NGEO facilities, developing and incorporating new capabilities, planning for future new initiatives, supporting a skilled and diverse work force, sustaining innovative and vigorous research and education projects awarded by NSF through the merit review process, and enabling use of NGEO for other critical stakeholder activities.

2. Ensuring that, within the resources available, NGEO fulfills all aspects of its mission with a visionary and productive program of world-class services, infrastructure, and research support in the interests of the NGEO stakeholder communities.

3. Carrying out activities at NGEO facilities that are funded by NSF and by other agencies and organizations. Any non-NSF programs managed by the Awardee(s) must be consistent with the NGEO mission, and complement and enhance activities funded and approved by NSF.

Expectations of the Awardee(s)

The Awardee(s) shall promote a culture of excellence that meets the highest standards for service and delivery to the scientific community and shall demonstrate a proactive and effective approach to facility management. The Awardee(s) shall carry out all NGEO activities with direct oversight and governance from the scientific community served by NGEO. The Awardees(s) shall be expected to:

- Define and implement organizational structure(s) for NGEO that provide vision, leadership, and service to manage NGEO as a vibrant, community-focused, multi-user facility that is an effective national resource. Such structures may include the establishment of new institutions, corporations, or consortia, provided all requirements of this solicitation are met.

- Hire and maintain a world-class, broadly inclusive workforce and management team with the expertise to provide the expected level of service to the user community.

- Establish and maintain an effective, broadly representative, community-based governance and oversight structure to guide all NGEO activities. Structure(s) proposed must be based fundamentally on ongoing direct involvement of the scientific community in all aspects of NGEO.

- Carry out all proposed NGEO activities in a cost-effective and efficient manner that meets the goals of NGEO; provides the support necessary for the conduct of research and education by the community, with highest priority given to NSF-funded investigators; is aligned with the highest standards of integrity and transparency; adheres with current best practices; ensures the safety and security of staff and users; and is fully compliant with all applicable laws and regulations.

- Demonstrate a strong and ongoing commitment to continued engagement of a broad community in all aspects of NGEO, including a focus on enabling significantly greater participation by traditionally underrepresented groups.

- Serve as stewards of high-quality scientific data products on behalf of the community through collection, quality assurance, curation, and distribution of products; by ensuring all NGEO data products are of sufficient quality, timeliness, and continuity to support high-quality Earth science research, education, and other uses; and ensuring that all NGEO data management activities are carried out in accordance with applicable NSF and EAR data policies and best practices in scientific data management.

- Carry out an active an engaging EWO program that disseminates the results of NGEO-enabled research and actively cultivates the scientific literacy of the American public.

- Seek and implement strategic partnerships, collaborations, or similar arrangements with national, state, and local government laboratories; research museums; private sector research laboratories and observatories; federal agencies, and international entities that will enhance the scientific capabilities available to the entire geosciences community.

- Establish a structured framework for ongoing planning, review, and performance management with mechanisms to enable regular assessment of NGEO activities.

- Support NGEO activities sponsored by other federal agencies, which may wish to utilize NGEO capabilities through interagency funding agreements with NSF.

Please note that in the event of multiple Awardee(s) being selected, all Awardee(s) will be expected to coordinate with each other, the scientific community, and NSF in ensuring that all NGEO activities are carried out efficiently, effectively, and responsively.

Important Considerations in the Preparation of a Proposal

Proposals submitted pursuant to this solicitation must be based on a detailed and well-defined integrated Work Breakdown Structure (WBS). Every section of the proposal, and every element of the proposed budget, must be tied clearly and directly to the proposal WBS.

Proposed management and business structures should be described fully in the proposal, including descriptions of:

1. The proposed organizational structure, with well-defined lines of authority and responsibility within the organization;

2. Workforce management processes and plans, including applicable human resources systems and policies;

3. Business systems capacities, including accounting systems with procedures for auditing and oversight; the ability to segregate and account separately for funding from NSF and that from other sources; procurement staff and processes; a property management system capable of acquiring, tracking and controlling equipment funded by NSF and, separately, equipment funded by other sources; and

4. Processes for planning future operations and initiatives carried out in full collaboration with the NGEO stakeholder communities.

Note that all business functions must meet the requirements set forth in 2 CFR § 200, the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards.

D. General Information

For additional information on this competition, NSF practices and policies, and/or access to the Resource Library that provides further detail, proposing organizations should contact the Cognizant Program Officers, Greg Anderson (greander@nsf.gov) and/or Russ Kelz (rkelz@nsf.gov).

Proposing organizations should review documents that are being made available through the NSF-maintained Resource Library. The documents are grouped in categories that include:

- Cooperative Agreements, Annual and Quarterly Reports, and Program Plans;
- Inventories of NSF and non-NSF owned equipment associated with NGEO;
- Memoranda of Understanding and Similar Agreements;
- NSF Large Facilities Manual, including draft version of Section 4.2 (Cost Estimating and Analysis)
- NSF and EAR Data Policies; and
- Frequently Asked Questions (FAQs).

Password-protected access to the Resource Library will be provided to organizations considering proposal submissions, upon request to the Cognizant Program Officers. Any added and updated material and information relating to this solicitation, including NSF responses to frequently asked questions, will be made available through the Resource Library as appropriate.

III. AWARD INFORMATION

Estimated program budget, number of awards, and average award size and duration are subject to the availability of funds.

Successful proposal(s) will be awarded as Cooperative Agreement(s) or as a Master Cooperative Agreement with Cooperative Support Agreement(s). NSF anticipates that the initial award commitment(s) will be for five years, with continuation for a maximum of a further five years contingent on the availability of funds and the successful outcome of comprehensive external review(s) of Awardee(s) performance and facility success in the third or fourth year of the initial period (see Section VII.B, "Special Award Conditions").

All budget amounts given herein are for planning purposes only; actual annual funding increments will be determined on the basis of Annual Program Operating Plan(s) submitted by the Awardee(s) to NSF and approved by NSF, subject to the availability of appropriated funds and contingent upon successful performance of the Awardee(s).

If new Awardee(s) are selected to replace any incumbent responsible for an element of GAGE or SAGE proposed as a component of NGEO, NSF will fund appropriate transition costs through a cooperative support agreement with the new Awardee for a transition period of up to 12 months preceding the main cooperative agreement. Relevant transition activities include interviewing and hiring personnel, assigning subcontracts, transferring data and property, and obtaining permits and licenses. During this transition period, the new awardee will have appropriate access to incumbent personnel and facilities.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI:

There are no restrictions or limits.

Additional Eligibility Info:

Consortia may include international partnerships, but NSF funds may be awarded only to U.S.-based organizations, and hence NSF expects the U.S. organization to be the lead organization.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Letters of Intent *(required)*:

Each proposing organization must submit a Letter of Intent (LOI) through FastLane; full proposals may be submitted only by organizations that have submitted a LOI by the LOI due date.

LOIs will be used by NSF to ensure that the appropriate expertise is available for participation in the review and selection process, to foresee potential conflicts of interest, to identify any potential gaps in the capabilities being proposed, and to anticipate special award conditions that may be necessary to accommodate the proposed organizational and governance structure. The LOI is a statement of a proposer's preliminary plans; the senior personnel, collaborating or partnering organizations, and proposed plans may change between submission of the Letter of Intent and submission of the Full Proposal.

Letter of Intent Preparation Instructions

Complete submission of a Letter of Intent (LOI) requires two separate components that must each be submitted prior to the LOI due date.

FastLane LOI Component

Submit the following LOI information via FastLane:

- Project Title
- Synopsis (a brief abstract of maximum 2,500 characters of plain text)
- Point of Contact for NSF Inquiries
- Project PI Information
- Participating Organizations

Submission of this component via FastLane will produce **a FastLane LOI ID** that must be included in the PDF LOI Component described below.

PDF LOI Component

Via an email to the Cognizant Program Officers named herein, submit a document of no more than 5 pages in length in Portable Document Format (PDF) that addresses the following:

- A description of the proposer's strategic vision and proposed management concept for the planned NGEO activities;
- A description of the envisioned organizational and governance structure to support the planned NGEO activities, including the identification of all collaborating and partnering institutions and their roles;
- A list that identifies full names and affiliations of proposed Key Personnel, including all PIs, co-PIs, and senior personnel; and
- A brief synopsis of the proposer's organizational expertise in operating large scientific facilities.

The PDF document should include the **FastLane LOI ID** in a running header and must be consistent with NSF Grant Proposal Guide formatting guidelines (NSF GPG Section II.B).

Letter of Intent Preparation Instructions

When submitting a Letter of Intent through FastLane in response to this Program Solicitation please note the conditions outlined below:

- Submission by an Authorized Organizational Representative (AOR) is required when submitting Letters of Intent;
- Submission of multiple Letters of Intent is not allowed;
- Other Participating Organizations are allowed; and
- Subrecipients may participate in more than one letter of intent.

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.5 of the Grant Proposal Guide provides additional information on collaborative proposals.

See Chapter II.C.2 of the GPG for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the GPG instructions.

The Full Proposal shall conform to the guidelines specified in the NSF Grant Proposal Guide or the NSF Grants.gov Application Guide, except where detailed below.

Proposers are reminded to review procedures under "Proprietary or Privileged Information" in Section I.D.3 of the GPG and to mark only such information, including patentable ideas, trade secrets, privileged or confidential commercial or financial information, disclosure of which might harm the proposer, with the appropriate legend such as, "The following is (proprietary or confidential) information that (name of proposing organization) requests not be released to persons outside the Government, except for purposes of review and evaluation." Please also see the section entitled "Privacy Act and Public Burden Statements" below.

The following information is required for the Full Proposal:

1. **PI/Co-I Information:** This should follow the standard GPG or NSF Grants.gov Application Guide guidelines.

2. **Cover Sheet:** A cover sheet must be submitted and electronically signed by an Authorized Organizational Representative for all full proposals.

3. **Project Summary:** This section should provide a summary of the key points of the proposal and should be understandable to a scientifically or technically literate lay reader. This section must follow the standard GPG or NSF Grants.gov Application Guide guidelines. Proposals that do not include an overview and separate statements on intellectual merit and broader impacts within the Project Summary will not be accepted by FastLane or will be returned without review.

4. **Project Description (up to 75 pages):** This section should describe the proposed activities and provide the scientific justification for the work proposed. The scientific justification must be clear and tied directly to applicable community-vetted guiding documents, including *Unlocking the Secrets of the North American Continent: An EarthScope Science Plan for 2010-2020 (Williams et al., 2010); New Research Opportunities in the Earth Sciences (NRC, 2012);* and *Future Geophysical Facilities Required to Address Grand Challenges in the Earth Sciences (Aster et al., 2015)*. This section of the proposal must demonstrate that input from the broad Earth science community served by NGEO has been solicited and incorporated. Please note that all information relevant to determining the quality of the proposed work must be included as part of the Project Description, unless otherwise directed in this solicitation.

5. **References Cited:** This section should follow the standard GPG or NSF Grants.gov Application Guide guidelines.

6. **Biographical Sketches:** A resume, limited to 2 pages, must be provided for the PI, each co-PI, all Key Personnel, and any other senior personnel as required in GPG Section II.C.2.f.

7. **Budget:** See the instructions in Section B, below.

8. **Current and Pending Support:** This section should follow the standard GPG or NSF Grants.gov Application Guide guidelines.

9. **Supplementary Documentation:** Except as specified in this item or in the NSF Grant Proposal Guide (see GPG Section II.C.2.j), special information relevant to determining the quality of the proposed work must be included either as part of the Project Description or as part of the budget justification.

    a. **Documentation of collaborative arrangements of significance to the proposal:** Proposers should document with formal letters of collaboration any collaborative arrangements of significance in performing the proposed work. Letters of support are not permitted under this solicitation, and proposals containing such letters may be returned without review. Please see the NSF Grant Proposal Guide Section II.C.2.d(iv) for further details.

    b. **Work Breakdown Structure Dictionary (text-searchable PDF up to 20 pages in length):** Document that provides detailed information about each element in the WBS, such as a brief definition of the scope of work, deliverables, bases for budget and schedule estimates, assessment measures, and milestones.

    c. **Transition Plan:** Proposing organizations, other than the incumbent responsible for an element of GAGE or SAGE that forms an element of a proposal from that incumbent, may be funded for an additional transition period of 12 months preceding the transfer of operating authority. If new Awardee(s) are selected to manage, operate, and maintain a particular NGEO capacity, the incumbent for that capacity will cooperate with the successor to the extent necessary to facilitate uninterrupted support for NGEO during the transition period, and will provide transfer of legal rights to relevant property and equipment. NSF will support appropriate transition costs incurred by successor Awardee(s) if different from the current Awardees.

    Organizations other than the incumbent for a given capacity must provide, as a Supplementary Document not to exceed 15 pages, a detailed transition plan and budget for a transition period of up to 12 months preceding the new award. The transition plan must include at a minimum:

        i. A proposed duration and schedule for the transition period;
        ii. Estimated resource needs for the transition period;
        iii. Plans for recruiting, orientation, and training;
        iv. Plans for changes to staffing, facilities, or operational modes;
        v. A plan to acquire office infrastructure and manage the transfer of assets, inventory, commitments, plans, and documents;
        vi. Identification of assumptions that underlie the transition plan; and
        vii. A detailed budget for the transition period, presented in accordance with instructions given in Section V.B.

10. **Single Copy Documents:** Information for the items below should be entered via the Single Copy Documents section in FastLane as "Additional Single Copy Documents."

    a. **Information required by NSF for determining conflicts of interest.** NSF will use the documents below to determine conflicts of interest in the review process. The documents should be entered in the Single Copy Document section of FastLane "List of Personnel, Collaborators and Affiliates."

        i. **Project Personnel:** Provide the full names, affiliations, educational background, and specific role for each person for whom support is sought, including all PIs, co-PIs, named senior personnel, and/or contractors (including subawardees).

        ii. **Collaborators and Other Affiliations Information:** For all PIs, co-PIs, named senior personnel, and/or contractors (including for subawardees), provide the names of all persons, participants and affiliates with potential conflicts of interest, with format as specified in Section II.C.1.e of the NSF GPG. For each

person, be sure to include information for all collaborators and other affiliations as specified in Section II.C.1.e of the NSF GPG, as well as for all known individuals who would act as external advisory committee members for NGEO; and all subcontractors who would receive funds through the award.

b. **Copy of Letter of Intent.** Proposers must submit a single PDF document that combines both the FastLane LOI component and the PDF LOI component described in Section V.A. Proposals lacking this combined document may be returned without review.

11. **The following section is not required for the Full Proposal:**

    Facilities, Equipment and Other Resources (all relevant information must be provided in the Project Description and Appendices).

    Proposers should insert text or upload a document in that section of the proposal that states, "Not Applicable for this Program Solicitation." Doing so will enable FastLane to accept your proposal.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Other budgetary limitations apply. Please see the full text of this solicitation for further information.

Budget Preparation Instructions:

Full proposals should include a budget on the budget form in FastLane or the R&R Budget Form in Grants.gov for each year of the ten-year period proposed (first five year period of an initial award plus another five years pending a successful performance review). The first year budget should total no more than $38,700,000 and only if the full set of desired capabilities described herein is proposed. FastLane and Grants.gov will automatically provide a cumulative budget.

The proposal should provide all staffing and budgeting information needed to describe how the organization would carry out the proposed activities. Requested budget amounts for each year of the proposal should reflect the level considered necessary to perform the NSF-funded activities described in the proposal. Proposers should be cognizant of budget constraints implied by the estimated funding levels provided under Sections II and III.

A budget justification tied directly to the integrated WBS and WBS Dictionary for the proposal shall be submitted with the budgets for each year, and shall be in sufficient detail to show how the proposer reached the amounts specified in the budget. NSF anticipates performing a cost analysis of successful proposal budget(s) in accordance with NSF's Large Facilities Manual (LFM; NSF 15-089, dated June 2015 or subsequent revision). A draft version of LFM Section 4.2 (Cost Estimating and Analysis) will be provided for proposal preparation. Proposing organizations are required to follow the instructions in the Grant Proposal Guide, effective January 25, 2016 (Budget and Budget Justification, http://www.nsf.gov/pubs/policydocs/pappguide/nsf16001/gpg_2.jsp#IIC2g).

Enter the anticipated total level of subrecipient support on line G5, Subawards, of the FastLane budget or line F5 of the R&R Budget Form in Grants.gov. Proposals require the inclusion of separate budgets for subrecipient agreements that exceed $250,000 per year, with a budget justification and detailed explanation of the proposing organization's cost analysis of that budget, for a maximum of 3 pages each. Examples include budgeted months and salaries for personnel, quotations to support budgeted equipment, itemized listing of material and supplies with support quotations, statements of risk assessments and monitoring plans for each subrecipient, cost price analysis to support that the proposed subaward amounts are reasonable and copies of the subrecipient responsibility determinations, including adequacy of accounting system and financial capability. For subawards valued at less than $250,000 year, include the costs in the aggregate on the subaward line in the budget.

Proposing organizations other than the incumbent for a particular NGEO facility capability must also provide a separate budget for a transition period of up to 12 months preceding the new award. This information must be provided as part of the required Transition Plan (see Section V.A, item 8.c). The budget must be presented in the same style with all applicable budget line items as for the budget for each year of the proposal. If new Awardee(s) are selected to manage and operate a given NGEO facility capability, the incumbent will cooperate with the successor to the extent necessary to facilitate uninterrupted support for NGEO during the transition period and will provide transfer of legal rights to relevant property and equipment. NSF will support appropriate transition costs incurred by a successor awardee if different from the current awardee. The transition budget should not include non-renewal costs of the incumbent. If a new operator is selected, the incumbent may submit to NSF costs related to the cooperative agreement non-renewal, and these costs will be considered separately.

Organizations that have not previously received NSF awards should review the NSF Prospective New Awardee Guide (http://www.nsf.gov/pubs/2005/nsf0529/guide05_29.pdf) and current NSF Large Facilities Manual (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf15089) for additional guidance in preparing their budget submission.

C. Due Dates

- **Letter of Intent Due Date(s)** ***(required)*** (due by 5 p.m. proposer's local time):

  August 01, 2016

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

  December 30, 2016

D. FastLane / Grants.gov Requirements

For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: https://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: http://www.grants.gov/web/grants/applicants.html. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

Proposers that submitted via FastLane are strongly encouraged to use FastLane to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in the GPG as Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: http://www.nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of

knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (GPG Chapter II.C.2.d.i. contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including GPG Chapter II.C.2.d.i., prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
    a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
    b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

For Full Proposals, reviewers will be asked to judge the following:

1. **How well demonstrated is the need for the proposed facility capabilities?**
    a. How well is the scientific justification for the proposed facility capabilities tied to the appropriate community-developed guiding documents?
    b. How clearly has the proposer demonstrated that input from the broad Earth science community served by EAR has been solicited and incorporated?
    c. How appropriate and essential for the intended Earth science research are the proposed facility capabilities?
    d. How much will research projects supported by GEO benefit from the proposed facility capabilities?
2. **How well conceived is the integrated maintenance and operation plan and budget for the proposed activities?**
    a. Are there well-defined vision, mission, goals, and objectives for maintenance and operations of the proposed activities to serve the Earth science community?
    b. Are the planned activities justified and adequate for management and operations of the proposed facility capabilities?
    c. Is the rationale used to develop task descriptions, milestones, and resource requirements adequately explained in the proposal?
    d. Is there a coherent and effective leadership, management, and organizational structure? Are the duties of each staff position clear and is the need for each position justified? Are the salaries and time commitments appropriate and well justified?
    e. Does the proposer have the ability to provide access to facility capabilities intended to serve a national or regional research community?
    f. Does the project have sufficient financial and audit controls?

g. Are there adequate descriptions of the hardware and software to be maintained and operated, and the means by which this would be accomplished?
h. What is the quality of the plan for risk management for the proposed activities? Does the risk management plan adequately address budget and other project risks?
i. What is the quality of the plan for annual critical self-assessment?

3. **Proposed Budget**
   a. Is the proposed budget appropriate, clear, detailed, and well justified?
   b. Does the proposal include specific activities associated with the work to be performed and the activity-based resource descriptions?
   c. Are FTE levels appropriate? Are all labor costs used in the budget appropriately and correctly identified? Are the activities and unit costs associated with the project scope clearly identified and defined in the budget?
   d. Are project resources effectively allocated to all personnel tasks, activities, and equipment and material and supply costs?
   e. Is the cost of the proposed capabilities reasonable and adequate when compared with previous history and current market prices?
   f. Is the budget consistent with the schedule?
   g. Are the schedule and budget adequate for maintaining the facility?
   h. Are the assumptions that have been used to develop the budget clearly identified and defined? Have all uncertainties in the project scope and budget been identified?
4. **Transition Plan (if any)**
   Reviewers will evaluate the Transition Plan to assess the proposing organization's ability to assume full responsibility for the management and operation of NGEO upon completion of the transition period, without degradation of facility capabilities.

In addition, NSF will assess the organization's budgetary, financial, and business information, as part of the merit review outlined in this solicitation, and pre-award business reviews. NSF will evaluate and/or assess the following:

- Total proposed costs, for reasonableness and potential impact on funding available for science and related activities;
- The impact of the proposed total cost relative to those of other proposals;
- Annual audited financial statements (e.g., Balance Sheet, Profit and Loss Statement, and Annual Reports) for the three most recent fiscal years, and/or other documentation to clearly explain the organization's current financial strength and resource capabilities; and
- The adequacy of the organization's internal accounting and operational controls (including human resources, property control and procurement systems); its potential for attracting qualified employees, and the adequacy of its financial resources for managing NGEO.

The business evaluation will be used to help inform the Program Officer's recommendation for award.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by

Ad hoc Review and/or Panel Review, Site Visit Review, or Reverse Site Review.

Proposals will be reviewed with a combination of ad hoc reviews, panel review meetings, and reverse site visits. The panel will include experts in business practices and management of scientific organizations. Reviewers will be asked to evaluate proposals using the criteria specified above. Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage each proposal's review will consider the advice of reviewers and will formulate a recommendation. NSF staff's evaluation of the financial and business systems will be used to help inform the Program Officer's review.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation. The National Science Board must also approve any award(s) from proposals submitted in response to this solicitation, and that may require additional processing time.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award notice, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

Special Award Conditions:

The award associated with this solicitation will not be a standard grant or contract, but rather either a cooperative agreement or a master cooperative agreement with individual cooperative support agreements issued under the terms and conditions of the overall agreement. Any special requirements not stated herein will be negotiated at time of award.

TBD - Programmatic Terms and Conditions:

The cooperative agreement(s) awarded as a result of this competition will be administered by the NSF Division of Earth Sciences. The following are some of the measures NSF envisions using to conduct oversight for the cooperative agreement or cooperative support agreements:

- Review of annual reports, program plans and performance metrics;
- Site visits at least annually, and as necessary;
- Annual estimated cost reviews;
- Review of NGEO activities and management performance in the third or fourth year of the initial award period; and
- After the mid-term review, NSF may either invite the Awardee(s) to submit renewal proposal(s) for an additional five-year period of support, or issue a new solicitation, or transition the facility activities in some other fashion.

TBD - Financial and Administrative Terms and Conditions:

Costs to be reimbursed in accordance with 2 CFR 220 -- Cost Principles for Educational Institutions, 2 CFR 230 -- Cost Principles for Nonprofit Organizations, or Federal Acquisition Regulation (FAR) Part 31, as applicable.

The awardee will be required to submit to an NSF Business Systems Review (see NSF 13-100, Business Systems Review Guide v.4.0) at least once during the award period.

Standard cooperative agreement terms and conditions, including supplements for managers of FFRDCs, are available at: http://www.nsf.gov/awards/managing/co-op_conditions.jsp. Specific terms and conditions will be negotiated at time of award.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

NSF will require the successful Awardee(s) to provide planning documents, such as annual program plans and long-range plans, along with necessary reports. Under the Government Performance and Results Act (GPRA), NSF is required to report on the Federal Performance Goals for Facilities. Any and all facilities with an annual budget exceeding a specific threshold must report on their operations activities; and any and all construction/upgrade projects that exceed a total project cost of a specific threshold must report on their construction/upgrade activities. Therefore, Awardee(s) will be required, upon request of the cognizant NSF program officer, to submit annual reports related to the GPRA performance goals. This may include the collection and submission of specific data related to the NSF GPRA requirements.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- Gregory J. Anderson, telephone: (703) 292-4693, email: greander@nsf.gov
- Russell C. Kelz, telephone: (703) 292-4747, email: rkelz@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "NSF Update" is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Grants Conferences. Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. "NSF Update" also is available on NSF's website.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this mechanism. Further information on Grants.gov may be obtained at http://www.grants.gov.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at http://www.nsf.gov

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center)**:** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

  Send an e-mail to: nsfpubs@nsf.gov

  or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

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Reports Clearance Officer
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