Earth Sciences Instrumentation and Facilities (EAR/IF)

PROGRAM SOLICITATION
NSF 22-577

REPLACES DOCUMENT(S):
NSF 16-609

National Science Foundation

Directorate for Geosciences
  Division of Earth Sciences

Full Proposal Deadline(s):

Proposals Accepted Anytime

IMPORTANT INFORMATION AND REVISION NOTES

Revision Notes

This solicitation supercedes NSF 16-609. Changes from the previous Earth Sciences Instrumentation and Facilities solicitation include:

1. Guidelines for **Equipment Acquisition or Upgrade** and **Instrumentation and/or Technique Development** have been clarified and the maximum allowable requests have been increased to $600,000.
2. A new opportunity for U.S. community colleges and minority-serving, non-Ph.D.-granting institutions of higher education to submit educational infrastructure focused **Equipment Acquisition or Upgrade** proposals has been added.
3. A new opportunity to submit **Technician Support** proposals has been added.
4. Guidelines for **Community Facility Support** proposals have been clarified and specific reporting requirements are articulated. Annual budget maximums have been imposed.
5. The opportunity for **Continental Drilling Planning** proposal submissions has been highlighted.
6. Guidelines for inclusion of Special Information and Supplementary Documents and Budget Information have been expanded.

Important Information

Innovating and migrating proposal preparation and submission capabilities from FastLane to Research.gov is part of the ongoing NSF information technology modernization efforts, as described in Important Notice No. 147. In support of these efforts, research proposals submitted in response to this program solicitation must be prepared and submitted via Research.gov or via Grants.gov, and may not be prepared or submitted via FastLane.

Any proposal submitted in response to this solicitation should be submitted in accordance with the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Earth Sciences Instrumentation and Facilities (EAR/IF)

Synopsis of Program:

The NSF Division of Earth Sciences (EAR) hereby solicits proposals for research infrastructure that is necessary to advance understanding of the Earth System including: the structure, properties and dynamics of the solid Earth and the interactions between the solid Earth and its biosphere, hydrosphere, cryosphere and atmosphere; the history and evolution of life; and the history and dynamics of Earth's climate.

The EAR Instrumentation and Facilities Program (EAR/IF) will support meritorious requests for instrument-based and human research infrastructure that will advance understanding of the Earth system, contribute toward training a diverse geoscience workforce, and encourage efforts to support belonging, accessibility, justice, equity, diversity, and inclusion (BAJEDI).

EAR/IF will consider proposals for:

1. **Equipment Acquisition or Upgrade**
2. **Instrumentation and/or Technique Development**
3. **Technician Support**
4. **Community Facility Support**
5. **Continental Drilling Planning**

EAR seeks proposals that prioritize support for the U.S. Earth science community supported by EAR core or special programs (see https://www.nsf.gov/funding/programs.jsp?org=EAR for a current list of funding programs in EAR).

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.

- Luciana Astiz,E 8466, telephone: (703) 292-4705, email: lastiz@nsf.gov

- Russell C. Kelz,E 8459, telephone: (703) 292-4747, email: rkelz@nsf.gov

- David D. Lambert, telephone: (703) 292-8558, email: dlambert@nsf.gov

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

- 47.050 --- Geosciences

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant or Cooperative Agreement

Estimated Number of Awards: 30 to 40

Anticipated Funding Amount: $10,000,000

for new awards annually, pending availability of funds

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- 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.

- Consortia as follows:

    a. legally incorporated, not-for-profit consortium that includes two or more submission-eligible organizations as described in the two bulleted items above. Such a consortium is one with an independent administrative structure (e.g., a sponsored projects office) located in the United States, its territories, or possessions and has 501(c)(3) status.
    b. Submission-eligible organizations as described in the two bulleted items above, on behalf of an informal consortium. These consortium proposals may also include as partners, via subawards, other U.S. and non-U.S. organizations that are not otherwise eligible to submit directly to this solicitation.

    In either case, the proposal title should indicate that a consortium is proposing.

    While for-profit commercial organizations, especially U.S. small businesses with strong capabilities in scientific or engineering research or education, are eligible for participatory support through subawards/subcontracts as private sector partners with submitting organizations; they may not submit independent proposals. Such partnerships must be substantive and meaningful. In addition, the value added by the for-profit commercial organization should be justified as a unique contribution that is otherwise unavailable within organizations described in the two bulleted items above.

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:** Not required

- **Preliminary Proposal Submission:** Not required

- **Full Proposals:**
  - Full Proposals submitted via Research.gov: *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.
  - 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: https://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

- **Full Proposal Deadline(s):**

  Proposals Accepted Anytime

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review criteria 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.

TABLE OF CONTENTS

I. INTRODUCTION

The Division of Earth Sciences (EAR) supports NSF's mission, strategic goals and objectives articulated in 'Building the Future: Investing in Discovery and Innovation' (NSF Strategic Plan for Fiscal Years (FY) 2018-2022). The EAR Instrumentation and Facilities Program (IF) supports research infrastructure that Earth scientists require to advance knowledge of the composition, evolution and dynamics of the solid Earth and its surface environment and the interaction of the solid Earth with the biosphere, atmosphere, hydrosphere, and cryosphere. The results of this research are expected to create a better understanding of the Earth's changing environments, the natural distribution of its mineral, water, biotic, and energy resources, and provide enhanced methods for mitigating the effects of geologic hazards.

Support for state-of-the-art, instrument-based and associated human research infrastructure is a strategic investment for the Nation with multiple goals including promoting and maintaining U.S. global leadership in science and technology, advancing our capability to meet current and future societal challenges, and fostering the growth of a more capable, diverse, and inclusive scientific workforce. EAR supported research infrastructure capitalizes on partnerships with other government agencies, academia, private and international entities.

EAR supports a broad spectrum of research and research infrastructure. A recent National Academies committee Decadal Survey, hereafter "Earth in Time", documents priority science questions to guide EAR research over the coming decade (National Academies of Sciences, Engineering, and Medicine 2020. A Vision for NSF Earth Sciences 2020-2030: Earth in Time. Washington, DC: The National Academies Press. https://doi.org/10.17226/25761). The Decadal Survey discusses the instrument-based (*e.g.*, emerging technologies, measurement and analysis capabilities) and human infrastructure (*e.g.*, pipeline of highly trained individuals) necessary to advance identified science priority questions, reviews existing infrastructure and facilities available to the EAR research community and makes several recommendations. This solicitation directly or indirectly addresses multiple Decadal Survey recommendations including regular facility evaluations using stated criteria, improved mechanisms to support U.S. researcher's involvement in continental drilling, guidance and investment opportunities to improve diversity, equity and inclusion within the Earth science community, and a commitment to funding that develops and sustains technical staff capacity, stability and competitiveness.

A central goal in all proposals submitted to EAR/IF should be to advance research and research training in the Earth sciences.

Investigators interested in a recent history of EAR/IF awards and in learning more about national or regional community facilities supported by the program are encouraged to make use of the NSF advanced award search engine (https://www.nsf.gov/awardsearch/advancedSearch.jsp) by entering Element Code 1580 and/or to browse the EAR/IF homepage at: https://www.nsf.gov/geo/ear/if/facil.jsp

II. PROGRAM DESCRIPTION

The Instrumentation and Facilities Program in the Division of Earth Sciences (EAR/IF) supports meritorious requests for instrument-based and human infrastructure that seek to promote Earth and environmental science research and education in U.S. academic and research institutions.

All proposals submitted to EAR/IF must describe research and/or educational applications that are within the realm of funding opportunities that exist within NSF/EAR disciplinary and integrated activities programs (see https://www.nsf.gov/funding/programs.jsp?org=EAR for a current list of disciplinary and integrated activities programs in EAR). However, it is not an eligibility requirement that investigators have a track record of NSF/EAR research support or have proposals pending within NSF/EAR research programs at the time of submission of a proposal to EAR/IF.

Human resource development and education are expected to be an integral part of all proposals submitted to EAR/IF. Proposers are encouraged to explore innovative education and outreach efforts to broaden participation of underrepresented groups in experiential learning using state-of-the-art analytical tools and to raise awareness of available geoanalytical capabilities in the U.S. Examples could include development and/or support of: 1) short courses or summer institutes focused on engaging underrepresented groups (faculty and students); 2) partnerships with faculty at Minority Serving Institutions and community colleges to make instrumentation and technology available to their students and faculty for research and education; 3) outreach activities to engage K-12 educators and students in field or laboratory studies involving experiential learning and/or exposure to proposed instrumentation, capabilities, or relevant data and its significance; 4) unique webcasting, social media or other activities to promote awareness of analytical capabilities, means of access, and the significance of scientific research applications made possible; and/or 5) travel to or virtual participation in annual conferences of professional societies focused on fostering enhanced diversity in science.

All proposals submitted to EAR/IF need to be cognizant and considerate of the need to support belonging, accessibility, justice, equity, diversity, and inclusion (BAJEDI) as part of proposed activities as appropriate.

EAR/IF will consider proposals under the categories described below.

Equipment Acquisition or Upgrade to advance laboratory and/or field investigations and student research training opportunities in the Earth sciences.

EAR/IF accepts proposals seeking support for the acquisition of new research equipment or the upgrade of existing equipment, and will consider proposals requesting support to acquire, ship and make suitable for research use, used analytical equipment.

Analytical laboratory, field instrumentation, and computational equipment often serve a range of scientific disciplines. EAR/IF may seek to partner with other appropriate NSF programs and other Federal agencies in proposal review and funding consideration. Investigators proposing equipment that supports research in the purview of other Divisions in the Geosciences Directorate, other NSF Directorates, or other federal agencies should email the relevant NSF or agency program managers about the planned submission and copy an EAR/IF Program Director on that email.

EAR/IF will consider Equipment Acquisition or Upgrade proposals from community colleges and minority serving non-Ph.D.-granting institutions of higher education where the intended uses of the equipment are solely or predominantly focused on educational applications. These proposals have budget request limitations that are lower than the limitations for Ph.D. granting and non-Ph.D.-granting institutions with investigators whose primary goal is to acquire instrument-based infrastructure to support the analytical needs of hypothesis driven Earth science research. See section V.B Budgetary Information below.

Instrumentation and/or Technique Development to extend current research and research training capabilities in the Earth sciences.

EAR/IF accepts proposals seeking support for the development of new instrumentation, techniques and associated software that extend or will improve current research capabilities in the Earth sciences**.** EAR/IF will also consider the development of analytical standards and/or interlaboratory method comparisons under this category.

Investigator(s) seeking to develop new instrumentation, techniques, and/or associated software should demonstrate that development would result in a new or improved capability that does not currently exist.

Proposals seeking funds primarily for development and/or operation of cyberinfrastructure resources that serve the Earth Sciences, including data resources, software tools, and computational infrastructure, should be directed to the Division of Earth Sciences Geoinformatics Program (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf21583).

EAR/IF welcomes collaborative development proposals between academic and industrial partners. **However, EAR/IF does not support the sole commercial development of instrumentation or capabilities.** Financial support of any proposed commercial entity involvement must be budgeted via subawards within a submission from an eligible institution proposal.

Technician Support to provide for optimal and efficient operation and maintenance of advanced instrumentation, support analytical protocol development, and provide user training for Earth science research instrumentation, including computational hardware, networks and software.

The intent of the EAR/IF Technician Support opportunity is to establish a **single, new, full-time technician position** to advance research productivity and student training at solicitation eligible institutions that already have required analytical, experimental or computational equipment. EAR/IF will **NOT** consider proposals for support of existing technicians. Technical support may result in specialized analytical, experimental or computational capabilities and/or services that would be made available to users beyond the proposing investigator(s) but it is not a requirement.

EAR/IF expects that proposers will have demonstrated laboratory management experience, necessary infrastructure, and a documented ability to conduct measurements, experiments, or develop and run computer codes that support innovative research in Earth Sciences.

Community Facility Support to make complex and expensive instruments, systems of instruments, or services, broadly available to the Earth science research and student communities.

Investigators seeking to establish support for a new Community Facility or to support the renewal of an existing Community Facility should contact an EAR/IF Program Officer prior to submission.

EAR/IF expects that proposers will have specialized technical expertise and demonstrated leadership capabilities.

Three Community Facility Support tracks are defined below:

Track I - Community Facility Concept

Track I proposals offer the opportunity for: support of workshop(s) focused on identifying unmet community needs for centralized Earth science Facility capabilities; developing or identifying possible solution(s) to meet an articulated need; assessing potential demand for a new Community Facility; and exploration of models for community access, management and operation needs including necessary instrumentation, required staffing, and expected services, and estimates of associated costs. Track I Community Facility Concept proposals should follow guidelines for Conference proposals found in PAPPG Chapter II.E.9.

Track II - New Community Facility: Development and Operation

Track II proposals offer the opportunity for initial development, operational, and management support of a new Earth science Community Facility that has been identified as a community need as documented through a compelling Track I workshop report. Track II proposals should present feasible, cost effective, and carefully considered solutions to meet community needs for open access to complex and expensive instruments or services that are not broadly available domestically to the U.S. Earth science community or for which a case for centralized support can be made that promotes broadening access and efficiencies in meeting community needs.

Track III - Community Facility Renewal

Track III proposals offer the opportunity for continued operational support of an established Earth science Community Facility that has demonstrated: a history of professional, effective, and efficient management and operations; the importance of the Facility to the NSF-supported Earth science community as evidenced through quantitative reporting of historical user support and the provenance of user research funding; a record of facilitating research that results in significant scholarly publication, both in impact and quantity; leadership in Facility-relevant technological development and accomplishments; exemplary and measured records of success in advancing the training and development of a diverse, next-generation geoscience workforce; and demonstrated and sustained efforts to address belonging, accessibility, justice, equity, diversity, and inclusion (BAJEDI) across all Facility activities.

Continental Drilling Planning to support activities that strengthen a submission of Earth science research proposals that intend to involve continental scientific drilling.

Continental Drilling Planning proposals offer the opportunity to support pre-drilling activities that will strengthen a drilling proposal intended for submission to one of EAR's core science programs. These activities could include workshops, community planning activities, site surveys, equipment design, and drilling plan and budget preparation. Interested investigators are encouraged to learn more about internationally and domestically supported continental

drilling support entities including the International Continental Drilling Program and the Continental Scientific Drilling Facility at the University of Minnesota.

III. AWARD INFORMATION

EAR/IF anticipates approximately $10,000,000 will be available annually for 30-40 new awards, subject to the availability of funds. Awards may be standard or continuing grants or cooperative agreements.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- 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.

- Consortia as follows:

  a. legally incorporated, not-for-profit consortium that includes two or more submission-eligible organizations as described in the two bulleted items above. Such a consortium is one with an independent administrative structure (e.g., a sponsored projects office) located in the United States, its territories, or possessions and has 501(c)(3) status.
  b. Submission-eligible organizations as described in the two bulleted items above, on behalf of an informal consortium. These consortium proposals may also include as partners, via subawards, other U.S. and non-U.S. organizations that are not otherwise eligible to submit directly to this solicitation.

  In either case, the proposal title should indicate that a consortium is proposing.

  While for-profit commercial organizations, especially U.S. small businesses with strong capabilities in scientific or engineering research or education, are eligible for participatory support through subawards/subcontracts as private sector partners with submitting organizations; they may not submit independent proposals. Such partnerships must be substantive and meaningful. In addition, the value added by the for-profit commercial organization should be justified as a unique contribution that is otherwise unavailable within organizations described in the two bulleted items above.

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.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

- Full Proposals submitted via Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.
- 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:

(https://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) 292-8134 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 Research.gov. PAPPG Chapter II.D.3 provides additional information on collaborative proposals.

See PAPPG Chapter II.C.2 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 PAPPG instructions.

Solicitation specific proposal preparation instructions follow:

1) Title

The title of the proposal should convey its category and main topic. Proposals for **Equipment Acquisition or Upgrade (EA)**, including those from U.S. community colleges and minority-serving, non-Ph.D.-granting institutions for educational infrastructure focused proposals **(EA/Ed)**, **Instrumentation and/or Technique Development (ITD)**, **Technician Support (TS)**, **Community Facility Support (CFS)**, and **Continental Drilling Planning proposals (CDP)** should have respective titles prefixed with:

EA: [*insert title*] or **EA/Ed:** [*insert title*]

ITD: [*insert title*]

TS: [*insert title*]

CFS (Track I, II, or III): [*insert title*]

CDP: [*insert title*]

2) Project Description

The project description must include and address the subsections identified below for the separate categories of EAR/IF proposal submissions.

Equipment Acquisition or Upgrade *(maximum length, 15 pages, including all figures and charts)* proposals must include the following subsections:

a. **Overview and Objectives.** Provide a brief introduction of the proposed instrumentation and the broad objectives for its use.
b. **Description of Instrumentation and Need.** The technical capabilities sought, and any market research conducted should be discussed. Where competing manufacturers exist, justification for the instrument(s) manufacturer requested should be provided. Alternatively, a plan to select an instrument based on further evaluation in the event of award should be articulated. Need for the instrument should include a review of any current similar instrumentation, if available to the investigators, either at the institution or within a defined region, and why the requested instrumentation is necessary to advance investigator(s) research and student training.
c. **Investigator Research Applications**. Discussion of PI and all co-PI primary research applications that is comprehensive enough to allow reviewers to evaluate the merit of the intended activities and the extent to which the instrumentation is essential and appropriate to proposed applications. Current and potential funding sources that may support these activities and/or how the instrument(s) might better enable future funding support should also be described. Research use by potential auxiliary users can be summarized or tabulated. **For EA/Ed submissions** that will support primarily educational activities at Community Colleges or non-PhD granting Minority Serving Institutions, a detailed description on how the equipment will support those activities must be included. For such proposals this section can be labeled **Investigator Educational Applications.**
d. **Operation and Management.** Should describe where the instrumentation would be located, including any space, environmental or power requirements and plans to accommodate requirements; who would be responsible for instrument operation and maintenance; how instrument access would be managed and usage allocated; a financial plan to support estimated annual costs of instrument operation and maintenance including any anticipated user fees and estimated demand for instrument time and/or sample throughput; and safety (**see also V.A.4, Special Information and Supplementary Documents, below**) and instrument training plans.
e. **Broader Impacts**. Anticipated research infrastructure, training, teaching impacts, and planned efforts to support BAJEDI activities should be described including: how the instrument will serve to attract researchers and make a substantial improvement in the institution's capabilities to conduct leading-edge research; how the instrument will improve the quality of research training and teaching; any plans to broaden participation in instrument experiential learning by underrepresented groups; partnerships with other academic institutions, industry or other agencies; anticipated societal relevance of research applications or data generated; and any planned outreach activities aimed at increasing public appreciation of science.
f. **Results from Prior NSF Support (maximum length, 5 pages of the 15-page Project Description).** Preference should be given to investigator team members with prior EAR awards, especially prior awards by the EAR/IF program (see requirements in the PAPPG).

Instrumentation and/or Technique Development *(maximum length, 15 pages, including all figures and charts)* proposals must include the following subsections

a. **Overview and Objectives.** Provide a brief introduction of the proposed instrumentation, technique, software or other planned development and the anticipated objectives for use.
b. **Investigator Research Applications**. Discussion of PI and all co-PI primary research applications that would benefit from the proposed development should be comprehensive enough to allow reviewers to evaluate the merit of the research and the extent to which the proposed instrument, technique, software, or other planned development is essential and appropriate to the research program. Current and potential funding sources that may support these activities and/or how the development will better enable future funding support should also be described. Research use of by potential auxiliary users of the developed instrument, technique or software can be summarized or tabulated.
c. **Design, Development and Deployment.** A description of the design, development and deployment plans for the instrument, technique, software, or other planned development should be sufficiently detailed for reviewers to evaluate technical feasibility, likelihood for success, and reasonableness of cost. The proposed instrument, technique, software, or other development should include discussion of the anticipated capabilities and how the

developed capability would result in a significant improvement to current capability not currently available commercially or otherwise. In the case of instrumentation, design specifications, any schematics and discussion of component systems should be included. Technique or software development proposals should describe all required activities, necessary materials and supplies, and plans for access to necessary computational hardware and codes, including adoption of open-source licenses for any new software development. Standards development projects should detail necessary tasks and present plan for distribution. Interlaboratory method comparisons should describe all laboratories and personnel that will be involved, who will be responsible for primary oversight of activities, and how the results will be made openly available to the Earth science community. All development proposals should include an anticipated schedule for each phase of the project, the personnel required, their technical expertise and their duties; and assessment of risks and potential mitigation plans to keep the project within scope, schedule and budget. Any plans for instrument deployment, dissemination of designs, techniques or software to the broader scientific community, or technology transfer or commercialization should be described.

d. **Operation and Management.** In the case of instrumentation, a description of where the developed instrument would be located, including any space, environmental or power requirements and plans to accommodate requirements; who would be responsible for instrument operation and maintenance; how instrument access would managed and usage allocated; a financial plan to support estimated annual costs of instrument operation and maintenance including anticipated user fees and estimated demand for instrument time and/or sample throughput; and safety (**see also V.A.4, Special Information and Supplementary Documents, below**) and instrument training plans should be described. In the case of software development any plans to maintain software and platform requirements should be described.

e. **Broader Impacts**. Anticipated research infrastructure, training, teaching impacts, and planned efforts to support BAJEDI activities should be described including: how the instrument will serve to attract researchers and make a substantial improvement in the institution's capabilities to conduct leading-edge research; how the instrument will improve the quality of research training and teaching; any plans to broaden participation in instrument experiential learning by underrepresented groups; partnerships with other academic institutions, industry or other agencies; anticipated societal relevance of research applications or data generated; and any planned outreach activities aimed at increasing public appreciation of science.

f. **Results from Prior NSF Support (maximum length, 5 pages of the 15 page Project Description).** Preference should be given to investigator team members with prior EAR awards, especially prior awards by the EAR/IF program (see requirements in the PAPPG).

Technician Support *(maximum length, 15 pages, including all figures and charts)* proposals must include the following subsections

a. **Overview and Objectives.** Provide a brief introduction of the proposed technical position and anticipated duties.

b. **Description of the Technical Position and Need.** A description of the technical capabilities of the laboratory or field capabilities, relevant investigator(s) expertise, expected qualifications of the intended technician, anticipated duties and associated time commitments should be sufficiently detailed for reviewers to evaluate the need for the position and reasonableness of budget. An intent of this opportunity is to provide for adequate technical support for extant U.S. academic laboratory, experimental or computational facilities where adequate support is not currently available.

c. **Investigator Research Applications**. Discussion of PI and all co-PI primary research applications that is comprehensive enough to allow reviewers to evaluate the merit of the research and the extent to which the technical position is critical to advancing the research programs of the investigator(s). Current and potential funding sources that may support these activities and/or how the technician will better enable future funding support should also be described. Technical support benefits to research use by potential auxiliary users can be summarized or tabulated.

d. **Hiring Plan and Technician Duties.** A timeline and plan for applicant search, including a brief discussion of related institutional policies, selection, hiring and initiation of duties. By whom and how the technician will be supervised and plans for periodic assessment should be discussed. Anticipated technician duties and estimated distribution of technician time spent on described duties should also be detailed, for example, anticipated faculty and student support both for on-campus and external users including instrument user and safety training (**see also V.A.4, Special Information and Supplementary Documents, below**) and any anticipated role in conducting fee-for-service analyses.

e. **Broader Impacts**. Plans for user training and support, including efforts to support BAJEDI activities: how the technician will make a substantial improvement in the institution's capabilities to conduct leading-edge research; how the technician will improve the quality of research training and teaching; and any plans to have the technician assist in efforts to broaden participation in instrument experiential learning by underrepresented groups should be described.

f. **Results from Prior NSF Support (maximum length, 5 pages of the 15 page Project Description).** Preference should be given to investigator team members with prior EAR awards, especially prior awards by the EAR/IF program (see requirements in the PAPPG).

Community Facility Support (Track I) proposals should follow the PAPPG guidelines for Conference proposals (Chapter II.E.9). **Track I** proposals are limited to either domestic venues or virtual meetings. Plans to invite participants should be included as well as open participation to interested members of the U.S. geoscience community and students within available budget. It is expected that workshop/conference findings will be reported to EAR/IF as part of a Final Project Report and to include the results of any conducted participant surveys aimed at supporting a consensus scientific need for a new community facility, the identification of a solution or solutions to meet that need, an initial estimate of possible community demand for facility services and an initial estimate of the budget required to operate and manage such a community facility through a subsequent **Track II** proposal.

Community Facility Support (Track II) Maximum page lengths for the Project Description of **Track II** proposals are defined according to the average annual requested amount. Average annual requested amounts less than $600,000 are limited to 15 pages including all figures and charts. Average annual requested amounts greater than $600,000 and are limited to 20 pages including all figures and charts.

Track II proposals MUST be invited by EAR/IF. Invitation to submit a **Track II** proposal must be documented. Following submission of a **Track I** Final Workshop Report, a potential lead investigator of a **Track II** proposal must request a formal Program invitation via email to a cognizant Program Officer. EAR/IF Program invitation must be documented in a positive reply email which should be uploaded to a **Track II** proposal under Special Information and Supplementary Documents.

Track II proposals must include the following subsections:

a. **Overview and objectives.** Provide a brief introduction of the Community Facility and describe overall objectives of operations.

b. **Description of facility capabilities.** Describe the instrumentation and proposed Community Facility capabilities. Also describe any associated Facility related cyberinfrastructure development plans.

c. **Community research applications**. Describe any planned PI and planned or anticipated community research applications. The description should be comprehensive enough to allow reviewers to evaluate the merit of the research and the extent to which the Facility capabilities are essential and appropriate to the research program(s). Current and potential funding sources that may support these activities and/or how the Facility will better enable future funding support should also be described. Description of potential interested users beyond the investigator team and can be either summarized or tabulated.

d. **Operation and management.** Describe the planned physical and human infrastructure needs for the Facility including: where the facility would be located, including any space, environmental or power requirements and plans to accommodate requirements; planned personnel needs for Facility operation and maintenance; how Facility access would managed and usage allocated; a financial plan to support estimated annual costs of Facility

operation and maintenance including any anticipated user fees and estimated demand for Facility services; and lab and/or field safety considerations (**see also V.A.4, Special Information and Supplementary Documents, below**). Proposed management and governance should describe how user access will be facilitated and how facility operations would be advised by an external advisory or governance committee. User access policies and procedures should include plans for development and maintenance of a facility web site.

   e. **Staffing.** A staffing table should be included that identifies anticipated personnel, their duties and qualifications.

   f. **Broader impacts**. Anticipated research infrastructure, training and teaching and outreach impacts should be described including: how the Facility will attract researchers and make a substantial improvement for the Earth Science community's ability to conduct leading-edge research; any planned Facility-related research training and teaching activities including any plans to broaden participation in Facility activities by underrepresented groups and related lab and/or field safety considerations; any planned community activities including development and conduct of any technical short courses, instructional materials, workshops, or community outreach activities; how the investigator(s) will address BAJEDI across all aspects of proposed activities; partnerships with other academic institutions, industry or other agencies; anticipated societal relevance of research applications or data generated; and any planned outreach activities aimed at increasing public appreciation of science.

   g. **Facility Metrics.** Facility metrics to assess performance should be developed. EAR/IF requires that Track II and III Community Facilities record and be prepared to report on details of supported projects, wherever possible, including:

      1. PI Last Name
      2. PI First Name
      3. Institution
      4. Project Title
      5. Source of Research Support (Agency)
      6. Source of Research Support (Division)
      7. Source of Research Support (Program)
      8. Grant Number
      9. Service Effort (*e.g.*, # analyses, scanning time, instruments provided, deployment time or personnel effort)
     10. Service Type (*e.g.*, type of analysis, type of field support etc.)
     11. User Fees Charged/Received

Plans to record and maintain records of scholarly productivity made possible by Facility support should be described.

   h. **Results from Prior NSF Support.** Preference should be given to investigator team members with prior EAR awards, especially prior awards by the EAR/IF program (see requirements in the PAPPG).

Community Facility Support (Track III) proposals may be submitted by investigators who have either received previous **Track II** support or by investigators who have been operating a community facility previously awarded under an earlier EAR/IF solicitation. To accommodate proposal reporting of the results of previous operational support project descriptions may be up to 25 pages.

Track III proposals should follow the same subsection guidance described for **Track II** proposals above with the following additional subsection considerations:

Facility metrics should report on the facility history of project support and related financials to include annualized summation of total numbers of projects supported by funding source at each level (Agency, Division, Program) and of total user fees assessed by funding source at each level (Agency, Division, Program), wherever possible. This may be detailed in table form and/or through the use of pie charts. Metrics related to scholarly activity made possible under previous Facility Support can be described, tabulated and/or plotted. Quantification or assessment of any broader impact activities conducted under previous Facility support should also be included.

Note: Full reference lists of any scholarly products made possible as a result of previous Community Facility Support should be included as a Supplementary Document (see solicitation section V.A.4)

Continental Drilling Planning proposals *(maximum length, 8 pages, including all figures and charts).*

Proposals should follow guidance for Planning Proposals contained in PAPPG Chapter II.E.1 .

Note: PAPPG guidelines require that investigators contact a cognizant Program Officer prior to submission of a planning proposal and include email documentation confirming Program Officer approval to submit a planning proposal (see section V.A.4 below).

In addition, proposals should describe the planning activities necessary to support Earth science proposals requiring continental scientific drilling. Planning grant proposals may include support for pre-drilling activities that will strengthen a drilling proposal intended for submission to one of EAR's core science programs. These activities could include workshop(s), community planning activities, site surveys, equipment design, and drilling plan and budget preparation. Any proposed field and/or laboratory activities should describe safety considerations plans (**see also V.A.4, Special Information and Supplementary Documents, below**).

3) Facilities, Equipment and Other Resources

This section of the proposal is used to assess the adequacy of the resources available to perform the effort proposed to satisfy both the Intellectual Merit and Broader Impacts review criteria. Proposers should describe only those resources that are directly applicable. Proposers should include an aggregated description of the internal and external resources (both physical and personnel) that the organization and its collaborators will provide to the project, should it be funded. Such information must be provided in this section, in lieu of other parts of the proposal (e.g., Budget Justification, Project Description). The description should be narrative in nature and must not include any quantifiable financial information.

Although these resources are not considered cost sharing as defined in 2 CFR § 200.306, the Foundation does expect that the resources identified in the *Facilities, Equipment, and Other Resources* section will be provided, or made available, should the proposal be funded.

4) Special Information and Supplementary Documents

Required Special Information and Supplementary Documents for all NSF proposal are described in PAPPG Chapter II.C.2.j . Additional Supplementary documents that are required for categories of EAR/IF proposal submissions and/or specific relevant guidance include:

Equipment Acquisition or Upgrade proposals must include copies of manufacturer quotes for requested instrumentation or components where per unit costs exceed $5,000. If plans for operation and management will rely on extant technical support, a Biographical Sketch of the technician should be included (see format guidelines in PAPPG Chapter II.C.2.f).

Instrumentation and/or Technique Development proposals should include manufacturer quotes for required components to be procured commercially where per unit costs exceed $5,000. If an existing technician or postdoctoral scholar will be engaged in the development efforts, a Biographical sketch should be included for that individual (see format guidelines in PAPPG Chapter II.C.2.f).

Technician Support proposals should include a letter from a relevant University Administrator which notes under which University position category the potential technician would be hired and the salary range for such a position.

Community Facility Support (CFS) Track II and III proposals should include:

a) A template for a one-page Facility support letter with the header "**EAR/IF Facility Support Letter**" that will be provided to prospective facility users via email attachment as a pdf file. The letter will communicate to the prospective user the willingness and ability of the Facility to support the research project. The letter should instruct the recipient to include the letter as a supplementary document in any NSF proposal submission to a research program.

The letter should conclude with the following:

"In order to begin scheduling and planning for facility support services, upon your notification of any sponsored award or if you have existing support, we require email notification to include the source of support (Agency, Division, and Program), grant title, and grant number. The terms of our NSF/EAR/IF facility award require that we maintain records of supported projects together with the source of that support to the level of detail defined here wherever possible. Please remember to acknowledge NSF [EAR-award number] for support of the [Facility Name] Facility in any publication or presentation whenever possible given space limitations."

b) A description of plans to maintain an informative and user-friendly Community Facility website that: describes and advertises the Facility and its services; provides contact information and instructions on how to initiate and document a formal request for facility support services; archives and allows for dissemination of Facility relevant documents and any Facility relevant open source software and educational materials; provides a record of supported projects and relevant metadata with links to information regarding any collected and/or analyzed physical samples including archival and access information; provides access to an up-to-date bibliography of publications from projects receiving facility support; describes any Facility related data policies and, where appropriate, provides links to any Facility hosted, non-proprietary data; and is updated with any Facility related news as necessary and appropriate but at a minimum reviewed on a quarterly periodic basis. The web site must document NSF Division of Earth Science Instrumentation and Facilities Program support via this award and visibly provide requested publication acknowledgement information for users.

Community Facility Support (CFS) Track III proposals should include reference lists of any scholarly products made possible as a result of previous Community Facility Support.

Continental Drilling Planning

Email documentation confirming Program Officer approval to submit a planning proposal must be uploaded by the PI as a document entitled "Planning–Program Officer Concurrence Email" in the Supplementary Documentation section of Research.gov.

Postdoctoral Researcher Mentoring Plan

Any proposal that requests funding to support a post-doctoral researcher is required to include a postdoctoral researcher mentoring plan (see PAPPG Chapter II.C.2.j).

Data Management Plan

All NSF proposals must include a **Data Management Plan (DMP)** of no more than two pages (see PAPPG Chapter II.C.2.j). Investigators are encouraged to become familiar with the many community data and informatics efforts that have been or are supported by NSF Programs such as the EAR Geoinformatics Program or through other agencies.

The Division of Earth Sciences has a specific Data and Sample Policy that is generally most applicable to funded research-oriented projects but that also applies to workflows for using instrumentation to generate data for research. Therefore, proposers to EAR/IF should describe in an included DMP how a supported project will address the EAR Data and Sample Policy.

General key considerations for compliance with the EAR Division Data Policy include the following:

- EAR's definition of "data" is expansive and includes (but is not limited to) the following: full data sets, derived data products (*e.g.*, model results, output, and workflows), software, and physical collections.
- The DMP should clearly describe what data will be collected, what analyses will be done, when data collection is considered "final," and how and when the project will provide open and timely access to data during and after the project.
- PIs are strongly encouraged to identify long-lived disciplinary repositories most appropriate for the data types to be collected.
- PIs are required to provide updates on the status of data sharing and archiving in project reports.

The DMP for **Equipment Acquisition or Upgrade** proposals should describe any plans to facilitate user compliance with NSF and/or EAR Data and Sample Policies.

The DMP for **Instrumentation and/or Technique Development** should describe plans to make findable, accessible, interoperable, and reusable (FAIR) any data and/or software generated during the development project and its testing.

The DMP for **Community Facility Support Track II and III** proposals should describe what and how the Facility intends to or has developed data acquisition,

analysis, archival and curation cyberinfrastructure in support of Facility users and in assisting their needs to adhere to relevant NSF and/or EAR Data and Sample Policies.

Broadening Participation and/or Outreach Activities

This supplemental funding opportunity is targeted at proposals for **Equipment Acquisition or Upgrade** and **Instrumentation and/or Technique Development.** While such activities are also allowable and encouraged under proposals for **Community Facility Support (CFS), Tracks II and III,** the budget allowance for this opportunity and guidance for inclusion of a related Supplementary Document applies only to proposals for **Equipment Acquisition or Upgrade** and **Instrumentation and/or Technique Development.**

Any focused efforts to support participation of underrepresented groups in laboratory and/or field instrument use and educational and community outreach activities as part of proposals for **Equipment Acquisition or Upgrade** and **Instrumentation and/or Technique Development** should be described in a related Supplementary Document of no more than two pages. Examples of such activities were described in section II. Program Description. Planned development and conduct of such activities should be described including timelines, tasks, personnel responsibilities, anticipated audience(s) and assessment plans.

Budgeting guidelines for related activities are described in section V.B below.

Safety Considerations

All proposals that will entail laboratory and/or field activities must describe protocols that will be undertaken to ensure the mental and physical safety of any participants or guests working in the laboratory or field, especially students and others who may be inexperienced in working with or developing instrumentation, handling dangerous reagents or materials, participating in challenging field conditions or working with field equipment that might pose hazards, or working without supervision. Laboratory and/or field safety protocols should include plans for ensuring a harassment free and inclusive working environment for all parties.

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:

In preparing the budget and budget justification for all categories of proposals investigators should follow the guidance in PAPPG Chapter II.C.2.g as well as the solicitation specific budget limitations and additional guidance described below:

Broadening Participation and/or Outreach Activities

> **Equipment Acquisition or Upgrade** and **Instrumentation and/or Technique Development** proposals may request up to $25,000 to engage audiences that otherwise will not have access to the instrumentation and/or data generated and/or to support focused efforts to broaden participation of underrepresented groups in experiential learning using state-of-the-art analytical tools and/or to raise awareness of available geo-analytical capabilities in the U.S. Budgetary requests for such activities may appear over multiple categories on the NSF Budget Form 1030 but the total should not exceed $25,000. Proposals for **Community Facility Support Tracks I and II** are exempt from this budgetary limit.

> **Equipment Acquisition or Upgrade** and **Instrumentation and/or Technique Development** proposals that request support under the **Broadening Participation and/or Outreach** opportunity should include an independent itemization and related justification for all planned activity expenditures in the Budget Justification that is separate from other line-item justifications.

> **Note:** The stated maximum budgets for **Equipment Acquisition or Upgrade** and **Instrumentation and/or Technique Development** proposals described below exclude any budgeted costs directly allocable and justified as part of the Broadening Participation and/or Outreach opportunity. Such costs may be in addition to the below noted budget maximums.

Equipment Acquisition or Upgrade

> The maximum request, including the total budget for any collaborative submissions, is **$600,000. If Broadening Participation and/or Outreach Activities** are proposed the maximum total request is **$625,000.** The following additional limitations apply:

>> The maximum request for acquisition or upgrade of **computers and/or computational hardware** is **$75,000**.

>> The maximum request for acquisition or upgrade proposals from **Community Colleges and non-PhD granting minority serving institutions** where the intended uses of the equipment are solely or predominantly focused on educational applications is **$100,000.**

> The budget justification section should indicate the quoted price of equipment less any available discounts and should be itemized by major components (> $5,000/unit).

> Travel costs associated with training for operations and maintenance may be an eligible expense but must be well-justified.

Instrumentation and/or Technique Development

The maximum request, including the total budget for any collaborative submissions, is **$600,000** and the maximum project duration is five (5) years. If **Broadening Participation and/or Outreach Activities** are proposed the maximum total request is **$625,000.**

The budget justification section of proposals for Instrumentation and/or Technique Development should indicate the quoted price of equipment less any available discounts and should be itemized by major components (> $5,000).

Salary support, including fringe benefits and indirect costs, is considered an eligible cost only for personnel directly involved in developing the instrument or technique. Any proposal including students or post-doctoral associates in development projects should justify the involvement in terms of tasks and in support of the training the next generation of instrumentalists.

Technician Support

The maximum annual request is $200,000 and the maximum project duration is five (5) years. Proposers may only request support for a technician's salary, fringe benefits and related indirect costs. No other budget categories may be included.

Community Facility Support

Track I - proposals should follow guidance in PAPPG Chapter II.E.9 . The maximum request is $200,000.

Track II –The maximum annual request is $1,000,000 and the maximum project duration is five (5) years. It is recommended that the Budget Justification include a one-page Work Breakdown Structure which accounts for line item requested costs across defined task categories with any subcategories further defined (*e.g.*, 1.0 Management, Governance and Administration, 2.0 User Support, 3.0 Instrumentation and/or Technique Development, 4.0 Data and Cyberinfrastructure Activities, 5.0 Education and Community Engagement).

Track III – The maximum annual request is $1,500,000 and the maximum project duration is five (5) years. Proposals should follow the Budget Justification guidance described above for Track II proposals.

NOTE: Costs estimated to be required to adhere to solicitation guidance and requirements for Facility project support data tracking and reporting, user support administration, development and maintenance of hardware and cyberinfrastructure to support user compliance with NSF and EAR Data Policies, and development and maintenance of Facility Web pages are allowable and may include direct costs for Other Professionals, Graduate Students, Undergraduate Students, Secretarial – Clerical, Consultant Services and Computer Services.

Continental Drilling Planning

Proposals should follow guidance in PAPPG Chapter II.E.1 . The maximum total request for Continental Drilling Planning proposals is $100,000 per year for up to two years in duration. Any included line items for subawards or consultant services should be accompanied by independent budget justifications.

Other Budgetary Limitations

The EAR/IF program **will not** support requests for:

- Personnel or publication costs in proposals for **Equipment Acquisition or Upgrade**

- Costs of instrument service contracts or service agreements in proposals for **Equipment Acquisition or Upgrade** or **Instrumentation and/or Technique Development.** Such costs are ONLY allowable in proposals for **Community Facility Support (Track II and III)**.

- Construction or renovation of laboratory space to be used to house requested instrumentation, or construction of experimental facilities that include significant amounts of common building materials or standard building techniques.

- Direct costs of maintaining infrastructure or building systems or general-purpose systems or platforms. This includes items such as HVAC, telecommunications, electrical systems, fume hoods, elevators, storage systems.

Proposals that request support for the above items may be subject to return without review.

C. Due Dates

- **Full Proposal Deadline(s):**

    Proposals Accepted Anytime

D. Research.gov/Grants.gov Requirements

For Proposals Submitted Via Research.gov:

To prepare and submit a proposal via Research.gov, see detailed technical instructions available at: https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparationandSubmission.html. For Research.gov user support, call the Research.gov Help Desk at 1-800-673-6188 or e-mail rgov@nsf.gov. The Research.gov Help Desk answers general technical questions related to the use of the Research.gov 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: https://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 Research.gov may use Research.gov 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 PAPPG Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: https://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 *Building the Future: Investing in Discovery and Innovation - NSF Strategic Plan for Fiscal Years (FY) 2018 – 2022*. 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. (PAPPG 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 PAPPG 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 other underrepresented groups 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

In addition to the general NSF merit review criteria (intellectual merit/broader impacts), criteria that should be considered in the evaluation of *all* proposals submitted to EAR/IF include:

- To what extent does the project appear poised to support research and/or education in the Earth and environmental science disciplines supported by EAR?
- To what extent does the proposal address requirements outlined in section V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS (*e.g.*, required or suggested elements for inclusion in the Project Description, Special Information and Supplementary Documents, Data Management Plan and, if relevant, Broadening Participation and/or Outreach opportunity).

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

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 https://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 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 *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

Special Award Conditions:

Any cooperative agreement awarded in response to this solicitation will contain the following term and condition:

Ensuring Adequate COVID-19 Safety Protocols

a. This clause implements Section 3(b) of Executive Order 14042, "Ensuring Adequate COVID Safety Protocols for Federal Contractors", dated September 9, 2021 (published in the Federal Register on September 14, 2021, 86 FR 50985). Note that the Department of Labor has included "cooperative agreements" within the definition of "contract-like instrument" in its rule referenced at Section 2(e) of this Executive Order, which provides:

   For purposes of this order, the term "contract or contract-like instrument" shall have the meaning set forth in the Department of Labor's proposed rule, "Increasing the Minimum Wage for Federal Contractors, " 86 Fed. Reg. 38816, 38887 (July 22, 2021). If the Department of Labor issues a final rule relating to that proposed rule, that term shall have the meaning set forth in that final rule.

b. The awardee must comply with all guidance, including guidance conveyed through Frequently Asked Questions, as amended during the performance of this award, for awardee workplace locations published by the Safer Federal Workforce Task Force (Task Force Guidance) at https://www.saferfederalworkforce.gov/contractors/

c. *Subawards* . The awardee must include the substance of this clause, including this paragraph (c), in subawards at any tier that exceed the simplified acquisition threshold, as defined in Federal Acquisition Regulation 2.101 on the date of subaward, and are for services, including construction, performed in whole or in part within the United States or its outlying areas. That threshold is presently $250,000.

d. *Definition* . As used in this clause -

   United States or its outlying areas means—

   1. The fifty States;
   2. The District of Columbia;
   3. The commonwealths of Puerto Rico and the Northern Mariana Islands;
   4. The territories of American Samoa, Guam, and the United States Virgin Islands; and
   5. The minor outlying islands of Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Islands, Navassa Island, Palmyra Atoll, and Wake Atoll.

e. The Foundation will take no action to enforce this article, where the place of performance identified in the award is in a U.S. state or outlying area subject to a court order prohibiting the application of requirements pursuant to the Executive Order (hereinafter, "Excluded State or Outlying Area". A current list of such Excluded States and Outlying Areas is maintained at *https://www.saferfederalworkforce.gov/contractors/* .

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 Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

Community Facility Support (Track I) proposals - It is expected that workshop/conference findings will be reported to EAR/IF as part of a Final Project Report and to include the results of any conducted participant surveys aimed at supporting a consensus scientific need for a new community facility, the identification of a solution or solutions to meet that need, an initial estimate of possible community demand for facility services and an initial estimate of the budget required to operate and manage such a community facility through a subsequent **Track II** proposal.

Data Management Plan

PIs are required to provide updates on the status of data sharing and archiving in project reports.

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:

- Luciana Astiz, E 8466, telephone: (703) 292-4705, email: lastiz@nsf.gov

- Russell C. Kelz, E 8459, telephone: (703) 292-4747, email: rkelz@nsf.gov

- David D. Lambert, telephone: (703) 292-8558, email: dlambert@nsf.gov

For questions related to the use of FastLane or Research.gov, contact:

- FastLane and Research.gov Help Desk: 1-800-673-6188
- FastLane Help Desk e-mail: fastlane@nsf.gov.
- Research.gov Help Desk e-mail: rgov@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 https://www.grants.gov.

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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 (FASED) provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See the *NSF Proposal & Award Policies & Procedures Guide* Chapter II.E.6 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.

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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 System of Record Notices, NSF-50, "Principal Investigator/Proposal File and Associated Records," and NSF-51, "Reviewer/Proposal File and Associated Records." 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:

Suzanne H. Plimpton
Reports Clearance Officer
Policy Office, Division of Institution and Award Support
Office of Budget, Finance, and Award Management
National Science Foundation
Alexandria, VA 22314

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