Natcast

PFAS Reduction and Innovation in Semiconductor Manufacturing (PRISM) Call for Proposals (CFP)

Funding Opportunity Number: NAT-RD-24-0003

Issued December 5, 2024

Revision History

Date	Author	Change
November 8, 2024	Program Staff	Version 1.0
December 5, 2024	Program Staff	Added Appendix and minor updates/clarifications

National Semiconductor Technology Center (NSTC) Call for Proposals
Executed by Natcast, the operator for NSTC
PFAS Reduction and Innovation in Semiconductor Manufacturing (PRISM)
Executive Summary

Funding Opportunity Title: PFAS Reduction and Innovation in Semiconductor Manufacturing (PRISM)

Funding Opportunity Number: NAT-RD-24-0003

Dates: Key dates are given below. A*ll submissions are due by 5:00 pm EDT on the specified dates.*

Activity/Event	**Date**
PRISM CFP Released	11/08/2024
PRISM Proposer's Day	11/19/2024
Concept Paper's Due	12/04/2024
Question Submission Deadline	01/13/2025
Full Proposals Due	**01/22/2025**
Target Project Start	Jun-2025

Concept Paper: Submission of a concept paper is required for submission of a full proposal. Concept papers may be 2 pages or less for each *Task Area* proposed. A separate concept paper must be submitted for each **Focus Area** (*i.e.* Wastewater or Air). Recipients will receive feedback encouraging or discouraging a full proposal within 14 days of concept paper submission. No down-selection will occur and all proposers who submitted a concept paper will be able to submit a full proposal if they choose. There is no concept paper template, however concept paper submissions should include a summary of the proposed technical agenda, preliminary work and supporting data, planned achievements or goals, and previous publications, whitepapers, technical documents, etc. Concept papers should list the project's title, proposer's team, principal investigators, team point of contact, and estimated budget. Citations, references, and figures count towards the page limit. A cover page would not count toward the page limit, but it is neither required nor encouraged for the concept paper.

The composition of the team can change between concept paper submission and full proposal submission. Concept papers will be evaluated against the first two criteria laid out in Section 5.1. Concept papers may be submitted directly by any individual who is authorized to agree to the submission terms and conditions on behalf of the organization(s). Proposers should note in the concept paper whether partnerships already exist with semiconductor manufacturing facilities. White, facility partnerships are not required, they are highly encouraged. Additionally, there is no restriction on the type of facility (*i.e.* research facility, high volume manufacturing facility, etc.) which proposers may partner.

Concise Description of Funding Opportunity: NSTC's PRISM program aims to enhance the sustainability of semiconductor manufacturing by addressing the challenges posed by per- and polyfluoroalkyl substances (PFAS) usage. The objective of the PRISM program is the successful creation of end-to-end PFAS mitigation capabilities, integrating advanced analytical methods, abatement technologies, and predictive modeling to address the environmental impact of PFAS usage in semiconductor manufacturing.

Anticipated Amounts: Total program award funding up to $35M with 8-15 awards is anticipated. Individual awards are anticipated to range from $250k to $8M.

Eligibility: Proposers and funded participants must be eligible to become NSTC members to submit proposals. If selected for the award, proposers and funded participants must become NSTC members in order to receive the award. Eligible proposers include domestic for-profit organizations, non-profit organizations, and institutions of higher education. See Section 3 for additional details on eligibility.

Proposal Submissions: Proposers are encouraged to submit proposals for at least one *Task Area* (*i.e.* Analysis, Sensing, Abatement, and Modeling) in at least one **Focus Area** (*i.e.* Wastewater or Air) but there is no limitation on the number of tasks that can be included in a single proposal. If proposing more than one solution per *Task Area*, clearly delineate each *subtask* in the proposal. Separate proposals must be submitted for each **Focus Area** if proposing work in both Wastewater and Air.

Contract Type: Firm-fixed price with milestone payments for each *Phase* of the program.

Cost Sharing Requirements: None

Website and Frequently Asked Questions (FAQs): https://natcast.org/research-and-development/prism

Overview of Natcast's competition and awards policy: https://natcast.org/research-and-development

Contact Information:

Subject Area	Point of Contact
Programmatic and Technical Questions:	Paige Jacob, Ph.D. Email: prism@natcast.org
Award Management:	Jill Bennett Email: prism@natcast.org
Technical Assistance with Proposal Submission:	PRISM Program Staff Email: prism@natcast.org

Table of Contents

1.0 Funding Opportunity Description

1.1 Introduction

The National Semiconductor Technology Center (NSTC) was established pursuant to the CHIPS Act as a public-private consortium dedicated to semiconductor research and development (R&D) in the United States (U.S.). The NSTC will convene the U.S. government, allied and partner nations, and organizations across the semiconductor ecosystem—including academia and businesses of all kinds—to address the most challenging barriers to continued technological progress in the domestic semiconductor industry, including the need for a capable workforce. The NSTC reflects a once-in-a-generation opportunity for the U.S. to drive the pace of innovation, set standards, and re-establish global leadership in semiconductor design and manufacturing. The mission of the NSTC is to serve as the focal point for research and engineering throughout the semiconductor ecosystem, enabling disruptive innovation to provide U.S. leadership in the industries of the future. Natcast is a purpose-built, non-profit entity designated to operate the National Semiconductor Technology Center (NSTC) by the Department of Commerce.

The NSTC aims to enhance the semiconductor manufacturing process and recognizes its importance for expanding domestic production, as identified by the President's Council of Advisors on Science and Technology, the National Science and Technology Council, and the Industrial Advisory Committee (IAC) established by the CHIPS and Science Act of 2022.[1,2,3] The IAC noted that addressing viability challenges in the semiconductor industry is crucial for achieving domestic leadership. This effort will require research and collaboration from stakeholders across the semiconductor supply chain, including industry experts, academic proposers, national laboratories, start-ups, government agencies, and others within the community.[1] Currently, only 12% of semiconductors globally are manufactured in the U.S., but the CHIPS and Science Act aims to double domestic semiconductor manufacturing in the next decade.[3] Improving sustainable practices in semiconductor manufacturing is essential to achieving this

[1] CHIPS Research and Development Office. (2023). CHIPS for America: VISION AND STRATEGY FOR THE NATIONAL SEMICONDUCTOR TECHNOLOGY CENTER.
[2] President's Council of Advisors on Science and Technology. (2022). EXECUTIVE OFFICE OF THE PRESIDENT PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY. https://www.whitehouse.gov/wp-content/uploads/2022/08/POTUS-letter_PCAST-Semiconductors_09AUG2022.pdf
[3] Subcommittee on Microelectronics Leadership, "National Strategy on Microelectronics Research", March 2024.

targeted increase while ensuring the well-being of the environment, workers, and communities.

One of the greatest challenges that the NSTC seeks to address is the use of per- and polyfluoroalkyl substances (PFAS) in semiconductor manufacturing. The Organization for Economic Cooperation and Development (OECD) defines PFAS as substances that contain at least one fully fluorinated methyl or methylene carbon atom.[4] There are different definitions of PFAS that may be appropriate in legal or regulatory contexts, however this broader definition allows for more thorough research investigations. The development and qualification of any replacement chemistry for the extremely demanding semiconductor industry is estimated to be a 5–10 year process. The CHIPS Artificial Intelligence-powered Autonomous Experimentation (AI/AE) for Rapid, Industry-informed Sustainable Semiconductor Materials and Processes (CARISSMA) funding opportunity is focused on accelerating this process for materials discovery, including PFAS replacements.[5] Complementing the CARISSMA program with even more accelerated impact, PRISM is focused on PFAS solutions with quick turnaround and broad ecosystem engagement in line with the NSTC mission, which can be attained in the areas of measurement and abatement as discussed below.

PFAS have critical uses in semiconductor manufacturing and their unique properties, including thermal and chemical stability and simultaneous hydrophobicity and oleophobicity, enable nanometer (nm)-scale semiconductor dimensions for cutting edge technologies.[6] In photolithography, one of many processes of semiconductor fabrication, PFAS are critical components in photoresists, antireflective coatings, surfactants, barrier layers, photo-imageable polybenzoxazoles, and polyimides.[9] PFAS are used in wet chemistries for cleaning, stripping, wet etching, chemical mechanical planarization, metal plating, and to facilitate other processes.[9] Fluorocarbon gases are used for plasma etch and deposition and fluorinated heat transfer fluids are used in manufacturing processes and device test applications.[9] Semiconductor assembly, test, and packaging processes utilize PFAS for packaging fluxes, surfactants, adhesives, encapsulants, and as anti-stiction agents inside specialty microelectromechanical

[4] Wang, Z., Buser, A. M., Cousins, I. T., Demattio, S., Drost, W., Johansson, O., Ohno, K., Patlewicz, G., Richard, A. M., Walker, G. W., White, G. S., & Leinala, E. (2021). A New OECD Definition for Per- and Polyfluoroalkyl Substances. Environmental Science & Technology, 55(23), 15575–15578. https://doi.org/10.1021/acs.est.1c06896

[5] CHIPS Research & Development Program Office. (2024, October 30). Biden-Harris Administration Opens $100 million Competition to Accelerate R&D and AI Technologies for Sustainable Semiconductor Materials. NIST Updates.

[6] Tyrwhitt Jones, E. (2023). The Impact of a Potential PFAS Restriction on the Semiconductor Sector. www.semiconductors.org.

system (MEMS) packages.[9] Additionally, pump fluids, lubricants, and articles within the facility contain PFAS due to their high stability in extreme chemical environments.[9]

As technology evolves from mature technologies at 28 nm to advanced nodes at 2 nm and smaller, manufacturing processes will continue to require greater water, energy, and greenhouse gas (GHG) inputs.[7] Manufacturing an advanced node at 2 nm needs 3.5 times as much energy, 2.3 times as much water, and emits 2.5 times as much GHG than a 28 nm mature technology.[8] The semiconductor industry utilizes fluorinated gases (*i.e.* perfluorinated compounds (PFCs), NF_3, and SF_6), some of which can be considered PFAS as well as GHG, for etching and chamber cleaning, which have high global warming potentials.[5] For example, SF_6 has a global warming potential 500 times higher than CO_2 and the U.S. Environmental Protection Agency (EPA) notes that 10-80% of these fluorinated process gases are directly released into the air.[9] Semiconductor GHG emissions account for 0.18% of all GHG emissions from industrial sources and 0.063% of all emission sources.[5,6] However, as manufacturing increases in volume and complexity, much opportunity lies in transforming these manufacturing processes to reduce their impact on the supply chain of critical materials. Increasing the viability of semiconductor manufacturing aligns with industry roadmaps, such as Microelectronics and Advanced Packaging Technologies Roadmap (MAPT),[10] and ensures sustainable growth of the industry, builds supply chain resilience, enables regulatory compliance, and reduces resource scarcity concerns.

Previous work conducted by other industry-wide organizations, such as the Semiconductor Industry Association's (SIA) PFAS Consortium and the Semiconductor Research Corporation (SRC) has facilitated the collection of data and identified critical knowledge gaps that remain ripe for further research. Current analytical methods are insufficient to reliably quantify and identify all PFAS in semiconductor waste or account for all source inputs of PFAS to waste. Analytical reference standards for reliable quantification only exist for about 100 of the tens of thousands of known PFAS and the exact identity of many commercial PFAS are proprietary information and not disclosed,

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[7] Stewart, D., Mitra, B., Ramachandran, K., & Simons, C. (2023, November 29). Semiconductor sustainability: Chips take a smaller byte out of resources. Deloitte Center for Technology, Media & Telecommunications.
[8] Bardon, M. G. P. B. (2020, December 14). The Environmental Footprint of Logic CMOS Technologies; A DTCO-based analysis. EE|Times.
[9] Czerniak, M. (2021, November). The Time is Now: Sustainable Semiconductor Manufacturing. Semiconductor Digest, 16–19.
[10] Semiconductor Research Corporation. (2024). MAPT Microelectronics and Advanced Packaging Technologies Roadmap.

making the majority of PFAS unquantifiable. Additionally, real-time sensing and monitoring capabilities for PFAS in semiconductor wastewater or air do not yet exist.

Another large knowledge gap exists in the efficacy of PFAS capture and destruction technologies on semiconductor manufacturing waste. Technologies have emerged for other industries and use cases but have yet to be thoroughly tested and evaluated for performance on semiconductor waste. PFAS chemistries used in semiconductor manufacturing generally contain short- and ultrashort-chain compounds, which are more difficult to capture and destroy than their longer-chain counterparts. Semiconductor waste poses unique challenges due to the complexity of the matrices and very low PFAS concentrations for both air and wastewater emissions. Additionally, models to predict release and transformation reactions of PFAS in semiconductor waste, have not been validated and only exist for a limited number of fabrication processes. The harsh chemical environment of semiconductor manufacturing may transform or degrade PFAS compounds and the ability to model the potential emissions from specific processes where PFAS chemistries are known to be used will be an invaluable tool for the industry to understand what type of abatement solutions are needed. The current efforts focused on analytical techniques and control processes to minimize PFAS in semiconductor manufacturing emissions have been experimentally proven in a laboratory setting and now require additional research. The NSTC seeks to be a vehicle to allow early technologies and innovations to mature into later stages of development, bridging the so-called “valley of death”.[11]

1.2 Motivation

It is anticipated that an impactful program will need to develop analytical methodology and prototype sensor devices in addition to generating data on PFAS emissions from point sources within multiple facilities. The program will also need to test abatement technologies for capture and destruction efficacy on facility air and wastewater emissions to identify promising PFAS treatment solutions. Lastly, performing degradation studies paired with existing emissions data to accurately calibrate and validate existing models and develop additional models where needed will be instrumental in holistically addressing the industry’s PFAS challenge.

[11] Seyhan, A. A. (2019). Lost in translation: the valley of death across preclinical and clinical divide – identification of problems and overcoming obstacles. Translational Medicine Communications, 4(1), 18. https://doi.org/10.1186/s41231-019-0050-7

To address these challenges, the NSTC is launching the PRISM program, which aims to coordinate industry development research projects focusing on addressing the use of PFAS in semiconductor manufacturing in the following *Task Areas*:

- **Analysis:** Close the existing analytical knowledge gaps in sources and release pathways throughout facilities and enable abatement solutions to be comprehensively characterized;
- **Sensing:** Assess the viability of novel sensor and device technologies to measure PFAS in wastewater and air emissions to develop real-time monitoring capabilities;
- **Abatement:** Assess prototypes to determine the viability of existing solutions in benchtop and pilot scale operation and identify R&D and commercialization needs. Combined with the Analysis and Modeling projects, the Abatement studies will provide measurement, technology integration, feasibility demonstration, and cost information needed to accelerate the implementation of PFAS control technologies into facilities; and
- **Modeling:** Model the release and transformation reaction pathways of PFAS within a facility to the environment or during a destruction process to ensure that the analytical metrology and abatement solutions are properly targeted and relevant.

Natcast will review the development of the proposed technologies and submit samples and results for independent verification and validation to ensure the utility and accessibility of the technologies to NSTC members. Lastly, proposers should include plans to incorporate learnings from the PRISM program into academic curricula or training packages to support Natcast's workforce development goals. Proposal teams should include a broad team composition capable of successfully completing the program together as defined and subsequently transitioning the work products for the benefit of the NSTC consortium members.

1.3 Goals and Outcomes

The overarching goal of the PRISM Program will be to provide NSTC members with the necessary data, information, and technologies to form customized, multi-pronged approaches to PFAS mitigation based on individual facility needs and evolving EPA guidelines. Due to the inherent variability in PFAS emissions from facilities depending on the type of products being manufactured or chemistries used, and the spectrum of abatement needs based on existing waste management approaches or system designs, the program aims to produce robust datasets and technology advancements that can be tailored to members' specific requirements. At a high level, the program seeks to

perform the following work in two **Focus Areas** *(i.e.* Wastewater and Air) and four *Task Areas* (*i.e.* Analysis, Sensing, Abatement, and Modeling) to achieve the following goals:

- *Task Area 1 - Analysis*
  - Fund the development of novel techniques or enhance and optimize existing analytical methodology for identification and quantification of a more robust suite of PFAS specific to facility emissions (air or wastewater) at relevant concentrations; and
  - Formulate datasets of PFAS released or generated from individual processes and waste management systems using the novel or optimized analytical techniques developed to comprehensively characterize principal sources of PFAS in a facility.
- *Task Area 2 - Sensing*
  - Fund research to demonstrate the technical feasibility and economic viability of field-deployable, low-cost sensors or devices to detect PFAS in real-time at relevant concentrations; and
  - Fund total cost of ownership (TCO) and life cycle assessments (LCAs) to provide extensive, realistic evaluations of each technology and identify ideal use cases along facility waste management systems.
- *Task Area 3 - Abatement*
  - Evaluate the efficacy and benchmark destruction removal efficiencies (DREs) of capture and destruction technologies at a bench-scale on real waste matrices from multiple facilities;
  - Fund the demonstration of down-selected technologies for capture and destruction efficacy at a field- or pilot-scale that are relevant for future commercial adoption at a full-scale; and
  - Fund TCO and LCAs to provide an extensive evaluation report of each technology and identify ideal use cases and designs along facility waste management systems (*i.e.* tool-level, lateral-level, additional wastewater treatment unit operations, etc.).
- *Task Area 4 - Modeling*
  - Fund the calibration and validation of existing industry release models for PFAS in individual facility processes with the previously collected datasets from *Task Area 1* and develop new models for specific manufacturing processes or destruction/abatement environments; and
  - Fund the development of a PFAS degradation pathway prediction software or model to determine reaction pathways of possible PFAS transformation products induced by facility processes and/or capture and destruction/ abatement technologies.

1.4 Scope

The PRISM program aims to use a multifaceted approach to PFAS mitigation. Proposers are encouraged to submit proposals for at least one *Task Area* (*i.e.* Analysis, Sensing, Abatement, and Modeling) in a **Focus Area** (*i.e.* Wastewater or Air) but there is no limitation on the number of *Task Areas* that can be included in a single proposal. If proposing more than one solution per *Task Area*, proposers must clearly delineate each *subtask* in the proposal. Separate proposals must be submitted for each **Focus Area** if proposing work in both Wastewater and Air. This selection includes the specific work that Natcast is soliciting proposals for as part of the PRISM program:

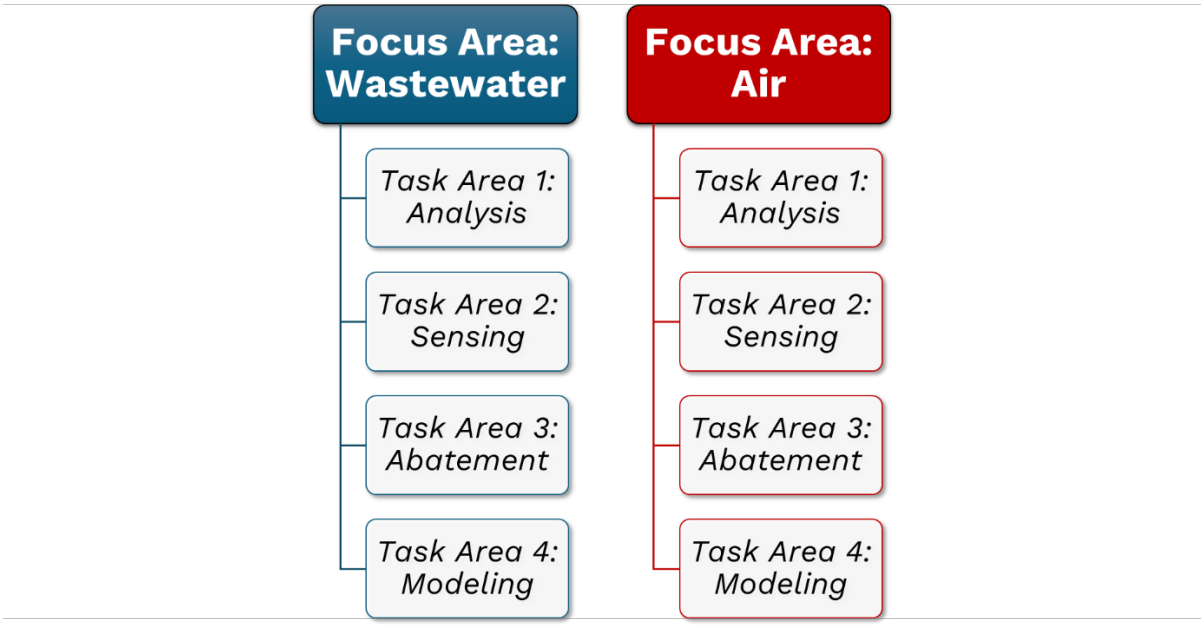

Figure 1. PRISM program structure.

Focus Area 1 – Wastewater

Task Area 1 - Analysis

Phase 1 – Analytical Method Application and Emissions Characterization

- Proposers will apply existing analytical methods to identify and quantify target and suspect PFAS or Total Organic Fluorine (TOF) to characterize releases in anonymized wastewater samples provided by Natcast's third-party sampling consultant from individual facility processes, tools, and wastewater emissions

from multiple facilities to generate a dataset of primary PFAS point sources within anonymized facilities.

- As part of the proposal proposers will submit a list of internal analytical capabilities called “Current PFAS” in the appendix, including specific target and suspect PFAS that can be quantified and measured with their current self-validated methodology. If there are additional PFAS that proposers believe they could measure with future method development and optimization, please include this list in a separate section of the proposal appendix titled “Proposed PFAS”. Target PFAS are defined as PFAS for which authentic reference standards exist for identification and quantification. Suspect PFAS are defined as PFAS for which compound-specific information exists (*i.e.* in the form of a database or spectral data) that can be used to search for and confirm the presence or absence of specific PFAS compounds and in some cases, semi-quantitative information. Nontarget PFAS, defined as unexpected or unknown PFAS with no *a priori* information, are not included in the scope of this program.
- When reporting results, proposers will need to include the limit of quantification for each analyte of the method and measure samples at least in duplicate to report an average value and some measurement of repeatability (*i.e.* standard deviation) between replicates. More details on limits of quantification for analytes and TOF can be found in **Table 2** of Section 1.8.
- Proposers must also conduct a matrix spike experiment (spiking a known concentration of analytes into the matrix) at least in triplicate and report the percent recovery (accuracy) and relative standard deviation (precision) for validation of the method when reporting the results.
- Using a template provided by Natcast, proposers will upload data to a data repository that will be controlled and maintained by Natcast. The data should include PFAS characterization data for wastewater emissions in individual process and wastewater samples from numerous, anonymized facilities. This data repository will be accessible to NSTC members, including other performers.
- Proposers are required to create relevant workforce content and make it available under a Creative Commons Attribution (CC BY 4.0) license (https://creativecommons.org/licenses/by/4.0/). The content will be uploaded to NSTC’s workforce repository to support the workforce development efforts. This content can include a lesson plan, entire

curriculum, white paper, best practices, training packages, skills assessment, lessons learned, etc.

Phase 2 – Analytical Method Development

- Proposers will tailor analytical method development to identify and quantify additional industry-specific target and suspect PFAS or optimize existing methods for newly identified PFAS or TOF when feasible. The methods will then be validated on real facility wastewater samples provided in *Phase 1* by Natcast's third-party sampling consultant.
    - When validating the method, proposers must conduct a matrix spike experiment (spiking a known concentration of analytes into the matrix) at least in triplicate and report the percent recovery (accuracy) and relative standard deviation (precision) of the method when reporting the method validation data.
    - Proposers will need to report the limit of quantification for each analyte of the method and measure samples at least in duplicate to report an average value and some measurement of repeatability (*i.e.* standard deviation) between replicates.
    - Proposers may work on the development of analytical standards for these PFAS if authentic standards do not exist or are not supplied by equipment or material suppliers.
    - Natcast may work with industry partners to develop and provide a model wastewater matrix to be used for initial experiments to identify potential challenges from common facility wastewater matrix constituents.
    - Using a template provided by Natcast, proposers will upload data to a data repository that will be controlled and maintained by Natcast, of method validation and benchmarking data, as well as PFAS characterization data for wastewater emissions in individual process and wastewater samples from numerous, anonymized facilities. This data repository will be accessible to NSTC members, including other performers.
    - Proposers are required to create relevant workforce content and make it available to Natcast under a Creative Commons Attribution (CC BY 4.0) license (https://creativecommons.org/licenses/by/4.0/) The content may be used to support the workforce development efforts. This content can include a lesson plan, entire curriculum, white paper, best practices, training packages, skills assessment, lessons learned, etc.

Task Area 2 - Sensing

Phase 1 –Determination of Sensor or Device Viability

- Proposers will begin optimizing existing field-deployable, low-cost sensors or high-throughput devices to detect industry specific PFAS or TOF in wastewater emissions and identify logistical challenges of facility wastewater systems. Wastewater samples for benchtop experiments will be provided by Natcast's third-party sampling consultant from multiple facilities.
    - Proposers will perform bench-top experiments to determine the efficacy of existing PFAS sensors/devices for detecting the expected concentration range of PFAS in semiconductor wastewater and the expected PFAS (*i.e.* ultrashort-chains, PFBS, etc.) with matrix co-contaminants in facility wastewater (*i.e.* high peroxide, highly basic, etc.).
    - Natcast may work with industry partners to develop and provide a model wastewater matrix to be used for initial experiments to identify potential challenges from common facility wastewater matrix constituents.
    - When validating the sensor/device, proposers must conduct a matrix spike experiment (spiking a known concentration of analytes into the matrix) at least in triplicate and report the percent recovery (accuracy) and relative standard deviation (precision) of the method.
    - Proposers will also need to report the limit of quantification of the sensor/device for each analyte (sensitivity) and what analytes the device measures successfully (selectivity). Samples must be measured at least in duplicate to report an average value and some measurement of repeatability (*i.e.* standard deviation) between replicates.
    - Using a template provided by Natcast, proposers will upload data to a data repository that will be controlled and maintained by Natcast. The data should include method validation and benchmarking data. This data repository will be accessible to NSTC members, including other performers.

Phase 2 –Pilot Sensor or Device Testing

- Proposers will conduct field-testing of novel sensors or devices that were down-selected from *Phase 1* by Natcast and Natcast's technical working groups. Field-testing will occur in facility wastewater systems to validate the viability of the device to provide qualitative and quantitative information on PFAS or TOF in facility wastewater in partnership with semiconductor manufacturing facilities. Facility partnerships are not required but are highly encouraged.

- Using a template provided by Natcast, proposers will upload data to a data repository that will be controlled and maintained by Natcast. The data should include method validation and benchmarking data. This data repository will be accessible to NSTC members, including other performers.
- Proposers will conduct TCO and LCAs based on data generated during the pilot experiments.
- In the proposal, proposers must demonstrate capability of designing and supporting a pilot-scale experiment and include a cost-estimate of a pilot system and installation.
- Proposers must conduct a matrix spike experiment (spiking a known concentration of analytes into the matrix) at least in triplicate and report the percent recovery (accuracy) and relative standard deviation (precision) of the method.
- Proposers will also need to report the limit of quantification of the sensor/device for each analyte (sensitivity) and what analytes the device measures successfully (selectivity). Samples must be measured at least in duplicate to report an average value and some measurement of repeatability (*i.e.* standard deviation) between replicates.

Task Area 3 - Abatement

Phase 1 – Capture and Destruction Technology Benchtop Testing for Facility Wastewater

- Proposers will conduct bench-top experiments and engineering evaluations of their existing PFAS capture and destruction technologies on facility wastewater samples provided by Natcast's third-party sampling consultant to screen for applicability and efficacy on real facility wastewater.
  - As part of the proposal, proposers are required to provide documentation on the technology readiness level (TRL) of their existing technology with preliminary supporting data. Proposers are also required to provide information on the volume and flow rate capacities, energy usage, and other relevant parameters of the bench-top experimental units and predicted parameters for pilot-scale systems.
  - Proposers can propose to conduct in-house analytics on post-treatment samples if the capabilities already exist internally (*i.e.* TOF, EPA Method 1633, etc.), pair up with teams from *Task Area 1 - Analysis*, or partner with contractors to analyze samples. Analytics must be comprehensive such that DRE distinguishes between PFAS removal, degradation, defluorination, vaporization, and mineralization.

- Natcast will fund the shipment of a subset of post-treatment samples from all proposers to a third-party accredited analytical lab chosen by Natcast to validate measurements used in assessment of technologies to ensure the integrity of DRE calculations, post-treatment target PFAS concentrations, etc.
- Natcast may work with industry partners to develop and provide a model wastewater matrix to be used for initial experiments to identify potential challenges from common facility wastewater matrix constituents.
- Using a template provided by Natcast, proposers will upload data to a data repository that will be controlled and maintained by Natcast. The data should include method validation and benchmarking data, as well as DRE and mass balance data and/or calculations for wastewater emissions in wastewater samples from numerous, anonymized facilities. This data repository will be accessible to NSTC members, including other performers.

Phase 2 – Capture and Destruction Technology Pilot Testing

- PFAS capture and destruction technologies that proved to be effective on facility wastewater samples at the bench-top level from *Phase 1* will be down-selected by Natcast and Natcast's technical working groups and evaluated for DRE of PFAS at a pilot-scale in partnership with semiconductor manufacturing facilities. Facility partnerships are not required but are highly encouraged.
  - In the proposal, proposers must demonstrate capability of designing and supporting a pilot-scale experiment and include a cost-estimate of a pilot system and installation.
  - If down-selected for *Phase 2*, the supporting analytical lab must also be able to support a potential *Phase 2*.
  - Natcast will fund the shipment of a subset of post-treatment samples from all proposers to a third-party accredited analytical lab chosen by Natcast to validate measurements used in assessment of technologies to ensure the integrity of DRE calculations, post-treatment target PFAS concentrations, etc.
  - Proposers will conduct TCO and LCAs based on data generated during the pilot experiments. Using a template provided by Natcast, proposers will upload data, include validation and benchmarking data, as well as DRE and mass balance data and/or calculations for wastewater emissions, to a data repository that will be controlled and maintained by Natcast. This

data repository will be accessible to NSTC members, including other performers.
    - Natcast will compile a report detailing the efficacy, ideal use cases, TCO, and LCAs of each technology based on previously decided success metrics.

Task Area 4 - Modeling

Phase 1 – Release Model Validation and Transformation Reaction Model or Software Creation

- Previously developed models for characterization of PFAS releases from point sources within a facility will be supplied by Natcast for calibration and validation with data collected in *Task Area 1 – Analysis*. This *Task Area* will not begin until Q2 of the program due to the reliance on data from *Task Area 1 – Analysis;*
    - Calibration refers to the determination of the model parameter values that best match the predicted model output and the actual measured data.
    - Validation refers to taking a calibrated model and applying it to a different set of conditions to see how well it matches the measured data.
- If models do not already exist for specific unit facility processes, relevant capture and destruction/abatement processes, or overall waste management systems of interest identified by proposers, Natcast, or industry partners, proposers will develop models for characterization of PFAS releases from those identified point sources or processes. Proposer will then calibrate and validate the new models with data collected in *Task Area 1 – Analysis*. These release models will use specific PFAS compounds (*i.e.* compounds known or expected to be used in a manufacturing unit process) as inputs into the model. The output of the model will be the specific PFAS compound predicted to be released after potential transformation reactions catalyzed by the unit process and/or relevant chemical conditions occur. These models may then be used by NSTC members to predict the PFAS compounds being emitted from a specific unit process, abatement process, or overall waste management system based on the starting chemistries used.
    - If needed, proposers are expected to conduct bench-top experiments to evaluate PFAS behavior in a specific tool, process or relevant chemical environment and use the data for further model validation. Teaming is encouraged but not required to accomplish this.

- Proposers will create a PFAS degradation pathway prediction software or model for reactions catalyzed by facility processes or capture and destruction technologies.
    - Natcast will provide data generated in *Task Area 1 and 3* to proposers to be used in tandem with publicly available data.
    - The PFAS pathway prediction software or model should be able to generate possible prediction pathways and resulting transformation products of the initial PFAS after exposure to the relevant chemical conditions encountered in manufacturing or waste treatment environments.
    - Proposers are encouraged conduct additional bench-top experiments simulating relevant process chemical environments as needed to isolate and better understand transformation and degradation reactions occurring in individual processes. Teaming is encouraged but not required to accomplish this.

Focus Area 2 – Air

Task Area 1 - Analysis

Phase 1 – Analytical Method Application and Emissions Characterization

- Proposers will apply existing analytical methods to identify and quantify CF_4 and other fluorinated gases (*i.e.* SF_6, HFCs, PFCs, NF_3, and F-HTF) and target and suspect PFAS to characterize releases in air samples. For specific analytical methodology (*i.e.* OTM-45 or OTM-50), samples will be collected by proposers, through coordination with facility partners. Facility partnerships are not required but are highly encouraged. For other methodology (*i.e.* Fourier Transform Infrared Spectroscopy (FTIR) Analysis), proposers will coordinate with facility partners to schedule and conduct on-site emissions testing from abatement systems in multiple facilities to generate an anonymized dataset of primary PFAS point sources within facilities.
    - As part of the proposal, proposers will submit a list of internal analytical capabilities called “Current PFAS” in the appendix, including specific target and suspect PFAS other fluorinated gases (*i.e.* SF_6, HFCs, PFCs, NF_3, and F-HTF) that can be quantified and measured with their current validated methodology/metrology. If there are additional PFAS that proposers believe they could measure with future method development or optimization, please include this list in the appendix titled “Proposed PFAS”. Target PFAS are defined as PFAS for which authentic reference

standards exist for identification and quantification. Suspect PFAS are defined as PFAS for which compound-specific information exists (*i.e.* in the form of a database or spectral data) that can be used to search for and confirm the presence or absence of specific PFAS compounds and in some cases, semi-quantitative information. Nontarget PFAS, defined as unexpected or unknown PFAS with no *a priori* information, are not included in the scope of this program.

- Air emissions testing will only be completed across conventional "house" type thermal oxidizers, wet scrubbers and point of use (POU) abatement systems. Testing across each abatement process will be completed in parallel. Proposers must include an estimate of sampling or testing duration.
- When reporting results, proposers will need to include the limit of quantification for each analyte of the method and measure samples at least in duplicate to report an average value and some measurement of repeatability (*i.e.* standard deviation) between replicates. Limits of quantification should be on the same order of magnitude as EPA standardized methods (*i.e.* OTM-45 and OTM-50).
- Proposers must also conduct a matrix spike experiment (spiking a known concentration of analytes into the matrix) or measure a reference gas standard at least in triplicate and report the percent recovery (accuracy) and relative standard deviation (precision) for validation of the method when reporting the results.
- Using a template provided by Natcast, proposers will upload data to a data repository that will be controlled and maintained by Natcast. The data will include PFAS and fluorinated gas characterization data for air emissions in individual process and air samples or testing from numerous, anonymized facilities. This data repository will be accessible to NSTC members, including other performers.
- Proposers are required to create relevant workforce content and make it available to Natcast under a Creative Commons Attribution (CC BY 4.0) license (https://creativecommons.org/licenses/by/4.0/) The content may be used to support the workforce development efforts. This content can include a lesson plan, entire curriculum, white paper, best practices, training packages, skills assessment, lessons learned, etc.

Phase 2 – Analytical Method Development

- Proposers will tailor analytical method development to identify and quantify the list of industry-informed target PFAS identified or optimize existing methods for the newly identified PFAS when feasible. The methods will then be validated on real facility air samples collected by proposers in *Phase 1*, through coordination through partnerships with semiconductor manufacturing facilities.
    - When reporting results, proposers will need to include the limit of quantification for each analyte of the method and measure samples at least in duplicate to report an average value and some measurement of repeatability (*i.e.* standard deviation) between replicates. Limits of quantification should be on the same order of magnitude as EPA standardized methods (*i.e.* OTM-45 and OTM-50).
    - Proposers must also report the percent recovery (accuracy) and relative standard deviation (precision) for validation of the method when reporting the results.
    - When validating the method, proposers must conduct a matrix spike experiment (spiking a known concentration of analytes into the matrix) or measure a reference gas standard at least in triplicate and report the percent recovery (accuracy) and relative standard deviation (precision) of the method when reporting the method validation data.
    - Proposers may work on the development of analytical standards for these PFAS if authentic standards do not already exist or are not supplied by equipment or material suppliers.
    - Using a template provided by Natcast, proposers will upload data to a data repository that will be controlled and maintained by Natcast. The data will include method validation and benchmarking data, as well as PFAS and fluorinated gas characterization data for air emissions in individual process and air samples or testing from numerous, anonymized facilities. This data repository will be accessible to NSTC members, including other performers.
    - Proposers are required to create relevant workforce content and make it available to Natcast under a Creative Commons Attribution (CC BY 4.0) license (https://creativecommons.org/licenses/by/4.0/) The content may be used to support the workforce development efforts. This content can include a lesson plan, entire curriculum, white paper, best practices, training packages, skills assessment, lessons learned, etc.

Task Area 2 – Sensing

Phase 1 – Determination of Sensor or Device Viability

- Proposers will begin designing field-deployable, low-cost sensors or high-throughput devices to detect the industry specific PFAS, TOF, or fluorinated gases in air emissions to identify logistical challenges of facility waste systems in partnership with semiconductor manufacturing facilities. Facility partnerships are not required but are highly encouraged.
    - Proposers will perform lab-scale experiments to determine the efficacy of current PFAS sensor or devices for detecting the expected concentration range and types of PFAS in semiconductor air emissions.
    - When validating the sensor/device, proposers must conduct a matrix spike experiment (spiking a known concentration of analytes into the matrix) at least in triplicate and report the percent recovery (accuracy) and relative standard deviation (precision) of the method.
    - Proposers will also need to report the limit of quantification of the sensor/device for each analyte (sensitivity) and what analytes the device measures successfully (selectivity). Samples must be measured at least in duplicate to report an average value and some measurement of repeatability (*i.e.* standard deviation) between replicates.
    - Using a template provided by Natcast, proposers will upload data to a data repository that will be controlled and maintained by Natcast. The data will include validation and benchmarking data. This data repository will be accessible to NSTC members, including other performers.

Phase 2 –Pilot Sensor or Device Testing

- Proposers will conduct field-testing of the novel sensors or devices down-selected by Natcast and Natcast's technical working groups from *Phase* 1. Field-testing will occur in facility abatement systems to validate the viability of the device to provide qualitative and quantitative information on PFAS, TOF, or fluorinated gases in facility air emissions in partnership with semiconductor manufacturing facilities. Facility partnerships are not required but are highly encouraged.
    - Using a template provided by Natcast, proposers will upload data to a data repository that will be controlled and maintained by Natcast, of validation and benchmarking data. This data repository will be accessible to NSTC members, including other performers.

- Proposers will conduct TCO and LCAs based on data generated during the pilot experiments.
- In the proposal, proposers must demonstrate capability of designing and supporting a pilot-scale experiment and include a cost-estimate of a pilot system and installation.
- Proposers must conduct a matrix spike experiment (spiking a known concentration of analytes into the matrix) at least in triplicate and report the percent recovery (accuracy) and relative standard deviation (precision) of the method.
- Proposers will also need to report the limit of quantification of the sensor/device for each analyte (sensitivity) and what analytes the device measures successfully (selectivity). Samples must be measured at least in duplicate to report an average value and some measurement of repeatability (*i.e.* standard deviation) between replicates.

Task Area 3 – Abatement

Phase 1 –Abatement Technology Benchtop Testing for Facility Air Emissions

- Proposers will assess novel technologies for reducing air emission of CF_4 and other fluorinated gases (*i.e.* SF_6, HFCs, PFCs, NF_3, and F-HTF) and PFAS through capture, removal, or destruction of these and other compounds found in air emissions.
  - As part of the proposal, proposers will need to provide documentation on the TRL of their proposed technology with preliminary supporting data.
  - Proposers can propose to conduct in-house analytics on post-treatment samples if the capabilities already exist internally (*i.e.* TOF, EPA OTM-45 or -50, etc.), pair up with teams in *Task Area 1 - Analysis*, or partner with contractors to analyze post-treatment samples. Analytics must be comprehensive such that DRE distinguishes between PFAS removal, degradation, defluorination, vaporization, and mineralization.
  - Natcast will fund the shipment of a subset of post-treatment samples from all proposers to a third-party accredited analytical lab chosen by Natcast to validate measurements used in assessment of technologies to ensure the integrity of DRE calculations, post-treatment target PFAS concentrations, etc.
  - Using a template provided by Natcast, proposers will upload data to a data repository that will be controlled and maintained by Natcast. The data will include validation and benchmarking data, as well as DRE and mass

balance data and/or calculations. This data repository will be accessible to NSTC members, including other performers.

Phase 2 –Abatement Technology Pilot Testing

- Technologies will be down-selected by Natcast and Natcast's technical working groups from *Phase 1* to be evaluated at the pilot-scale in partnership with semiconductor manufacturing facilities. Facility partnerships are not required but are highly encouraged.
    - In the proposal, proposers must demonstrate capability of designing and supporting a pilot-scale experiment and include a cost-estimate of a pilot system and installation.
    - If down-selected, the supporting analytical team must also be able to support potential *Phase 2*.
    - Natcast will fund the shipment of a subset of post-treatment samples from all proposers to a third-party accredited analytical lab chosen by Natcast to validate measurements used in assessment of technologies to ensure the integrity of DRE calculations, post-treatment target PFAS concentrations, etc.
    - Proposers will conduct TCO and LCAs based on data generated during the pilot experiments.
    - Using a template provided by Natcast, proposers will upload data to a data repository that will be controlled and maintained by Natcast. The data will include validation and benchmarking data, as well as DRE and mass balance data and/or calculations. This data repository will be accessible to NSTC members, including other performers.
    - using the template provided by Natcast, of all data and/or calculations.
    - Natcast will compile a report detailing the efficacy, TCO, and LCAs of each technology based on previously decided success metrics.

Task Area 4 – Modeling

Phase 1 – Release Model Validation and Transformation Reaction Model or Software Creation

- Previously developed models for characterization of PFAS releases from point sources within a facility will be supplied by Natcast for calibration and validation with data collected in *Task Area 1 – Analysis*. This *Task Area* will not begin until Q2 of the program due to the reliance on data from *Task Area 1 – Analysis;*

  - Calibration refers to the determination of the model parameter values that best match the predicted model output and the actual measured data.
  - Validation refers to taking a calibrated model and applying it to a different set of conditions to see how well it matches the measured data.
- If models do not already exist for specific unit facility processes, relevant capture and destruction/abatement processes, or overall waste management systems of interest identified by proposers, Natcast, or industry partners, proposers will develop models for characterization of PFAS releases from those identified point sources or processes. Proposer will then calibrate and validate the new models with data collected in *Task Area 1 – Analysis*. These release models will use specific PFAS compounds (*i.e.* compounds known or expected to be used in a manufacturing unit process) as inputs into the model. The output of the model will be the specific PFAS compound predicted to be released after potential transformation reactions catalyzed by the unit process and/or relevant chemical conditions occur. These models may then be used by NSTC members to predict the PFAS compounds being emitted from a specific unit process, abatement process, or overall waste management system based on the starting chemistries used.
  - If needed, proposers are expected to conduct bench-top experiments to evaluate PFAS behavior in a specific tool, process or relevant chemical environment and use the data for further model validation. Teaming is encouraged but not required to accomplish this.
- Proposers will create a PFAS degradation pathway prediction software or model for reactions catalyzed by facility processes or capture and destruction technologies.
  - Natcast will provide data generated in *Task Area 1 and 3* to proposers to be used in tandem with publicly available data.
  - The PFAS pathway prediction software or model should be able to generate possible prediction pathways and resulting transformation products of the initial PFAS after exposure to the relevant chemical conditions encountered in manufacturing or waste treatment environments.
  - Proposers are encouraged conduct additional bench-top experiments simulating relevant process chemical environments as needed to isolate and better understand transformation and degradation reactions occurring in individual processes. Teaming is encouraged but not required to accomplish this.

1.5 Program Structure

The PRISM Program will be funded for a period of thirty months. Projects in *Task Areas 1 – Analysis, Task Areas 2 – Sensing*, and *Task Area 3 - Abatement*, will be split into two phases while *Task Area 4 – Modeling* only has one phase. *Phase 1* will focus on completing emission characterization and prototyping within the first 12 months. Projects in *Task Areas 1, 2, and 3* will be evaluated and a subset of projects will then be down-selected by Natcast and Natcast's technical working groups from *Phase 1* to continue work in *Phase 2*. *Phase 2* will focus on the development of novel techniques and field or pilot demonstrations from months 12 to 30 of the project. Overlap exists between *Phase 1* and *Phase 2* due to the iterative nature of the projects. It is expected that significant information sharing will occur across project teams to enhance progress towards all key areas and incorporate learnings into existing and future efforts.

Natcast will also employ a third-party sampling consultant to conduct the wastewater sampling campaign across multiple facilities through coordination with facility partners, anonymize sensitive information related to the wastewater samples before distributing to proposers, and distribute samples to all proposers. All facilities, proposers, and consultants are expected to follow the appropriate safety protocols when handling any wastewater and air samples. For air samples, it is anticipated that some analytical techniques (*i.e.* FTIR) will be conducted in real-time on-site by proposers. Natcast will ensure that all sensitive information related to the samples is anonymized appropriately prior to any data reporting or sharing. Proposers should note in the concept paper whether partnerships already exist with semiconductor manufacturing facilities. Facility partnerships are not required but are highly encouraged. Additionally, there is no restriction on the type of facility (*i.e.* research facility, high volume manufacturing facility, etc.) with which proposers may partner. Natcast will also provide anonymized wastewater characterization data to proposers, including the standard physical and chemical properties of the wastewater samples (*i.e.* metals, TDS/TSS, anions, peroxide concentrations, etc.). Natcast will coordinate the collection and dissemination of the wastewater samples required for the execution of the program. However, Natcast shall not be held liable for any injuries, damages losses, or safety measures related to the collection, dissemination, analysis or other handling of any samples. Each performer is independently responsible for adhering to and implementing industry best practices and complying with any relevant regulations for safety measures in connection with the handling of any samples.

A third-party neutral accredited analytical lab chosen by Natcast will be utilized for analytical confirmations for *Task Area 3 – Abatement*. This third-party lab will receive a subset of samples from proposers and conduct PFAS baseline measurements (*i.e.* TOF,

EPA Method 1633, EPA OTM-45, EPA OTM-50, etc.) on wastewater or air samples post-treatment to be used as benchmarking data when evaluating proposers.

This program anticipates funding multiple collaborative teams of various sizes with varying scopes (*i.e.,* addressing either one or both **Focus Areas**, and addressing one or more *Task Areas*). An organization may only lead up to two proposals maximum (one for each **Focus Area** - air and wastewater) but may participate on more than one team. Organizations may submit a partial proposal for one or more complete *Task Area* under each **Focus Area**, clearly delineating the efforts in each phase of the *Task Area*. This breakdown of effort into phases must be reflected in the detailed budget breakdown accordingly. Natcast will coordinate the collection and dissemination of the wastewater samples required for the execution of the program.

Proposal teams should include a broad team composition capable of successfully completing the program together as defined and subsequently transitioning the technology into the commercial space. Proposals are limited to 20 pages for one *Task Area* and up to 3 additional pages are allotted for each additional *Task Area* proposed. Separate proposals must be submitted for each **Focus Area** if proposing work in both Wastewater and Air. Proposers may include as many *Task Areas* as desired in single proposal for one **Focus Area**, but the total length must not exceed 29 pages if proposing to all four *Task Areas*.

Natcast will independently contract a diverse group of reviewers from across the domestic semiconductor ecosystem to form industry-supported technical working groups for validation and verification. The composition of these technical working groups will consist of organizations that are not directly involved in the execution of the projects, ensuring an unbiased evaluation process. To further address potential sensitivities, Natcast will anonymize all sampled data. Additionally, stringent confidentiality agreements and data handling protocols will be implemented. All reviewers and technical working group members will be required to adhere to these agreements to ensure that proprietary information remains secure and confidential. Clear guidelines and oversight mechanisms will also be established to prevent any misuse of data, thereby maintaining the integrity and impartiality of the review process. These technical working groups will review proposals, program materials, and provide guidance for decisions on down-selecting proposers during the program from *Phase 1 to Phase 2* for *Task Areas 1, 2, and 3*. If proposers receive awards for multiple *Task Areas* in *Phase 1,* this does not mean that all *Task Areas* will be awarded for *Phase 2*. Each *Task Area* will be evaluated individually at *Phase* 1 prior to down-selection of *Phase 2* awards. Natcast and its industry-supported technical working groups will evaluate each

team's performance upon completion of each *Phase*. Natcast may terminate the award agreement should the results not meet the program objectives.

1.6 Schedule and Milestones

The thirty-month PRISM program planned schedule is shown in **Figure 2** and the target start date is June 2025. In addition to the kickoff meeting, there will be several in-person reviews. Subawardees are expected to attend in-person and should budget accordingly. The in-person reviews will be held at the performer's site or another location of Natcast's choosing and are scheduled for the end of Months 6, 12, 18 and 24. The final review will be held during Month 30. There will be virtual monthly status meetings for all other months.

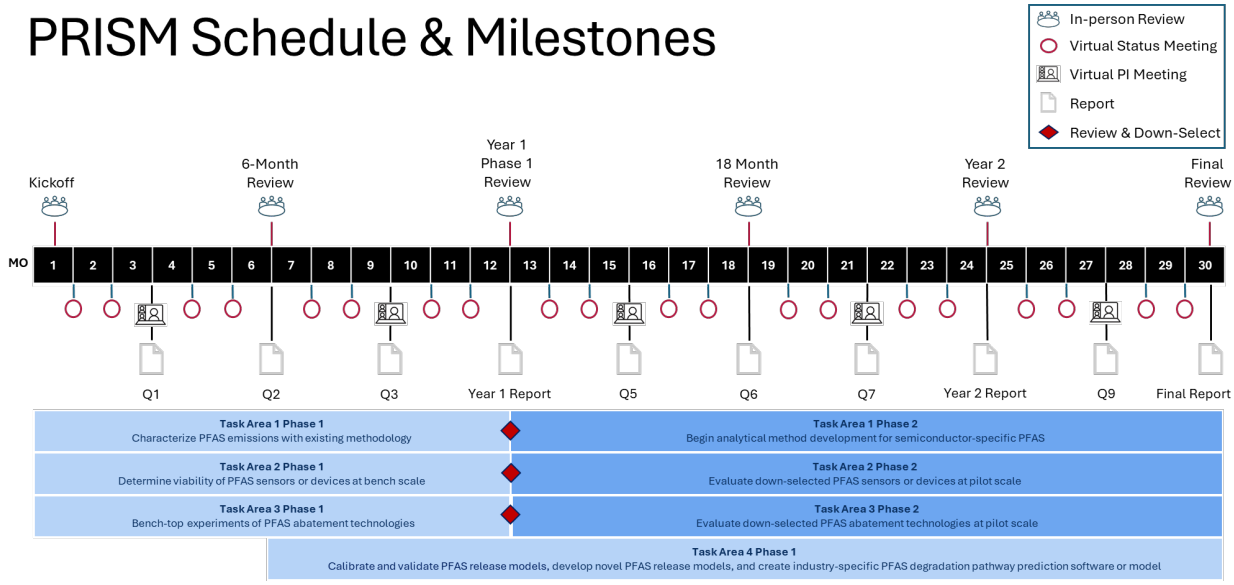

Figure 2. PRISM Schedule and Milestones

The program kickoff, interim reviews, final review, and monthly status meetings will provide opportunities to interact with Natcast and the industry-supported technical working groups regarding the scope of work, specifics of the technical approaches, and any technical or programmatic items of concern. In addition, one or more technical workshops may be held during the program that are open to all proposers in which proposers may provide further insights on future technical paths and challenges that must be addressed. Performer teams are encouraged to share knowledge and interact with other teams. Virtual monthly status meetings will be scheduled with Natcast and the industry-supported technical working groups technical working group to review technical progress and identify risks to completing the tasks outlined in the Statement of Work (SOW).

1.7 Deliverables

The list of deliverables is shown in **Table 1**. These include all presentation materials from review and status meetings, including kickoff, monthly, quarterly, annual, and final written reports. Please note that the availability or non-availability of deliverables to NSTC members will be governed pursuant to the proposer's Intellectual Property Management Plan as well as the NSTC Transition Plan. Section 2.5.1 outlines more detailed legal and data sharing requirements as well as exclusions.

Table 1. Program Deliverables for PRISM

Focus Area	Key Technical Deliverables
Analysis	List of additional semiconductor-specific target or suspect PFAS included in the analytical method outside of analytes from EPA 1633, OTM-45, or OTM-50.
	Creation of new analytical reference standard chemicals or materials
	Benchmarking and validation data for analytical method performance
	Novel analytical techniques and workflow documentation and supporting method development validation data
	PFAS characterization data from measurement of air and wastewater emissions and samples from individual facility processes, tools, and waste systems
	Relevant content, materials, or curriculum developed to be shared in the workforce repository
Sensing	Benchmarking and validation data for lab-scale sensor
	Data generated from prototype experiments of down-selected technologies
Abatement	Data and calculations generated from benchtop experiments on synthetic and/or real facility wastewater or air samples, including DREs, mass balances, TOF measurements, and target PFAS concentrations
	Documentation of technology treatment process workflow
	Data and calculations generated from pilot-scale experiments of down-selected technologies, including design, DRE, mass balances, TOF measurements, and target PFAS concentrations
	TCO and LCAs generated with pilot data
	Final report containing efficacy, TCO, LCA, major challenges, design strategies, ideal use cases, etc. for each technology
Modeling	Calibrated and validated models
	PFAS degradation pathway prediction software or models
General Program	Reports, Presentation Material, Documentation, Developed Curriculum,

	IP Management Plan, Research Management Plan, Domestic Production Plan, Risk Management Plan, and Detailed schedule (See Appendix E for additional details)

In connection with the reporting obligations described in Section 6.3, the performer will provide to Natcast quarterly written reports that include a description of newly developed IP, including patentable inventions, data, software, and research results, as well as any applications of the developed IP.

1.8 Success Metrics

In addition to contributing to the overall goals of the PRISM program, a successful project will demonstrate advancement by meeting or exceeding specified metrics. It is anticipated that proposals will meet variable target categories across these areas given the maturity differences in the technologies and metrologies between *Task Areas* and **Focus Areas**. Success metrics for the PRISM program are divided into three key areas:

- **Technology Relevance** – Identification of the industrial relevance or readiness of the metrology or technology within the *Task Area* to ensure the projects are of interest to stakeholders across the industry and address the identified knowledge gaps appropriately.
- **Data Quality and Analysis** – Assessment of the validity, accuracy, and reliability of the data to ensure that quality assurance and quality control methods are comprehensive and rigorous. The quality of data analytics will also be evaluated for depth, breadth, and presentation.
- **Impact** – Evaluation of the value and usefulness of the expected research outcomes and findings to the industry-relevant stakeholders and the broader research community and their potential to influence and advance state of the field.

Success metric targets are shown in **Table 2**. Industry partners and Natcast's technical working groups may also provide target specifications to facilitate down-selection and piloting during the program. Natcast expects that other relevant specs or metrics (*i.e.* flowrate) for *Phase 2* projects will depend on the specific technology or application and these success metrics will be refined and communicated in *Phase 1*. Proposals may also describe additional metrics and data in the appendix by which the team will demonstrate success and achievement of the goals of the PRISM program if the metrics below do not align with the proposed research or technology. Strong proposals should demonstrate a team's plans and capabilities to meet or exceed the metrics stated below, which are primarily evaluated against "threshold", "goal," and "stretch" targets.

Table 2. Success metrics for the PRISM program.

Success Metric Targets			
Technology Relevance	**Threshold**	**Goal**	**Stretch**
Analysis	Accreditation or experience with standard EPA PFAS analytical methods (*i.e.* EPA 1633, OTM 45, OTM-50, EPA Draft 1621, etc.)	Enhanced or optimized methods with expanded analyte lists beyond the standardized EPA methods.	Developed and self-validated methods for semiconductor industry-specific PFAS
Analysis	Quantify all method target compounds at EPA Maximum Contaminant Levels (10 ppt) or quantify TOF levels <10 ppb	Quantify all method target compounds below EPA Maximum Contaminant Levels (<<10 ppt), quantify TFA <10 ppt, or quantify TOF levels <1 ppb	Quantify new classes of PFAS at EPA Maximum Contaminant Levels (10 ppt), quantify ultrashort-chain PFCAs and PFSAs <10 ppt, or quantify TOF levels <500 ppt
Sensing	Sensor or device has been benchmarked and self-validated for PFAS measurement in real-world applications or wastewater/air matrices	Sensor or device has been self-validated for PFAS measurement in a semiconductor wastewater or air matrix	Sensor or device pilot has been completed for PFAS measurement in a semiconductor wastewater or air matrix
Sensing	For TOF sensors, measure <100 ppb and for individual compound sensors measure PFOA, PFOS, PFHxS, PFNA, HFPO-DA (GenX), and PFBS <100 ppb	For TOF sensors, measure <10 ppb and for individual compound sensors measure PFOA, PFOS, PFHxS, PFNA, HFPO-DA (GenX), PFBS, and TFA <100 ppb	For TOF sensors, measure <1 ppb and for individual compound sensors measure PFOA, PFOS, PFHxS, PFNA, HFPO-DA (GenX), PFBS, and TFA <1 ppb and/or additional PFAS compounds
Abatement	Abatement technology has been benchmarked and self-validated for PFAS capture and/or destruction in real-world applications or	Abatement technology has been benchmarked and self-validated for PFAS capture and/or destruction in a semiconductor	Abatement technology pilot has been completed for PFAS capture and/or destruction in a semiconductor

	wastewater/air matrices	wastewater or air matrix	wastewater or air matrix
Abatement	DRE >90% for 6 EPA compounds and TFA and complete mineralization of TOF >85%	DRE >95% for 6 EPA compounds and other PFAS compounds (including TFA) >85% complete mineralization of TOF >90%	DRE >99% for 6 EPA compounds and other PFAS compounds (including 1633 or ultrashort-chain PFCAs and PFSAs) >90% complete mineralization of TOF >95%
Modeling	Previously developed PFAS environmental fate and transport or transformation reaction modeling in relevant matrices	Calibrated or validated PFAS fate and transport or transformation reaction models for semiconductor industry emissions	Developed novel and reliable PFAS fate and transport or transformation reaction models or software for the semiconductor industry
Modeling	Generate pathway prediction software or model for PFOA, PFOS, PFHxS, PFNA, HFPO-DA (GenX), and PFBS through at least 2 individual unit processes and either wastewater and/or air waste management systems. Models should be validated using an appropriate evaluation metric (*i.e.* root mean squared error, r-squared, etc.) or cross-validation technique to show <70% accuracy.	Generate pathway prediction software or model for EPA standardized method PFAS (*i.e.* 1633, OTM-45, or OTM-50) through at least 2 individual unit processes and either wastewater and/or air waste management systems. Models should be validated using an appropriate evaluation metric (*i.e.* root mean squared error, r-squared, etc.) or cross-validation technique to show <80% accuracy.	Generate pathway prediction software or model for EPA method PFAS (*i.e.* 1633, OTM-45, or OTM-50) and TFA through 2 individual unit processes, either wastewater and/or air waste management systems, and PFAS capture and destruction and/or abatement processes. Models should be validated using an appropriate evaluation metric (*i.e.* root mean squared error, r-squared, etc.) or cross-validation technique to show <90% accuracy.
TRL of the current proposed	TRL 3-4: Proof of concept and validation experiments in a laboratory	TRL 5-6: Technology has been evaluated in a relevant environment or a prototype/pilot	TRL 7+: Technology has been piloted or prototyped in a semiconductor facility

metrology or technology	environment have been completed	scale demonstration has been conducted	or manufacturing environment
Data Quality and Analysis	**Threshold**	**Goal**	**Stretch**
Data Quality	Data collection is done using standard methods or best practices in the field, datasets are generally complete, and data has been organized in an accessible way	Data collection is done using well-defined methods, datasets are complete and accurate with appropriate quality assurance and quality control metrics applied, and data has been organized in an easily accessible way	Data collection is done using well-defined methods and is externally validated or reproducible, datasets are complete and accurate with extensive quality assurance and quality control metrics applied, and data has been organized in a comprehensive way
Data Analysis	Data has been analyzed with appropriate statistical or analytical techniques and has been presented with clear visuals and relevant interpretations of findings	Data has been analyzed with strong statistical or analytical techniques and has been presented with impactful visuals that enhance communications along with and original interpretations of findings	Data has been analyzed with extensive statistical or analytical techniques and has been presented with exceptional visuals that communicate strong and insightful conclusions along with highly effective interpretations of findings and insights across the field
Impact	**Threshold**	**Goal**	**Stretch**
Stakeholder Engagement	Receives input from collaborators or semiconductor industry stakeholders and adapts the goals and methods of the research based on external feedback	Directly seeks out input from semiconductor industry stakeholders and adapts the goals and methods of the research based on external feedback	Direct collaboration or partnership with semiconductor industry stakeholders and adapted the goals and methods of the research based on partnership feedback
Ability of the Researcher to Enhance the State of the Field	Project outcomes are useful to proposers in the relevant *Task Area*	Project outcomes are useful to a diverse group of industry-relevant stakeholders,	Project outcomes are useful to the intended audience as well as policy members and

		proposers, and NSTC members	other PFAS-using industries
Reputability of Work	Research has been published in impactful journals, patented, or communicated to the broader research community	Research has been published in impactful journals, received awards or special acknowledgements, been patented, or communicated to the broader research community	Research has been published in impactful journals, received awards or special acknowledgements, been commercialized, has received media coverage in relevant media outlets, or communicated to the broader research community
Development of Relevant Content or Curriculum related to Analysis	Teaching or training materials developed for future students or proposers	Active class or training new students or proposers in the field	New proposers and students have been taught using the relevant curricula or training package

2.0 Award Information

2.1 General Award Information

Natcast anticipates granting 8-15 awards not to exceed a total program budget for the awards of up to $35M. The number of awards will depend on the proposed budgets and the availability of funds. Awards will be made to proposers whose proposals best address all evaluation criteria and selection factors.

2.2 Terms and Conditions

By submitting a proposal, proposers affirm that they have read, understood, and agreed to the terms and conditions contained in the CFP.

Natcast is not obligated to make an award, or award the full amount of available funds, as a result of the CFP process or the receipt of proposals in response to this CFP. Funds will only be made available after entering into a binding award agreement. Natcast may remove proposers from award consideration if the parties fail to reach agreement on award terms within a reasonable time or the proposer fails to provide requested additional information in a timely manner.

As a part of the CFP process, proposals and related information submitted under the CFP may be used, extracted, copied, reproduced, and/or distributed to Natcast

employees, contractors, consultants, and external reviewers as well as the Department of Commerce or other Federal agencies and their contractors or consultants for the purposes of conducting the competition under this CFP. Persons requiring access will be subject to appropriate non-disclosure and conflict of interest requirements.

Any parts of a proposal shared with Federal agencies may be subject to requests under the Freedom of Information Act (5 U.S.C. § 552). Proposers are encouraged to mark as confidential any part of a proposal they believe is confidential, such as trade secrets or privileged or confidential commercial or financial information.

By submitting a proposal in response to this CFP, proposers represent and warrant that they have the authority to submit a proposal and grant the rights set forth in the CFP on behalf of their organization.

2.3 Fundamental Research

Given the nature of the program, we expect a combination of both fundamental and non-fundamental research. Proposers are required to identify and provide an explanation for whether the proposed research is fundamental research or non-fundamental research. As established by National Security Decision Directive (NSDD) 189: 'Fundamental research' means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons.

Natcast reserves the right to make a final determination on whether the research in a specific project constitutes fundamental research and may impose additional publication or reporting terms and conditions on non-fundamental research. In particular, any publication based non-fundamental research shall be subject to pre-publication review.

Proposers should also be aware that the content of a Research Security Plan may depend in part on whether the proposal concerns fundamental or non-fundamental research.

2.4 Research Security

2.4.1 Research Security Review and Risk Determination

Proposers are required to undergo a Research Security Review by Natcast and/or NIST in order to be considered for award. The provided Project Narrative Template details

the information that proposers must supply for this review, which comprises a brief summary of proposer's current capabilities related to Research Security as well as resumes/CVs and current and pending support forms for all covered individuals. A covered individual is defined as a person who contributes in a substantive, meaningful way to the scientific development or execution of a research and development project proposed. The resulting research security risk determination may be used as a selection factor. Furthermore, Natcast may require that proposers mitigate identified risks as an aspect of award negotiation.

Proposers must provide (as a Project Narrative appendix as specified in Appendix A) a brief summary of proposer's current capabilities related to Research Security that addresses cybersecurity, foreign travel, research security training, and export control to protect against adversarial exfiltration. Each proposer also must attest that, if preliminarily selected for an award, the proposer has the capacity and intends to develop a Research Security Plan prior to receipt of the award demonstrating that NSTC-funded research and associated data products will be protected.

2.4.2 Research Security Plans

As an aspect of award negotiation, selected proposers may be asked to improve their research security practices or plans. It is essential that proposers be prepared to strengthen their research security protocols as part of the award process and/or over the course of the period of performance.

If and when selected for award negotiation, proposers must submit a detailed description of their current Research Security Plan or (if none) describe a plan to protect Natcast-funded research and associated data products; this plan must include an implementation timeline. The description must identify a member of proposer's leadership team to serve as the point of contact responsible for coordinating with Natcast on research security issues. The description must further describe the Proposer's existing or proposed internal processes or procedures to address cybersecurity, foreign talent recruitment programs, conflicts of commitment, conflicts of interest, research security training, and research integrity. The description must also address research security considerations involving subawardees and collaborators, if any. Appendix B contains a Research Security Plan questionnaire that will be requested if and when a proposal is selected for award negotiation. Award terms will specify that within ninety (90) days of award, proposers must show progress on implementing the Research Security Plan as applicable.

2.5 Intellectual Property and Data Rights

2.5.1 Award Agreement IP terms

The award agreement will include terms and conditions related to intellectual property and data. Certain of these terms and conditions are specifically required by Natcast's obligations to the Department of Commerce; others are intended to fulfill the NSTC mission of furthering research and engineering throughout the semiconductor ecosystem. This program is the third that Natcast is funding and coincides with the launch of the NSTC and the development of policies to be adopted by the NSTC including with respect to intellectual property. The terms below apply only to this program; future programs may be accompanied by different terms with respect to IP.

The following commitments will be required of all proposers. A performer is responsible for ensuring each member of its team and their respective affiliated organizations comply with the IP terms of the award agreement.

- **Ownership of IP:** The performer or, as applicable, the Project team member responsible for development, will own all intellectual property and data developed by such performer or team member under the Project.
- **Government License:** The U.S. Government will have a nonexclusive, nontransferable, royalty-free, fully paid-up, worldwide, perpetual license to practice all inventions that are or may be patentable developed by the performer, using government funds, during the PRISM program, for research and non-commercial purposes.
- **Government Data Rights:** The U.S. Government will have the right to use, duplicate, or disclose all information contained in the performer's quarterly reports, in whole or in part, and in any manner, for U.S. Government purposes, and to have or permit others to do so for U.S. Government purposes, except to the extent such reports contain proprietary information of the performer.
- **Domestic Control Restrictions:** The performer will comply with domestic control requirements adopted by Natcast pursuant to the Department of Commerce's policies under the CHIPS Act, 15 U.S.C. § 4656(g), including: (a) the owner of the inventions developed during the PRISM program that are or may be patentable under U.S. law must be a "domestic entity"—meaning, either a state, local or tribal government or a US entity with its principal place of business in the US; (b) that domestic entity—and any successor in interest—may not sell, transfer, or assign ownership of any developed inventions that are or may be patentable under U.S. law to a foreign adversary ("foreign adversary" includes any "foreign entity of concern" and "foreign country of concern" as defined in 15 C.F.R. §

231.102, § 231.104); (c) that domestic entity may not grant a license to a foreign adversary with some limited exceptions; and (d) that domestic entity may only assign ownership of the developed inventions that are or may be patentable under U.S. law to a foreign entity (that is not a foreign adversary) after the expiration of a specified period of years; the specific period of years will be determined prior to award. While a uniform term of years, and certain disclosure requirements, will be included in all award agreements, proposers will have an opportunity to discuss the term of years prior to award.

The following IP commitments are preferred, but Proposers are welcome to propose alternative terms that align with the PRISM program goals. The terms and conditions agreed upon between the Proposers and Natcast will be included in the award agreement.

- **Rights to Use Deliverables:** The performer will grant to Natcast the rights necessary to achieve the goals of the PRISM program. The rights granted will include a non-exclusive license (with the right to sublicense to NSTC members) to use the Deliverables (as described in Table 1),) and to practice the Related IP Rights, without the obligation to make additional payments other than the milestone payments set forth in the award agreement or as otherwise agreed to by the parties in the award agreement.
- Natcast will consider exceptions to these usage rights if specifically requested in the performer's written proposal responding to this CFP. For example, Natcast understands that if the performer proposes to provide a commercially available product as part of the Deliverables, it may want to exclude that product from the proposer's obligation to make it available to NSTC members without additional payment.
- **Table 3** below includes the preferred IP rights that Natcast desires from proposers to achieve the goals of the PRISM Program. The preferred IP rights for exemplary types of Deliverables are described below:

Table 3. Program Deliverables for PRISM and preferred IP rights.

Focus Area	Key Technical Deliverables	Preferred IP Terms
Analysis	List of additional semiconductor-specific target or suspect PFAS included in the analytical method outside of analytes from EPA 1633, OTM-45, or OTM-50.	1
	Creation of new analytical reference standard chemicals or materials	1

	Benchmarking and validation data for analytical method performance	1
	Novel analytical techniques and workflow documentation and supporting method development validation data	1
	PFAS characterization data from measurement of air and wastewater emissions and samples from individual facility processes, tools, and waste systems	1
Sensing	Benchmarking and validation data for lab-scale sensor	1
	Data generated from pilot-scale experiments of down-selected technologies	1
Abatement	Data and calculations generated from benchtop experiments on synthetic and/or real facility wastewater or air samples, including DREs, mass balances, TOF measurements, and target PFAS concentrations	1
	Documentation of technology treatment process workflow	1
	Data and calculations generated from pilot-scale experiments of down-selected technologies, including design, DRE, mass balances, TOF measurements, and target PFAS concentrations	1
	TCO and LCAs generated with pilot data	1
	Final report containing efficacy, TCO, LCA, major challenges, design strategies, ideal use cases, etc. for each technology	1
	Relevant content, materials, or curriculum developed to be shared in the workforce repository	2
Modeling	Calibrated and validated models	1
	PFAS degradation pathway prediction software or model	3
General Program	Reports, Presentation Material, Documentation, Developed Curriculum, IP Management Plan, Research Management Plan, Commercial Viability and Domestic Production Plan, Risk Management Plan, and Detailed schedule (See Appendix E for additional details.)	2

1. *Natcast and NSTC members should be able to use the datasets and test results generated during the PFAS program. The performer is required to provide a useful dataset to Natcast, but may, with Natcast's approval, remove specific data that would reveal sensitive, proprietary information.*
2. *The reports, presentation materials, guidance and recommendations, developed curriculum, and other related content or documentation will be included in a Natcast controlled repository and made available to current and future NSTC members.*
3. *Any software developed should be made available for Natcast future research programs and sub-licensable by Natcast to current and future NSTC members for R&D purposes. In connection with the reporting obligations described in Section 6.3, the performer will provide to Natcast quarterly written reports that include a*

description of newly developed IP, including patentable inventions, data, software, and research results, as well as any application of such generated IP.

2.5.3 Intellectual Property Management Plan

Each proposer must submit an Intellectual Property Management Plan, in which the proposer should clearly identify (1) any Background IP, incorporated into, embodied in or otherwise used to complete the Deliverables, and whether this Background IP is being made available to Natcast and NSTC members on a non-exclusive royalty free basis or is excluded (2) IP that is expected to be developed in connection with the PRISM program.

It is recommended that in connection with identified Background IP, proposer(i) should identify the excluded Background IP (*i.e.* pre-existing workflows, methods, system parameters, commercially available software and tools, etc.) with as much specificity as reasonably possible, describe how the excluded Background IP is used in or relates to the Deliverables, and describe how the requested exclusion for the Background IP could be expected to affect the Deliverables, the usability thereof, and achievement of the goals of the PRISM program, and (ii) should (a) specify the pricing, licensing and other commercial terms under which the performer would license the otherwise excluded Background IP to Natcast and NSTC members after the PRISM Program is over or (b) state that it is unwilling to make available or license the excluded Background IP. The reasonableness of the commercial terms for the excluded Background IP will be a criterion in evaluating the proposal.

Additionally, the Intellectual Property Management Plan should identify any encumbrances on the Deliverables or Related IP (*e.g.,* third party IP) that could affect the obligations of the performer or the rights of Natcast and NSTC members.

The Intellectual Property Management Plan may also identify any restrictions on use of the Deliverables, such as restrictions on commercial use of software by Natcast or NSTC members. For any commercial restrictions, proposer should specify the pricing, licensing and other commercial terms under which the performer would license the Deliverable for commercial use. The reasonableness of the commercial terms for any restricted Deliverable will be a criterion in evaluating the proposal. Pursuant to 15 U.S.C. § 4656(g), the proposer should describe how the proposed management and ownership of inventions that are or may be patentable will ensure domestic control of such CHIPS funded intellectual property, including to protect such intellectual property from foreign adversaries.

Section 2.5.1 describes the minimum desired IP rights for the PRISM program, and the Intellectual Property Management Plan should affirm the proposer's commitment to the minimum desired IP terms. Additionally, the proposer should specify its commitment to any preferred terms (as identified in Table 3) or propose any alternative terms. Terms that align with goals of the PRISM program and provide potential benefits to Natcast and NSTC members, as described in Section 5.1, will be considered as an evaluation factor.

The proposer should also confirm that it agrees to make all workforce content, as called out in the CFP, available to Natcast under a Creative Commons Attribution (CC BY 4.0) license (https://creativecommons.org/licenses/by/4.0/). The proposer also agrees that Natcast may upload the content to NSTC's workforce repository to support workforce development efforts by Natcast and other CHIPS programs.

An example Intellectual Property Management Plan is included herein in Section 7.6, Appendix F.

2.5.4 Definitions for IP and Data Rights Terms

For purposes of this Section 2.5, the following terms (whether capitalized) have the following respective meanings:

"Background IP" means any pre-existing IP developed independently of the PRISM program.

"Deliverables" means materials and information provided, or required under the award agreement to be provided, to Natcast or NSTC members in connection with the PRISM program.

"IP" and "intellectual property" means all intellectual property, intellectual property rights and other proprietary rights, including copyrights; software, written materials and other works of authorship; other rights in software; data, databases and rights in data and databases; reports, curriculum, or white papers; patents, patent applications and rights with respect to inventions; trade secrets and other information and ideas not generally known to the public; and methods, processes, algorithms and other subject matter of intellectual property or other proprietary rights. "IP" and "intellectual property" do not include trademarks and related rights unless otherwise specified. This definition does not apply to references to IP or Intellectual Property under 15 U.S.C. § 4656(g).

"Related IP Rights," in reference to Deliverables, means IP embodied in or necessary for use of the Deliverables.

"Use," with respect to Deliverables or IP, means to utilize, reproduce, distribute, disclose, modify, and make and supply products or services using, such Deliverables or IP, and otherwise use such Deliverables and IP. This definition does not apply to references to use by the U.S. Government.

2.6 Domestic Production

To promote a robust, sustainable domestic capacity for semiconductor R&D, prototyping, and production, and pursuant to the CHIPS Act domestic production requirements (15 U.S.C. §4656(g)), CHIPS R&D requires proposers to develop plans to domestically production, to the extent possible, any intellectual property resulting from CHIPS-funded microelectronics research and development. F

For the purposes of 15 U.S.C. § 4656(g):

- "Intellectual property" means any invention that is or may be patentable under U.S. law.
- "Production" includes the manufacture, integration, assembly, testing, and packaging of semiconductors, materials used to manufacture semiconductors, or semiconductor manufacturing equipment [e.g., sensors, devices or abatement technologies] developed or improved as a result of CHIPS-funded intellectual property.

For the purpose of this Call for Proposals, only activities relating to creation of tangible assets such as sensors, devices, and abatement technologies, but not intangible assets such as software and designs, are subject to the Department's domestic production requirements. Proposers must explain the extent to which they plan to engage in production in the United States of any intellectual property (in the form of tangible assets), as defined for purposes of 15 U.S.C. § 4656(g), developed through this funding opportunity. A proposal's initial plans to engage in domestic production may be refined over the course of the award and must be updated on at least a yearly basis for the duration of the award. To the extent it is not reasonably "possible" for any Proposers to conduct certain covered "production" activities in the United States (15 U.S.C. § 4656(g)), the Proposers must provide their reasons, relying on the factors described below.

1. The availability or lack of availability of domestic production capabilities, which may consider:

   a. Planned or previous efforts made to locate, develop, or contract for the production of the CHIPS R&D-funded technology, or relevant similar technologies, in the United States;
   b. Access to resources and other material inputs required for production;
   c. The expected additional product development time or cost required to make U.S. production of the CHIPS R&D-funded technology commercially feasible;
2. The relative costs of domestic versus foreign production of the CHIPS R&D-funded technology, at relevant production volumes;
3. Commercial adoption risks and benefits, such as
   a. Risks to the market acceptance and to the value proposition for the CHIPS-funded technology, resulting from U.S. production;
   b. Expected commercial, economic, or national security benefits to the United States resulting from distributed production among U.S. and overseas sites;
4. Any other factors that are important to the success of the CHIPS R&D-funded technology.

2.6.1 Domestic Production Plan

Per the guidelines in Section 2.6, Proposers must explain the extent to which proposers plan to engage in production within the United States of any intellectual property (in the form of tangible assets) developed through this funding opportunity (e.g., including but not limited to the sensors, devices, and abatement technologies).

For example, a Proposer may anticipate producing sensors, devices, and abatement technologies that satisfy the definition of "intellectual property." In that case, the Proposer must explain, at a minimum, whether and to what extent it plans to produce the sensors, devices, or abatement technologies in the United States. For instance, if the Proposer plans to produce the sensors, devices, or abatement technologies in the United States, it should explain, if it is known at the time, where it intends to produce those items (*i.e.,* in a particular city and state in the United States), and, if it will be produced through the use of any particular vendor.

If, however, the Proposer intends to produce either the sensors, devices, and abatement technologies outside the United States, the Proposer, if known, must provide the same information (*i.e.,* particular city and country in which the intellectual property would be produced and any particular vendor that would be used) and, in addition, explain why it cannot produce in the United States using the factors listed in Section 2.6.

3.0 Eligibility Information

The recipient of an award must be a core, rather than affiliate, member and all subawardees must also be core NSTC members at the time of award.

NSTC Members may not be foreign entities of concern or foreign countries of concern, as those terms are defined in 15 C.F.R. 231.104 and 231.102, respectively. Individuals and unincorporated sole proprietors are not eligible to receive funding or for NSTC membership. Moreover, as also required by this CFP, recipients must undergo a Research Security Review (see 2.3.1) and be prepared to implement a Research Security Plan (see 2.3.2).

A lead Proposer must be a domestic entity to be eligible for an award. A domestic entity is one that is incorporated within the United States (including U.S. territories) and with its principal place of business in the United States (including U.S. territories). Additional information on participation by foreign entities can be found in Section 3.5 “Foreign Collaboration and Overseas Activities. Additional information about NSTC Membership and the process for becoming a member is available at natcast.org/nstcmembership.

3.1 Federal Entities

Federal Entities (*e.g.,* Federal departments and agencies, military services educational institutions, etc.) are eligible to participate in funding opportunities as team members or contractors, to the extent allowed by law and subject to applicable direct competition limitations. Federal Entities must clearly demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority and contractual authority, if relevant, establishing their ability to receive Federal award funds and compete with industry. Proposers must identify the Federal entity in the Project Plan and provide documentation attached to the required letter of commitment establishing that the Federal entity is able to participate in the proposed work.

Federally Funded Research and Development Centers (FFRDCs) may participate in awards as subawardees or contractors, to the extent allowed by law, based on the unique and specific needs of the project. Proposers must identify the FFRDC(s) in the Project Plan and provide documentation attached to the required letter of commitment establishing that FFRDC subawardees and contractors are able to participate in the proposed work, including:

- Documentation demonstrating that the proposed work does not compete with the private sector; and

- Documentation from the FFRDC's sponsoring institution citing the FFRDC's eligibility to participate in competitive Government funding opportunities; the FFRDC's compliance with the sponsor agreement; and confirmation from the sponsoring agency that they can receive Federal funds from Natcast.

3.2 Eligible Use of Funds

Eligible uses may include, but not be limited to, basic and applied research, demonstration, prototyping, preparation of commercial viability and domestic production information, industry stakeholder engagement, design work, information collection, acquisition of software or hardware, manufacturing costs, associated program travel, data analysis, audit costs, contracted work.

Use of funds for travel costs must be consistent with the following guidelines. Permissible Costs include necessary and reasonable costs for travel to perform the scope outlined in the projects. For common carrier transportation costs, performer shall agree that it will travel by a direct route or on an uninterrupted basis (*i.e.*, travel will not be interrupted for personal convenience). In addition, travel will be by coach class, except for instances in which Natcast has provided written approval. Non-coach class travel is expected to be rare, and the Natcast may utilize the standards in 41 C.F.R. § 301-10.103 to determine whether, in their discretion, to approve other than coach class transportation. For meals and incidental expenses, the per diem rates established by the Federal Travel Regulation are to be utilized. For lodging, proposers should plan to book reasonable but not extravagant lodging accommodations for employees in travel status. Proposers should make use of government rates whenever possible; otherwise, corporate rates or other discounts should be obtained whenever possible. For air travel, performer shall use U.S.-flag air carriers to the extent the carriers provide those services, consistent with the Fly America Act at 49 U.S.C. § 40118.

Proposers may also propose to expend limited funds to protect innovations or content developed under the funding opportunity, such as fees for patent or copyright protection or to enhance research security.

3.3 Organizational Conflict of Interest

Proposers are asked to identify any potential organizational conflicts of interest that may arise in the context of this CFP, and (if applicable) potential strategies that it proposes to mitigate those conflicts.

3.4 Cost Sharing

Cost sharing is encouraged but not required for this effort. It is neither an evaluation nor selection criterion.

3.5 Foreign Collaboration and Overseas Activities

Foreign entities (*i.e.* for-profit companies, educational institutions, and other non-profits) and foreign individuals (*i.e.* persons participating from a foreign location) can participate in research funded by Natcast R&D on an unfunded basis, subject to certain limitations such as a research security review, to ensure the protection of CHIPS R&D-funded intellectual property from foreign adversaries. Non-U.S. citizens whose work will occur in the U.S., and who are lawfully present and authorized to work in the U.S., are eligible to participate on a funded basis, subject to any export control laws and regulation.

To protect national security and the resiliency of supply chains, however, foreign entities of concern may not receive Natcast R&D funds or participate in NSTC R&D programs. Foreign entities of concern ("FEOCs") include entities owned by, controlled by, or subject to the jurisdiction or direction of the governments of China, Russia, North Korea, or Iran. Complete definitions of foreign entity of concern and foreign country of concern are found at 15 CFR part 231.

Foreign entities that are not FEOCs may participate, on a funded basis, as members of a project team, as subawardees or contractors, subject to Natcast approval. The proposer must provide Natcast with a written justification demonstrating that the foreign entity's involvement is essential to advancing project objectives, such as by offering access to unique facilities, IP, or expertise that is otherwise not readily available in the United States. Natcast will only approve work outside of the United States if it is in the best interest of CHIPS R&D and the United States, including the domestic economy generally, U.S. national security, U.S. industry, and U.S. manufacturing competitiveness. Natcast's determination regarding the performance of project tasks outside the United States will be based on information provided by the proposer and by other Federal agencies.

A foreign entity is any entity that is not a domestic entity. A domestic entity is one that is incorporated within the United States (including U.S. territories) and with its principal place of business in the United States (including U.S. territories).

4.0 Proposal and Submission Information

4.1 Proposal and Submission Information

Natcast will follow a five-step process for making the PRISM award:

Step 1: Concept paper submission is required.

Step 1.5: Natcast responds to proposers encouraging or discouraging the submission of a full proposal.

Step 2: Full proposal submission

Step 3: Full proposal evaluation

Step 4: Research Security Review and Research Security Plan

Step 5: Negotiation and Award

Submission of a concept paper is required for submission of a full proposal. Concept papers may be 2 pages long for each *Task Area* proposed. A separate concept paper must be submitted for each **Focus Area** (*i.e.* Wastewater or Air). Recipients will receive feedback encouraging or discouraging a full proposal within 14 days of concept paper submission. No down-selection will occur, however, all proposers who submitted a concept paper will be able to advance to full proposal if they choose. No template exists, however concept paper submissions should include a summary of the proposed technical agenda, preliminary work and supporting data, planned achievements or goals, and previous publications, whitepapers, technical documents, etc. Concept papers should list the project's title, proposer's team, principal investigators, team point of contact, and estimated budget. Citations, references, and figures count towards the page limit. A cover page would not count toward the page count, but it is neither required nor encouraged for the concept paper. The composition of the team can change between concept paper submission and proposal submission. Concept paper submissions should include a summary of the proposed technical agenda and will be evaluated against the first two criteria laid out in Section 5.1. Concept papers may be submitted directly by any individual who is authorized to agree to the submission terms and conditions on behalf of the organization. Proposers should note in the concept paper whether partnerships already exist with semiconductor manufacturing facilities. Facility partnerships are not required but are highly encouraged. Additionally, there is no restriction on the type of facility (*i.e.* research facility, high volume manufacturing facility, etc.) with which proposers may partner.

Natcast will only encourage full proposals for technologies that have been proven at a TRL of 4 or higher (**Figure 3**). This means that all research proposed should already have had basic concepts and principles observed and reported, the technology concept and application has been formulated, and analytical and experimental critical function and/or characteristic proof of concept has been demonstrated and validated. We do not recommend submitting any proposals for basic research in TRL levels 1-3. For *Task Area 1 – Analysis*, proposers must already have the required instrumentation and submit preliminary data or citations with the proposal confirming prior analysis of PFAS in the target **Focus Area**. For *Task Area 4* – Modeling, proposers must provide citations or preliminary data showcasing prior, relevant modeling work in the target **Focus Area** (*i.e.* fate and transport modeling, environmental modeling, etc.). If proposing more than one solution per *Task Area*, clearly delineate each *subtask* in the proposal.

Figure 3. Technology Readiness Levels adapted from WindHarvest.

The concept paper (Step 1) and the full proposal must be uploaded to a secure web site: https://natcast.secure-platform.com/rnd. It is also possible to navigate to this site from the PRISM home page: https://natcast.org/research-and-development/prism.

4.2 Proposal form and Content

Proposals are required to adhere to Project Narrative structure and include a Budget Workbook. Page limits and policy requirements are explained in the template.

Full Proposals due on 01/22/2025 must contain the following:

1. **Project Narrative**
   See Appendix A below for more detailed requirements and suggestions.

- Cover Sheet
- Executive Summary
- Goals and Impact
- Management Plan
- Technical Plan

- Intellectual Property Rights Management Plan
- Appendices
  - Table of Abbreviations and Acronyms
  - Bibliographic List of References
  - Table of Funded Participants and Unfunded Collaborators
  - Statement of Work (SOW)
  - A list of "Current PFAS" for *Task Area 1 – Analysis* proposals
  - A list of "Proposed PFAS" for *Task Area 1 – Analysis* proposals
  - Budget Volume *(Optional prose appendix, to be supplemented by an excel-format Budget Workbook uploaded separately).*
  - Domestic Production Plan
  - Research Security Capabilities
  - Resumes/CVs
  - Current and Pending Support Forms
  - Letters of Commitment

2. **Budget Workbook**
   The budget workbook is an Excel-format document, uploaded separately from the Project Narrative. Budget template will be made available for the convenience of proposers at the PRISM home page: https://natcast.org/research-and-development/prism.

For full instructions and specific requirements of the Executive Summary, Project Narrative, and Budget Workbook contents, please see the annotated outline in the below Appendix A.

4.3 Teaming

It is anticipated that this effort will be led by teams including partnerships between combinations of university proposers, start-ups, commercial laboratories, facilities, and companies. Teams may include unfunded collaborators. This program anticipates funding multiple collaborative teams of various sizes with varying scopes (*i.e.*, addressing either one or both **Focus Areas**, and addressing one or more *Task Areas*). start-ups, commercial laboratories, facilities, and companies.

Teams should be comprised of one lead proposer (the "Performer") with funded team members who would become subawardees and/or unfunded collaborators. Subawardees and collaborators must meet eligibility requirements and should submit a teaming letter with the project proposal or white paper, as applicable. Full proposals should include a subawardee budget in addition to letters of commitment. A single

entity may only submit a maximum of two (2) proposals (one to each **Focus Area)** as the lead proposer, but may participate on more than two teams.

4.4 Frequently asked questions

Proposers can submit questions via email prior to January 13, 2025 by submitting questions to prism@natcast.org. Abstracted answers will be shared publicly via FAQ posted at https://natcast.org/research-and-development/prism.

5.0 Proposal Review Information

5.1 Evaluation Criteria

Proposals will be evaluated according to the following criteria, listed in order of priority:

- **Overall Scientific and Technical Merit** - This criterion addresses the quality, innovativeness, and feasibility of the project proposal and the potential for meeting the objectives of the funding opportunity. Reviewers will consider the extent to which:
    - The proposed activities are innovative, original, or potentially transformative;
    - The proposal demonstrates knowledge of the current state of the art in relevant fields and the feasibility of the proposed technologies to be advanced, including gaps, constraints, and significant challenges that must be addressed;
    - The plans for achievements, outcomes, or goals represent a significant advance relative to the state of the art globally in the field of technology development, exploration, and transfer;
    - The proposed plans rely on the use of proven and reliable methods or processes which have been shown to work in the past but had not otherwise been generally applied in industry-relevant conditions or environments; and
    - The extent to which the proposed metrology and technology could lead to a fundamental advancement in science, knowledge, and understanding which would otherwise not occur.

- **Utility and Benefit to NSTC membership** - This criterion addresses the potential utility and benefits of the proposed projects to Natcast and the NSTC membership or plans for making the NSTC membership aware of the emerging knowledge and enabling its use. Reviewers will consider the extent to which:
    - The overall accessibility of metrology or technology to a number of potential interested users;

- The extent to which the proposed IP terms will make rights in data, inventions, and copyrightable material available to the NSTC membership;
- The extent to which any proposed additional IP benefits are commensurate with the benefit of Natcast funding and the availability of NSTC infrastructure and support as it evolves;
- The extent to which the proposed IP terms maximize the potential for commercializing Natcast-funded inventions, datasets, and copyrightable materials; and
- The reasonableness of the terms for Natcast and NSTC members to gain access to the IP generated.

- **Transition and Impact Strategy** - This criterion addresses the project's potential for supporting the commercialization and domestic production of funded semiconductor innovations, as well as beneficial impacts to workforce development and the broader domestic research, development, and innovation ecosystem. Reviewers will consider the extent to which the proposal provides:
  - A metrology or technology capability which impacts an important area of fundamental sustainability research for the semiconductor industry;
  - A reasonable approach for transitioning the proposed technology to commercial deployment;
  - The potential for which the proposed metrology and technology can be utilized by a broad user base;
  - Outlines an education and workforce plan or deliverable appropriate to developing a workforce relevant to domestic semiconductor manufacturing capabilities; and
  - The evaluation may also consider the proposer's history of transitioning (or plans to transition) technologies to foreign governments or to companies that are foreign owned, controlled, or influenced.

- **Project Management** - This criterion addresses the degree to which proposers demonstrate that they have the appropriate personnel, experience, and access to required equipment and facilities. Reviewers will consider the extent to which the proposal:
  - Identifies key staff, leadership, and technical experts with qualifications and experience appropriate to the proposed work, including prior experience and results in efforts similar in nature, purpose, or scope of proposed activities; and

- The proposed activities are feasible, well organized, and conceived clearly and realistically.

5.2 Selection Criteria

Natcast will select a portfolio of proposals based on a broad range of criteria including:

- **Merit Review** - Results of the merit reviewers' evaluations, including narrative evaluations (if applicable), and the Reviewers' adjectival ratings (if applicable).

- **Relevance to Program and Mission** - Alignment with the objectives of the funding opportunity as well as the objectives and priorities of NSTC and the mission, goals, and priorities of the NSTC R&D program. This may include considerations related to research security, domestic production, and domestic control of intellectual property.

- **Funding** - The availability of funding.

- **Diversity of Projects and Participants -** The degree to which the selected portfolio of proposed teams and project provides for a diversity of proposed project topics or approaches, regional diversity of participants, and institutional diversity (including small and medium enterprises, universities, nonprofit research organizations, etc.) in the overall NSTC projects portfolio.

- **Funding duplication**. Selection will strive to avoid funding duplicative projects.

- **Benefit to NSTC membership**. The extent to which IP plans and other factors benefit the NSTC membership, as described in Section 5.1.

- **Research Security Risk**. Natcast may consider the results of a Research Security Review in its selection.

5.3 Review of Proposals

The review process involves evaluation of each conforming and eligible proposal based on its individual merits, followed by a selection process that considers a range of broader criteria that are comparative and/or additive of the merit evaluation as Natcast determines which set of proposals best meets the program objectives.

Natcast may, at its discretion, review a partially incomplete proposal if any gaps in information can be rectified easily during the review or award process for completion of the proposal.

6.0 Award Administration Information

6.1 Notification of Submission Status

Natcast intends to publicly announce awards no later than thirty (30) days after all awards under this CFP are executed. Announcements may occur earlier once both parties give consent to announce the award. Such announcements must reflect that a final, binding award has not yet been made.

Successful proposers will be notified by email when a determination has been made to enter award negotiations.

Unsuccessful proposers will also be notified by email and may be offered the opportunity to receive a debriefing after the funding opportunity is officially closed. Proposers must request to receive a debrief from Natcast within 14 business days of the email notification. Natcast will then work with the unsuccessful proposer to schedule a date and time for the debrief.

6.2 Policy Requirements

6.2.1 Documentation Retention

Proposers must keep and retain records of all data generated through funded research which includes but is not limited to technical data, specifications, software, and pilot designs. In addition, proposers must keep and retain all financial records, supporting documents, statistical records, and other materials related to the award.

These requirements apply for three (3) years following Natcast's final payment.

6.2.2 Tangible Property

The acquisition of certain tangible personal property, including equipment and supplies, must comply with the requirements of 2 C.F.R. § 200.313 and 314. Proposers will also be required to record appropriate notices of record to indicate that personal property has been acquired or improved with federal funds and that use and disposition conditions apply to the property, in accordance with 2 C.F.R. § 200.316. For purposes of this CFP, these requirements apply to tangible personal property (including information technology systems), including equipment and supplies, having a useful life of more

than one year and a per-unit acquisition cost which equals or exceeds the lesser of the capitalization level established by the acquiring entity for financial statement purposes, or $10,000. Equipment installation and any associated construction costs may be allowable, contingent on Natcast prior approval. Permissible equipment installation and associated construction costs are expected to be minimal (*e.g.* likely below $100,000.00). If approved, such costs may require compliance with laws and regulations relating to federally funded construction projects and environmental requirements.

Certain tangible assets, specifically any property which may be generally considered "customer owned tooling" which are wholly or partially acquired through the use of program funds may, in some cases, be expected to be transferred to Natcast at the end of the program to be managed for the benefit of NSTC members.

Proposers may not use award funds to acquire real property or to engage in construction. Except, installation of pilot abatement systems, and any associated low-level construction would be allowed.

6.2.3 Accounting Standards

Award agreements will require that Proposers maintain proper GAAP accounting of all federal funds provided under the award, including the use of funds for approved research and development purposes as well as maintain commitment to any cost-sharing, if applicable.

6.3 Reporting

The number and types of reports will be specified in the award agreement but will include at a minimum quarterly technical and financial status reports and a final project report.

- **Technical Reports -** These reports should provide Natcast Program Managers with information on the progress of supported projects and the way funds are being used. Technical reports may request the types of information described in the illustrative Technical Report Template found in *Appendix C*.
- **Financial Status Reports -** Proposers may report financial information regarding their award using their standard reporting format or as specified in the award.
- **Final Project Report -** This last report of the project should be written specifically for the most recently completed budget period. It should address progress in all activities of the project in its final year, including any activities intended to address the Broader Impacts criterion that are not intrinsic to the research. Illustrative contents of this report are outlined in *Appendix D*.

- **Post Project Reports -** Once the project is completed, proposers must comply with recordkeeping and reporting obligations required by Natcast for compliance with 4656(g) and tracking IP.

6.3.1 Meeting and Travel Requirements

Please refer to Section 1.6 for travel expectations. Proposers should anticipate travel costs accordingly.

6.4 Federal Requirements

Awards made under this CFP are made from federal funds Natcast receives under an "other transaction agreement" (OTA) with the Department of Commerce. These funds are generally not subject to the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200, or the Federal Acquisition Regulation. They are subject to requirements imposed via the OTA. The OTA requires that awards under this CFP include terms addressing the following:

- A prohibition on federal funds going to any foreign entities of concern or foreign countries of concern, as those terms are defined in 15 C.F.R. 231.104 and 231.102, respectively, or to any other entity debarred, suspended or otherwise prohibited from receiving federal funds;
- Compliance with export control laws;
- Compliance with Title VI of the Civil Rights Act, Title IX of the Education Amendments, and other non-discrimination laws that prohibit discrimination on the basis race, color, national origin, handicap, age, religion, veteran status, or sex;
- Maintaining effective internal controls;
- Maintaining a System for Award Management (SAM) and ensuring that it is current, accurate, and complete;
- Providing access to records for examination, audit, investigation, or inspection by Natcast, the Department of Commerce, a third party retained by the Department of Commerce, the Department of Commerce Office of Inspector General, or the Comptroller General. This requirement continues to apply for three (3) years after the final award payment, unless otherwise required by law;
- A certification to the best of its knowledge and belief that no Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on its behalf in connection with the making of an award under this CFP.

- For award funded travel, adherence to the Fly America Act at 49 U.S.C. § 40118, economy class travel 41 C.F.R. § 301-10.103, and GSA per diem and hotel rates (https://www.gsa.gov/travel/plan-book/per-diem-rates) as otherwise provided by Natcast.

These requirements and others will be specified in award terms. Proposers will be subject to sub-recipient monitoring throughout the life of the award, which will include steps to ensure that proposers comply with applicable requirements.

6.5 Payment Terms

The PRISM program plans to operate with separate awards for each *Phase* of the program for *Task Areas 1, 2, 3*, and *4* using the following payment structure:

Phase 1

Initial Payment - Upon signing the award agreement, an initial payment of 15% of the total award value will be made to the awardee.

Milestone Payments - Payments will be made upon the completion of predefined milestones. These milestones and their associated payments will be clearly defined in the contract or agreement.

Final Payment - A final payment constituting no less than 15% of the total contract value will be made upon the acceptance of the final report by Natcast.

Phase 2

Initial Payment - Upon selection to proceed with phase 2, an initial payment of 15% of the total award value will be made to the awardee.

Milestone Payments -Payments will be made upon the completion of predefined milestones. These milestones and their associated payments will be clearly defined in the contract or agreement.

Final Payment - A final payment constituting no less than 15% of the total contract value will be made upon the acceptance of the final report by Natcast.

All payments, including milestone and final payments, will be subject to the approval of the designated Program Manager (PM) following Natcast's approval process flows.

7.0 Appendices

7.1 Appendix A: Project Narrative Outline

This outline describes the required structure of a full proposal. Instructions are included in italics and may be deleted.

The Project Narrative for a single proposal for one **Focus Area** may not exceed 20 pages for one *Task Area*, including the executive summary, goals and impact, management plan, technical plan, fundamental research declaration, proposed international collaborations, and intellectual property and rights management plan sections count towards the page limit. Up to 3 additional pages are allotted for each additional *Task Area* proposed. The page limit does not apply to the appendices in section 7.1.3. Proposers may include as many *Task Areas* as desired in single proposal, but the total length must not exceed 29 pages, as outlined in the Executive Summary of the CFP. If proposing more than one solution per *Task Area*, clearly delineate each *subtask* in the proposal. Separate proposals must be submitted for each **Focus Area** if proposing work in both Wastewater and Air

7.1.1 Proposal Formatting requirements

- Font:
    - Use one of the following fonts:
        - Arial (not Arial Narrow), Times New Roman, or Calibri at a font size of 10 points or larger; or
        - Aptos or Computer Modern family of fonts at a font size of 11 points or larger.
        - Different font sizes can be used for tables and figures as long as they are legible.
- Line spacing: Single
- Margins: One (1) inch top, bottom, left, and right
- Page layout: Portrait orientation
- Page limit: Project proposals should not exceed 20 pages for one *Task Area*. Only the executive summary, goals and impact, management plan, technical plan, fundamental research declaration, proposed international collaborations, and intellectual property and rights management plan sections count towards the page limit. Up to 3 additional pages are allotted for each additional *Task Area* proposed, but the total length must not exceed 29 pages. If proposing work in both **Focus Areas**, two separate proposals will be required to delineate work in

each **Focus Area**. If proposing more than one solution per *Task Area*, clearly delineate each *subtask* in the proposal.

- Paper size: 8.5” by 11”
- Application language: English
- Typed document: All applications must be typed

7.1.2 Required Sections

- ***Cover Page***
  - Funding opportunity name and reference number (if applicable)
  - Relevant **Focus Area**
  - Name of the proposer
  - Name of the project director(s)/principal investigator(s)
  - Any major subawardees and contractors
  - Project title
  - Point of Contact for the proposer, to include name, address, telephone number, and e-mail address
  - Total funds requested and total proposed cost-share (if applicable)
  - Any statement regarding confidentiality, including proprietary or sensitive business information, if applicable

- ***Executive Summary -*** Proposers should provide a concise summary/abstract of the proposed effort including the following information:
  - Name of the proposer(s)
  - Name(s) of other collaborators (if applicable)
  - Application title
  - Project Objectives
  - Methods to be employed
  - Potential impact of the proposed project (*i.e.* benefits, outcomes, etc.)

- ***Goals and Impact -*** Proposers should clearly describe what they are trying to achieve and the potential impact (qualitatively and quantitatively) of the work they are proposing. Proposers should provide a clear problem statement and well-defined project outcomes, clearly demonstrating how both are relevant to the goals and objectives of the funding opportunity and contribute to the specific evaluation criteria.

- ***Management Plan -*** Proposers should provide a summary of team expertise, including any subawardees, contractors, and key personnel who will be

performing work. A Principal Investigator (PI) for the project must be identified, along with a clear description of the team's organization, including an organization chart that includes, as applicable: the programmatic relationship of team members, the unique capabilities of team members, the task responsibilities of team members, the teaming strategy among the team members, and key personnel, with the amount of effort to be expended by each person during each year. Proposers should also provide a detailed plan for coordination, including explicit guidelines for interaction among subawardees, contractors of the proposed effort, risk management approaches, and descriptions of any formal teaming agreements that are required to execute the proposed research.

- ***Technical Plan -*** Proposers should outline and address technical challenges inherent in the approach and possible solutions for overcoming potential problems. This section should provide appropriate measurable milestones (quantitative if possible) at intermediate stages of the proposed research to demonstrate progress, and a plan for achieving the milestones. The technical plan should demonstrate a deep understanding of the technical challenges and present a credible (even if risky) plan to achieve the proposal's stated goal and discuss mitigation of technical risk.

  In the technical agenda, the proposer may broadly outline a general approach consistent across one or more *Task Areas* and *Phases* wherever appropriate, however, each *Task Area* and *Phase* must be proposed and budgeted independently so that, given the limited availability of funds, it may be possible to select individual *Task Areas* within a proposal.

  As part of their proposal, the team should document how they plan to transition their project results to NSTC within the technical narrative. This plan should include a discussion of the productivity gains for proposers, foundries, and others in the semiconductor ecosystem. Many elements of the plan are expected to overlap with the proposer's Intellectual Property Management Plan (see section 2.5.2). Additionally, the plan should highlight the benefits and integration of the research for other key programs, such as the CHIPS Manufacturing USA Institute, the CHIPS Metrology Program, or the DoD Commons. Furthermore, the plan should cover the transfer and maintenance of modeling software/scripts and how they can be made available to users, such as through cloud deployment, especially if such workflows depend on existing proprietary software.

- ***Fundamental Research Declaration -*** Proposers should identify which of the proposed research activities, if any, the proposer believes NSTC should consider as fundamental research and the rationale for that determination. For any proposed fundamental research, proposers should identify the involved project team member(s).

- ***Proposed International Collaborations -*** If an international collaboration is required for the project, proposers must provide a written justification demonstrating:
  - that the foreign partner's involvement is essential to advancing program objectives, such as by offering access to unique facilities, IP, or expertise that is otherwise not readily available in the United States;
  - the adequacy of any agreements and protocols between the proposer and foreign partner regarding IP protection and data protection;
  - the partnership does not jeopardize the soundness of the project's proposed pathway to domestic production;
  - as applicable, the foreign partner will comply with any necessary nondisclosure agreements, security regulations, export control laws, audit requirements, and other governing statutes, regulations, and policies; and
  - the foreign partner is not based in a foreign country of concern as defined at 15 U.S.C. §4651(7) and implemented by the final rule entitled Preventing the Improper Use of CHIPS Act Funding, 88 FR 65600 (Sept. 25, 2023), codified at 15 C.F.R. §231.104; and 6. the foreign partner agrees to be subject to a national security review by CHIPS R&D AND workforce, which may include a risk assessment of IP leakage, if appropriate.

- ***Intellectual Property and Rights Management Plan -*** Please refer to Section 2.5.3.

7.1.3 Appendices

- ***Table of Abbreviations and Acronyms*** - An alphabetical list of all abbreviations, acronyms, and their meanings.

- ***Bibliographic List of References*** - A complete bibliographic listing of all references used within the application.

- ***Table of Subawardees (Funded Participants) and Unfunded Collaborators*** - A table that identifies all organizations that will participate in and collaborate with

the awarded team, known at the time of the application submission. The table should consist of an alphabetically ordered list by organization of all team members, funded and unfunded, including any known contractors.

- ***Statement of Work (SOW)*** - Include a detailed statement of work that captures and defines all the work management aspects of your project. This should feature a more detailed work breakdown structure aligned with the major tasks outlined in the CFP and should include, but not be limited to, key tasks and activities necessary to achieve the project objectives, research methods and experimental designs to be used, and the expected outputs, such as reports, publications, datasets, software, and prototypes. Include start and end dates for each phase or key activity. The budget volume should align with the work breakdown structure of the SOW.

- ***A list of "Current PFAS" for Task Area 1 – Analysis proposals -*** Include a list of current internal analytical capabilities, including specific target and suspect PFAS that can be quantified and measured with your current validated methodology.

- ***A list of "Proposed PFAS" for Task Area 1 – Analysis proposals -*** If there are additional PFAS that proposers believe they could measure with future method development, optimization, validation, please include in list titled "Proposed PFAS".

- ***Budget Volume***
    - ***Budget Workbook*** - To be uploaded separately as an excel spreadsheet, using the Natcast approved Budget Workbook (BW) available at https://natcast.org/research-and-development/prism. The total proposed costs should be a sum of the total from all partners. Please do not submit separate tabs for separate partners. A detailed budget workbook is not required for all subawardees for the proposal. However, during contract negotiations, Natcast may request detailed information to support due diligence and finalizing the award agreement. ***Budget Narrative and Justification*** - Justifications for expenditures should be outlined in detail on the "Detailed Budget" tab, far right column marked "Justifications." All information must align with the amounts being requested for that individual line item and funding levels must be consistent with the project scope and allowable costs.

- ***Direct Labor*** - The budget justification for all staff/personnel should include the following: Job title, commitment of effort on the proposed project in terms of average number of hours per week or percentage of time, salary rate, total personnel charges for each identified position on the proposed project, description of the role of the individual on the proposed project and the work to be performed.
- ***Fringe Benefits*** - Fringe benefits for each position should be identified separately from direct labor and based on rates determined by your organizational policy. The items included in the fringe benefit rate (*e.g.,* health insurance, dental, life, FICA, etc.) This should not be charged under another cost category.
- ***Equipment*** - Equipment is defined as an item of property that has an acquisition cost of $10,000 or more (unless the organization has established lower levels) and an expected service life of more than one year. The budget justification should list each piece of equipment, the cost, and a description of how it will be used and why it is necessary for the successful completion of the proposed project. Please note that any general use equipment (computers, etc.) charged directly to the award should be allocated to the award according to expected usage on the project.
- ***Travel*** - For all travel costs, the budget justification for travel should include the destination, number of people traveling, duration, estimated transportation, lodging and per diem rates, and a description of how the travel is directly related to the proposed project. For travel that is yet to be determined, please provide the best estimates based on prior experience.
- ***Other Direct Costs*** - For costs such as supplies, printing, and publications. This can include fewer common items that do not have a specific heading within the budget template. Please list the item, cost, and the breakdown of the total costs by quantity or unit of cost. Include an explanation of the necessity of the cost for the completion of the proposed project.
- ***Contractual (i.e., Contracts or Consultants)*** - Each contract or consultant should be treated as a separate item. Identify the cost (daily rate x period) or fixed fee and describe the services to be provided and the necessity of contract to the successful performance of the proposed project. Contracts are for obtaining

goods and services for the use on the project and creating a procurement relationship with the contractor.

- ***Subaward (i.e., subrecipient)*** - Each subaward should be treated as a separate item. Identify the entity, cost, and describe the scope of work to be provided by the recipient and the necessity of the subaward to the successful performance of the proposed project. A subaward is for the purpose of carrying out a portion of an Award and creates a Federal financial assistance relationship with the subrecipient.
- ***Indirect/Overhead Rates*** - Commonly referred to as F&A, Overhead, Indirect Costs (IDC), are defined as costs incurred by the proposer organization that cannot otherwise be directly assigned or attributed to a specific project. The justification should include a cost calculation that reflects the applicable indirect cost rate.

- ***Proposed Milestone Payments –*** Proposers must articulate proposed programmatic milestones tied to their use of funds. Milestones will be used to negotiate payments and payment schedules with Natcast, if selected. Proposers may include proposed milestones to stand up programs, such as an initial advance, quarterly, and final payments. Each milestones should represent significant operational achievements or deliverables (*i.e.* key technical deliverables, reports, etc.) and major performance outcomes that align with the proposed scope, as described in their application.

- ***Table of Cost Share and Contributors -*** Where voluntary, committed cost share is offered, a table with details about all contributing sources of cost share, both cash and in-kind, including the rationale for selection of the contribution and the merits and risks associated with each known and anticipated contribution.
    - ***Leveraged Resources -*** Proposers are not required to provide cost sharing or matching funds. Including such funds is not one of the application screening criteria and applications that include any form of cost sharing or match will not receive additional consideration during the review process. Instead, Natcast considers any resources contributed to the project beyond the funds provided by the agency as leveraged resources. Proposers are strongly encouraged to leverage additional funds to support the project but leveraged resources are not required. Leveraged resources can come from a variety of sources, including, but not limited to, employers, industry associations, labor organizations, community-based

organizations, education and training providers, philanthropic organizations, and/or state, and local government.

- ***Domestic Production Plan*** - Per the guidelines in Section 2.6, proposers must explain the extent to which proposers plan to engage in production within the United States of any inventions that are or may be patentable (in the form of tangible assets) developed through this funding opportunity *(i.e.* sensors, devices, and abatement technologies*).*

  The Proposer must explain, at a minimum, whether and to what extent they plan to produce the sensors, devices, and abatement technologies in the United States. For instance, if the Proposer plans to produce the sensors, devices, or abatement technologies in the United States, it should specify the particular vendor and the physical location of that vendor, if known. Conversely, if the Proposer intends to produce the sensors, devices, or abatement technologies outside the United States, it must provide the same information (*i.e.,* the specific vendor and city in the chosen country) and additionally explain why production in the United States is not feasible, using the factors listed in Section 2.6 Domestic Production.

- ***Research Security Capabilities*** - All proposers must describe their research security capabilities and be prepared to develop or improve their research security plans if selected for an award.

  - ***(Insert Organization Name) Research Security Capabilities***

  Does the organization have an existing research security program (y/n)?

  If yes, by submitting this proposal, the proposer acknowledges that depending on an assessment by NIST in collaboration with Natcast, it may be asked to improve the described program as a condition of award.

  If no, by submitting this proposal, the proposer acknowledges that, if selected for award negotiation, the proposer has the capacity and intends to develop a robust Research Security Plan prior to receipt of the award demonstrating that Natcast funded research and associated IP and data products will be protected. The proposer also acknowledges that a lack of progress in implementing elements of such a plan may delay award or impact the

execution of the program, potentially halting progress until the plan is fully implemented.

- ***Research Security Overview (at most 3 pages)***

For organizations that have an existing research security program or elements of such a program, provide a written plan description that:

- Names a point of contact on research security issues within the project leadership team;
- Describes internal processes or procedures to address foreign talent recruitment programs, conflicts of commitment, conflicts of interest, research security training, and research integrity for application team personnel;
- Addresses cybersecurity in the planning, design, and project oversight phases, describing measures taken to ensure that appropriate practices for cybersecurity —such as the NIST Cybersecurity Framework and Cybersecurity and Infrastructure Security Agency (CISA) Cybersecurity Performance Goals (CPGs) —are incorporated; and
- Lists any relevant certifications in place or plans to obtain such certifications (e.g., FCL, CMMC, FedRAMP) and standards they follow (e.g. ISO/IEC 27001, ISO 8000-51, NIST 800-171).

Proposers *may refer to the CHIPS Technology Protection Guidebook as a reference.*

- **Quad Summery -** Submit a quad summary page (with 4 boxes each approximately 5” wide x 4” tall) that includes the following details:
  - Program Overview: A high-level summary of the project, capturing the key technologies to be developed within its scope.
  - Representative image or graphic: One or more image/visual relevant to the project.
  - Budget High level chart or table with key budget figures and timeline
  - Summary of Proposal details:
    - Team Lead
    - Team Composition
    - Focus Area(s)
    - Partnerships
    - TRL Level

The information on the quad summary page should not contain any details that are not already included in the proposal. See Appendix H for a sample of the document's format and content. Submit as a .docx compatible file in landscape mode. See appendix for sample layout.

- **Resumes or CVs -** Submit for all for all covered individuals, limited to two pages each, highlighting experience relevant to the proposed work.

- **Current and Pending Support Forms -** All "covered individuals" must enumerate current and pending support information for all federally funded research projects. A covered individual is defined as a person who contributes in a substantive, meaningful way to the scientific development or execution of a research and development project proposed. Note that NIST generally does not consider individuals who only conduct isolated tasks incidental to the research (for example, setting up equipment or performing administrative functions) or individuals who support research by executing discrete tasks as directed as covered individuals. Consistent with guidance for implementing NSPM-33, disclosures from broader classes of individuals (e.g., certain graduate students and undergraduate students) will generally be unnecessary, except when the activities of such an individual in a specific proposal rise to the level of meeting the definition of a "covered individual" under 42 U.S.C. § 6605(d)(1). For instance, NIST views authorship of a technical or scholarly publication as evidence of a truly substantial professional contribution to the research, given an author's participation in conceiving or evolving the project design, executing one or more significant aspects of the project, or documenting the project results in a form accessible to the scientific community.
- To facilitate the submission of this information, proposers must use the online form available at: https://forms.office.com/g/HscpN1n8Wz. Please note, in addition to all the information required on the NIST standard form, the online form requires the proposal application number and title to match those in the online submission portal at https://natcast.secure-platform.com/rnd/organizations/main/home.

- ***Letters of Commitment -*** Each partner organization and/or subawardee cited by the lead proposer as providing services to support the program model and lead proposer must submit a Letter of Commitment.

  Letters of Commitment must address the level of participation, qualifications of the personnel who will be actively involved, and how successful completion of

this project would positively impact their profession or community. Letters must be signed by an individual with authority to legally bind the organization to its commitment. Letters of Commitment must also specify any voluntary committed cost-share, including the specific services and/or products to be used in the project.

7.2 Appendix B: Research Security Plan Questionnaire

The information in this questionnaire is needed only at the time of award negotiations.

7.2.1 (Insert Organization Name) Research Security Plan

- ***Organizational leadership*** - Identify the organization's leadership.
  - Name of organization
  - Names and positions of organization's leadership
  - Point of contact

- ***Organizational policy*** - Attach the existing research security policy or the intent to develop such policy. For an organization needing to create a research security policy, please provide a timeline.
- ***Scope of Program***- Provide the research security scope or the intent to develop such scope. For an organization needing to create a research security scope, please provide a timeline.
- ***Research Security Team*** - Provide the research security team membership.
  - Name, position, and e-mail contact
  - Roles and responsibilities of team members

  For an organization needing to create a research security team, please provide a timeline.
- ***Technology and Intellectual Property Assessment*** - Attach an existing critical asset list that contains a minimum list of technologies and intellectual property that are pertinent to a funding application that are at risk from foreign adversaries.

  For an organization needing to create a critical asset list, please provide a timeline.

- ***Communication and training*** - Describe the current communication and training strategy. Please include type of training provided.

  For an organization needing to create a communication and training strategy, please provide proposed communication strategy, a proposed training scope, and a timeline.

- ***Technology Control Plans*** - For an organization with existing TCPs, please attach.

  For an organization without an existing TCP, please identify the intended solution and timeline.

- ***Reviews, Risk Determination, and Mitigation*** **-** Identify a research security review methodology and provide a timeline.

- ***Acceptance and Implementation*** **-** Outline a proposed research security program implementation timeline for the organization.

7.3 Appendix C: Illustrative Technical Report Template

7.3.1 Outcomes

- **Major Goals and Objectives**
  - Accomplishments in the current period
  - Plans for the Next Reporting Period

7.3.2 Outputs

- **Publications, Conference Papers, and Presentations**
  - List any publications, conference papers, and presentations produced during the reporting period.

- **Website(s) or Other Internet Site(s)**
  - Provide details of any websites or other internet sites developed as part of the project.

- **Technologies or Techniques**
  - Describe any new technologies or techniques that were developed.

- **Inventions, Patent or Copyright Applications, and/or Licenses**
  - List any inventions, patent or copyright applications, and/or licenses that resulted from the project.

- **Other Products**
  - Detail any other products such as data or databases, physical collections, audio or video products, software, models, educational aids or curricula, instruments or equipment, research material, interventions (e.g., clinical or educational), government ratification (*e.g.,* NIST, EPA, etc. for new analytical methods), or new business creation.

7.3.3 Risks and Changes

- **Risks and Risk Mitigation**
  - Consider maintaining a running list of significant uncertainties and their perceived impact on the project. Consider a risk matrix covering technical, managerial, and other uncertainties (*i.e.* market or external dependencies) versus impact on the project outcome (*i.e.* low, medium, high impact) depending on resolution. As progress is made, new risks or uncertainties may appear and others may be resolved.
  - If not already accounted for in the project plan, identify any actual or anticipated problems or delays and the actions or plans to resolve them.

- **Changes in Approach**
  - Describe any changes in approach to mitigate newly discovered risks or problems and the reasons for these changes.

- **Impact on Expenditures and Timeline**
  - Discuss any changes that have a significant impact on the timeline or budget and expenditures and the reason.

7.3.4 Schedule

Capture a high-level schedule that is aligned to the SOW, documenting progress against the baseline plan.

7.3.5 Actuals versus Forecast

Capture spend-to-date against the baseline budget for the cost of work completed. While there is no requirement for an earned value management system, it is expected that the performer maintains some level of internal control over the budgeted work, monitors performance against it, and describes any variances from the plan.

7.4 Appendix D: Illustrative Final Report Template

7.4.1 Required Sections

- **Introduction** - Overview of the project and its objectives
- **Project Outcomes or Findings** - Detailed description of the project's outcomes or findings, intellectual merit, and broader impacts
- **Publications and Outputs** - List of publications, patents, copyrights, presentation, articles, or disclosures of research results
- **Impact Analysis** - Comparison of the project's impact to the expected outcomes
- **Lessons Learned and Future Recommendations** - Insights and recommendations for future NSTC R&D Programs
- **Transition Plans and Commercialization** - Discuss how to advance the economic goals of the NSTC
- **Deliverables and Research Byproducts** - Descriptions, instructions, and artifacts associated with project deliverables and research byproducts, potentially including but not limited to:
    - Datasets
    - Source code
    - Object code
    - Curriculum and labs
    - Copyrighted materials
    - Prototypes (*i.e.* sensors, devices, and abatement technologies)
- **Expected Publication of Results** - Information on the expected publications of results and other relevant details for NSTC members
- **Citations and Links** - Citations and links to publicly accessible data and other public outputs

7.5 Appendix E: General Program Deliverable Details

Table 4. General Program Deliverables for PRISM, description, and target schedule.

ID	Title	Description	Target Schedule
1	Weekly Status Meeting	Project Team members representatives must meet for status updates to include details of any efforts and processes executed in support of this program.	First meeting must be held no later than 1 month from project award; hold meetings up to weekly thereafter.
2	Monthly Status Report (MSR)	Submit MSR in the form of a Microsoft (MS) Word document to identify key accomplishments and issues.	Submitted no later than 1 month from project award; monthly thereafter.
3	Monthly Project Team Meeting	Project Team meetings with all Project Team members to discuss details of any efforts and processes executed in support of this project.	First meeting considered the Kick-Off, will be held no later than 1 month from project award; monthly project teams thereafter. Minutes submitted no later than 7 days after meeting. May be captured in the MSR.
4	Financial Status Report	Summary of the budget, actual expenditures, and any variances. It should detail the costs incurred to date, remaining budget, and forecasted expenses. The report should also highlight any financial risks or issues, along with recommendations for addressing them.	Quarterly submission within 30 days of quarter end.
5	Quarterly Progress Report	Submit Quarterly Progress Report in the form of an MS Word document, Quad Chart, and briefing (slide deck) to identify key accomplishments in the reporting period, metrics, milestones achieved. Include a description of newly developed IP, including patentable inventions, software and research results, as well as any utilization activities of such IP. Project Team member representatives must meet with assigned Natcast personnel for milestone progress updates. Project continuation/termination decisions will be made by Natcast quarterly.	Quarterly Progress Report, Quad Chart, and briefing must be submitted no later than 4 months from project award; submit quarterly thereafter.

6	Quarterly Reviews	Natcast technical review.	First review conducted no later than 4 months from project award; conduct reviews quarterly thereafter. Reviews must be conducted within 14 days of receiving Quarterly Progress Report.
7	Final Project Report	Detailed description of project outcomes and findings, intellectual merit and broader impacts, list of publications and outputs, impact analysis, lessons learned and recommendations transition plans and commercialization deliverable research byproducts.	Due at the end of project.
8	Metrics Collection Plan	An intentional metrics collection plan with methodologies and a schedule that is specific to showing progress in advancing the TRL/MRLs of the project. Metrics must include Go/No-Go metrics.	Submit first plan no later than 2 months from project award; Submit revised plans annually thereafter.
9	Detailed Schedule	Schedules shall be provided for planning, statusing, controlling, modeling and specifying work activities throughout the project life cycle.	Submitted no later than 2 months from project award; monthly thereafter.
10	Risk Management Plan	Methods and procedures the contractor uses to implement a systematic and iterative process that efficiently identifies, analyzes, plans, tracks, controls, communicates, and documents risks associated with implementation of designs, plans, and processes.	Preliminary plan submitted no later than 2 months from project award; Final due no later than 4 months from project award; Update as required.
11	Developed Curriculum	All relevant course or training material and documentation for use by NSTC membership.	Submitted as it is developed during project, and no later than end of project.
12	Domestic Production Plan	Commercialization plan defining how results of research can be commercialized. Domestic production plan detailing the extent to which research can be produced domestically.	Submitted as developed during the project and included with Final Project Report.

13	Research Security Plan	Proposers must submit a detailed description of their Research Security Plan which includes cybersecurity, foreign travel, research security training, and export control.	Within 20 business days of execution of the Award, submit to Natcast for approval a timeline with milestones for implementation Research Security Plan. The plan must be implemented no later than 180 days of execution of the Award; plan is updated annually thereafter.
14	Covered Individual List	List of all individuals in support of the program updated as needed. Personnel change notifications are required, including submission of resumes/CV and Current and Pending support form for new personnel to ensure Research Security plan compliance.	Initial list due at contract award and updated periodically as needed. Natcast Research Security to provide status update on new individuals within 14 Days of receiving updates.

7.6 Appendix F: Illustrative Intellectual Property Management Plan Template

Model Intellectual Property Management Plan for PRISM

This model Intellectual Property Management Plan (IPMP) is intended to help you prepare an IPMP. If your proposal is selected, then the IPMP agreed upon between you and Natcast will be incorporated into the award agreement.

When completing your IPMP, we ask that you provide as much detail as reasonably possible in your response, following this model. You may format the information in any way you prefer, as long as it captures the necessary details outlined here.

The IPMP is intended to document the R&D results and the technology and IP expected to be developed through the NSTC PRISM Program and to describe the planned management of the technology and IP. The IPMP also provides you an opportunity to offer additional benefits or request exclusions from or limitations on the license and other terms described in the PRISM Call for Proposal (CFP) that you would want to be implemented in the award agreement with Natcast.

Table 5. PRISM Model IPMP.

IP	Details
1. Program deliverables	Based on the tasks listed under PRISM CFP 1.4 and the Deliverables under PRISM CFP 1.7: Please list the deliverables that you expect to be developed or delivered under the PRISM R&D program. The deliverables should include—and you should describe—all technology, data and other R&D results and related IP that you expect to be developed or generated in connection with the program. For each listed task/program deliverable, please make it clear if they will be subject to any requested exclusions or limitations as described in 2.
2. Requested exclusions or limitations	The PRISM CFP 2.5 calls for proposers to require certain IP terms for the deliverables and related IP to fully utilize the deliverables and practice the related IP in a manner that is consistent with the stated aims of the applicable NSTC PRISM Program as set forth in the call for proposals.

	Please list any requests for limitations on or exclusions from this use of the deliverables and related IP such as—*e.g.,* restrictions on commercial use; exclusions of preexisting technology or IP incorporated in or necessary for use of the deliverables; or commercial conditions (*i.e.,* pricing, licensing, or other commercial terms) applicable to pre-existing technology to be included in the deliverables or such related IP. In requesting any exclusions or limitations above: Please explain how the exclusions or limitations are consistent with the stated aims of the PRISM R&D program. If you are requesting to exclude preexisting technology or IP, please: describe with as much specificity as reasonably possible the technology or IP that would be excluded or limited (*i.e.,* APIs, pre-existing workflows, recipes, commercially available software or tools, etc.); and describe how the excluded or limited technology or IP is used in or relates to the program deliverables, and how such exclusion or limitation may affect the useability of the deliverables. Please describe whether and, if so, how Natcast's right to sublicense to NSTC members would be limited.
3. IP benefits	If applicable, please describe any technology or IP benefits, in addition to the technology and IP benefits required by the PRISM R&D program, that you are willing to offer to Natcast and NSTC members.
4. Alternative IP terms	If you believe that alternative IP terms (*e.g.,* replacements for or additions to the IP terms described in the call for proposals) would enable you to better achieve PRISM R&D program goals, please include your proposal for such alternative IP terms. Please explain how these alternative IP terms would help to achieve the goals of the PRISM R&D program.

5. Encumbrances	If applicable, please identify encumbrances, if any, on the deliverables and related IP (*i.e.,* previously granted exclusivity, security interests of financing sources, etc.) and how the encumbrances could affect your ability to meet PRISM R&D program obligations or goals, including any commitment to provide rights to Natcast and NSTC members, as applicable.
6. Publication and public dissemination	If you want to publish or otherwise publicly disseminate results or findings from the PRISM R&D program, please indicate: *(1.)* if you want to do so; and *(2.)* whether the proposed research is fundamental or non-fundamental (and provide an explanation for that characterization).*).*
7. Domestic control	Please describe how your planned ownership and management of patents and patentable inventions developed under the PRISM R&D program will enable compliance with the domestic control requirements of the CHIPS Act, including your plans to protect such IP from access or use by foreign adversaries.
8. Domestic production	Based on PRISM CFP 2.6, please describe your plans to engage in domestic production in the United States of products practicing patents or patentable inventions made using funding under the PRISM R&D program.

If your proposal is selected, then the IPMP agreed upon between you and Natcast will be incorporated into the award agreement. You may also be required under the award agreement to update parts of the IPMP during, and for a limited period of time after, the NSTC PRISM R&D program.

If you choose not to request any exclusions, limitations, or other additional terms, the terms as described in PRISM CFP will apply and be implemented in the award agreement.

7.7 Appendix G: Acronyms and Definitions

7.7.1 Acronyms

- **AI/AE -** Artificial Intelligence-powered Autonomous Experimentation
- **BW –** Budget Workbook
- **CARISSMA -** CHIPS AI/AE for Rapid, Industry-informed Sustainable Semiconductor Materials and Processes
- **CFP –** Call for Proposals
- **DRE –** Destruction Removal Efficiency
- **EPA –** U.S. Environmental Protection Agency
- **FEOCs –** Foreign Entities of Concern
- **FFRDCs -** Federally Funded Research and Development Centers
- **FTIR -** Fourier Transform Infrared Spectroscopy
- **GHG –** Greenhouse gas
- **IAC -** Industrial Advisory Committee
- **IP –** Intellectual Property
- **LCA –** Life-cycle Assessment
- **MAPT -** Microelectronics and Advanced Packaging Technologies Roadmap
- **MCL –** Maximum Contaminant Level
- **MEMS -** Microelectromechanical System
- **NM –** nanometer
- **NPDES -** National Pollutant Discharge Elimination System
- **NPDWR -** National Primary Drinking Water Regulation
- **NSDD -** National Security Decision Directive
- **NSTC -** National Semiconductor Technology Center
- **OECD -** Organization for Economic Cooperation and Development
- **PFAS –** Per-and polyfluoroalkyl substances
- **PFCs –** Perfluorinated Compounds
- **POU –** Point of Use
- **PPB –** Parts per billion
- **PPT –** Parts per trillion
- **PRISM -** PFAS Reduction and Innovation in Semiconductor Manufacturing
- **SOW –** Statement of Work
- **TCO –** Total Cost of Ownership
- **TOF –** Total Organic Fluorine
- **TRL –** Technology Readiness Level
- **U.S. –** United States

7.7.2 Definitions

- **Collaborator** – An unfunded entity, or individual, that provides property, equipment, subject matter expertise, or other assistance in connection with the PFAS program.
- **Contractor** – An entity from whom the Awardee purchases property, equipment, or subject matter expertise consultative services needed to carry out an Awardee program.
- **Fundamental Research** - basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons, according to NSDD 189.
- **Nontarget PFAS** - unexpected or unknown PFAS with no *a priori* information.
- **Subawardee** - An entity that carries out a defined portion of a program's scope of work. Natcast Program Management oversees the overall execution of program deliverables
- **Suspect PFAS** - PFAS for which compound-specific information exists (*i.e.* in the form of a database or spectral data) that can be used to search for and confirm the presence or absence of specific PFAS compounds and in some cases, semi-quantitative information.
- **Target PFAS** - PFAS for which authentic reference standards exist for identification and quantification.

7.8 Appendix H: Quad Summary Page

Quad Summary

The information on the quad summary page should not contain any details that are not already included in the proposal. Below is a sample of the document's format and content. Submit as a .docx compatible file in landscape mode.

Proposal Title

1. Program Overview – High level summary of the proposed project	4. Summary of Proposal Details – High level summary of the proposed project details • Team Lead • Team Composition • Focus Area(s) • Task Area(s) • Partnerships • TRL level
2. Representative graphic – Image, graphic, or visual relevant to the proposed project	3. Budget chart– High level budget chart or table with key budget figures