Department of Commerce (DOC) Fiscal Year 2022 Agency Report

1. Please provide a summary of your agency's activities undertaken to carry out the provisions of OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities" and the National Technology Transfer and Advance Act (NTTAA). The summary should contain a link to the agency's standards-specific website(s) where information about your agency's standards and conformity assessment related activities are available.

The Department of Commerce's (DOC) mission is to create the conditions for economic growth and opportunity for all communities. Through its 13 bureaus, DOC works to drive the United States (U.S.) economic competitiveness, strengthen domestic industry, and spur the growth of quality jobs in all communities across the country. DOC serves as the voice of business in the federal government, and at the same time, touches and serves every American every day.

DOC fosters the innovation and invention that underpin the U.S. comparative advantage. Its scientists and engineers research emerging technologies and actively provide their knowledge to the voluntary standards development process. Data collected and analyzed by DOC is used by federal and local governments as well as by businesses. Companies benefit from DOC laboratories in conducting research and development (R&D) and in scientific and technical leadership. DOC advances R&D of the commercial space industry and climate science and uses intellectual property (IP) protections to ensure American innovators profit from their work. Together with other branches of DOC, the five branches listed in this report support the strategic goals of enhancing U.S. leadership, accelerating job creation, strengthening U.S. economic and national security, fulfilling constitutional requirements, and delivering excellent customer service. The following report compiles information about how these organizations used their engagement in voluntary consensus standards and conformity assessment activities during FY2022 to support these critical mission areas in fulfillment of the Office of Management and Budget (OMB) and the National Technology Transfer and Advancement Act (NTTAA) reporting requirements.

<u>The U.S. Census Bureau (Census Bureau)</u>

The Census Bureau applies voluntary consensus standards from organizations such as the International Organization for Standardization (ISO), the American National Standards Institute (ANSI), the Open Geospatial Consortium (OGC), and the Federal Geographic Data Committee (FGDC) to all the Census Bureau statistical surveys, economic analysis, geographic programs, and products.

The 2022 Census Bureau geographic products include: the most current legal, statistical, and administrative boundaries and names for urban areas, congressional districts, and State Legislative Districts (Upper and Lower Chambers) as collected by the Census Bureau are available as TIGER/Line Shapefiles. Harvesting the metadata to the GeoPlatform.gov and

Data.gov using ISO metadata standards is a requirement of the Geospatial Data Act (GDA) of 2018 for the Census Bureau's NGDAs

The Census Bureau led the development of ISO 19160-3, Addressing – Part 3: Quality management for address data and is actively involved in the development of ISO 19160-2, Addressing - Part 2: Assigning and maintaining addresses for objects in the physical world (see item 9 below). These standards and programs, in addition to ongoing research and innovation activities, were designed to improve public access, discoverability, integration, data sharing, and to support the open government initiative and the provisions of OMB Circular A-119.

Standards Development and Policies: In 2022, the following activities exemplified the Census Bureau's direct application of standards policies, membership in standards bodies, ISO standards licensing, and continued development of voluntary consensus standards to implement within the GSP and its geospatial data products.

1. Commerce continues to provide leadership to the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM), helping to promote innovation, leadership, frameworks, and partnerships to enhance geospatial information management globally. The Census Bureau is the appointed head of the U.S. Delegation to the UN-GGIM and Co-Chair for the High-level Group on the Integrated Geospatial Information Framework (IGIF).
2. In 2021, the Commerce Geospatial Working Group (CGWG) published the Commerce Geospatial Strategy (2021-2024) and the associated Commerce Geospatial Strategic Action Plan. In 2022, DOC made significant progress in meeting the GDA requirements, including monthly reporting to DOC's Chief Data Officer and DOC's Data Governance Board on key Commerce Geospatial Strategic Action Plan milestones and accomplishments. These documents refer to open international standards, standards initiatives, metadata standards implementation, and standards development to support enhanced interoperability and equitable access to all DOC geospatial data users. In FY21, DOC established terms of Reference and a Membership List for the Commerce Geospatial Standards Users' Group (CGSUG) to leverage geospatial expertise and innovation in standards.
3. During FY22, the CGWG supported the continuation of the CGSUG to raise awareness on critical geospatial topics and activities pertaining to standards. The CGSUG has established a core team dedicated to metadata and standards with members from the Census Bureau, the National Oceanic and Atmospheric Administration (NOAA), and the National Institute of Standards and Technology (NIST). The CGDUG has developed a library to hold metadata and standards documentation, participated in voluntary consensus standards development, collaborated with the OGC, and attended training on metadata standards and compliance.

4. The Census Bureau recently published the U.S. Census Bureau - Strategic Plan-Fiscal Year 2022 Through Fiscal Year 2026 (January 2022) and the GSP Program Strategic Plan, Fiscal Year 2022 Through Fiscal Year 2026 (August 2022). Both plans emphasize the importance of a nationwide geographic database with boundary information for legal, statistical, and administrative areas to support the Census Bureau's programs and activities. Methodological and technical advances in the global statistical and geographic communities reflect in the geographic data production and the development of tools, applications, and standards shared with international organizations such as the UN-GGIM and the Pan American Institute of Geography and History. The GSP operates within the constraints of U.S.C. Title 13, U.S.C. Title 15, and U.S.C Title 26 and federal geographic, address, and statistical standards.
5. Census Bureau staff are leading address standards development through the International Committee for Information Technology Standards (INCITS) Technical Committee L1 - Geographic Information Systems (INCITS-L1) and the U.S. Technical Advisory Group to the ISO Technical Committee 211 Geographic information/Geomatics (TC 211).
6. As a requirement of the GDA, the Census Bureau staff participated in the DOC Office of the Inspector General's GDA Audit in FY22 and completed initial deliveries of the FGDC Covered Agency Report and Lead Covered Agency reports to provide information on their use of the ISO standards for all geospatial data, including 34 NGDAs.
7. The Census Bureau's NGDA datasets represent a portfolio of geospatial datasets derived from the MAF/TIGER System. The Census Bureau's TIGER/Line shapefiles for these NGDAs are accessible by the public and discoverable on Census.gov, GeoPlatform.gov, and Data.gov. Each year, Census NGDAs are harvested to these open data portals using metadata standards INCITS/ISO 19115-2:2019 (2019) Geographic information - Metadata - Part 2: Extensions for acquisition and processing, INCITS/ISO/TS 19139-2:2012 (2017) Geographic information - Metadata XML schema implementation - Part 2: Extensions for imagery and gridded data, and adherence to FAIR principles (Findable, Accessible, Interoperable, Reusable).
8. Census Bureau Geospatial Standards Working Group (CBGSWG) facilitates monthly meetings relating to implementing geospatial standards for Census Bureau products and services. In FY22, the CBGSWG documented metadata creation, quality control, and harvesting activities for the Census Bureau's NGDAs, produced a geospatial product inventory, and developed a road map for future standards activities.
9. The Census Bureau submitted responses, to the FGDC, for the NGDA Baseline Standards Inventory Survey in October 2020 and has renewed licensed subscriptions to twenty-three ISO standards through the American National Standards Institute (ANSI):

- INCITS 31-2009 (R2019) Information Technology - Codes for the Identification of Counties and Equivalent Areas of the United States, Puerto Rico, and the Insular Areas.
- INCITS 38-2009 (R2019) Information Technology - Codes for the Identification of the States and Equivalent Areas within the United States, Puerto Rico, and the Insular Areas.
- INCITS 446-2008 (R2018) Information Technology - Identifying Attributes for Named Physical and Cultural Geographic Features (Except Roads and Highways) of the United States, Territories, Outlying Areas, and Freely Associated Areas, and the Waters of the Same to the Limit of the Twelve-Mile Statutory Zone.
- INCITS 454-2009 (R2019) Information Technology - Codes for the Identification of Metropolitan and Micropolitan Statistical Areas and Related Statistical Areas of the United States and Puerto Rico.
- INCITS 455-2009 (R2019) Information Technology - Codes for the Identification of Congressional Districts and Equivalent Areas of the United States, Puerto Rico, and the Insular Areas.
- INCITS/ISO 19110:2016 (2018) Geographic information - Methodology for feature cataloging.
- INCITS/ISO 19111:2007 [R2012] Geographic information - Spatial referencing by coordinates.
- INCITS/ISO 19115-1:2014 (R2019) Geographic information - Metadata- Part 1: Fundamentals.
- INCITS/ISO 19115-2:2019 (2019) Geographic information - Metadata - Part 2: Extensions for acquisition and processing.
- INCITS/ISO TS 19139:2007 [2015] Geographic information - Metadata XML schema implementation.
- INCITS/ISO/TS 19139-2:2012 (2017) Geographic information - Metadata XML schema implementation - Part 2: Extensions for imagery and gridded data.
- INCITS/ISO 19157:2013 (R2019) Geographic information - Data Quality.
- INCITS/ISO 19115-2003 Geographic information - Metadata.
- INCITS 453-2009 [R2014] Information Technology - North American Profile of ISO 19115:2003 - Geographic Information - Metadata (NAP - Metadata).
- INCITS/ISO/TS 19115-3:2016 (2017) Geographic information – Metadata – Part 3: SML Schema Implementation for Fundamental Concepts.
- INCITS/ISO/IEC 19757-3:2016 (2018) Information technology - Document Schema Definition Languages (DSDL) - Part 3: Rule-based validation – Schematron.
- INCITS/TR-47-2012 (R2017) INCITS Technical Report for Information Technology - Fibre Channel - Simplified Configuration and Management Specification (FC-SCM).
- ISO/IEC 19757-3:2020 Information technology - Document Schema Definition Languages (DSDL) - Part 3: Rule-based validation using Schematron.

- ISO 19115-2:2009 Geographic information - Metadata - Part 2: Extensions for imagery and gridded data.
- ISO 3166-1:2020 Codes for the representation of names of countries and their subdivisions - Part 1: Country code.
- ISO 3166-2:2020 Codes for the representation of names of countries and their subdivisions - Part 2: Country subdivision code.
- ISO 3166-3:2020 Codes for the representation of names of countries and their subdivisions - Part 3: Code for formerly used names of countries.
- ISO/IEC 10646:2020 Information technology - Universal coded character set (UCS).

10. ISO 19160-2: The Census Bureau continued active involvement in the development of ISO 19160-2, Addressing - Part 2: Assigning and maintaining addresses for objects in the physical world. This standard specifies how to plan, implement, and maintain addresses and corresponding address data to gain maximum benefits for governance and society. While the Census Bureau does not assign addresses within local communities, it has extensive experience in national address data management and an understanding of the principles and requirements necessary to create an address maintenance system. This standard will be valuable to stakeholders embarking on new addressing systems (e.g., developing countries, communities planning or considering a re-addressing initiative) and those that want to enhance their existing systems. Through participation in the development of ISO 19160-2, the Census Bureau gains valuable knowledge about how other nations maintain their data. This project also has the potential to help the Census Bureau's partners improve their address assignment and maintenance systems, which in turn will benefit the Census Bureau and other federal agencies seeking to obtain current, complete, and accurate address data. Expect ISO 19160-2 to publish in early 2023.

International Trade Administration (ITA)

ITA strengthens the competitiveness of U.S. industry, promotes trade and investment, and ensures fair trade through the support of rigorous enforcement of U.S. trade laws and agreements. Through its participation on U.S. delegations addressing global standards development and trade-related standards issues, ITA works to improve the global business environment and helps U.S. organizations compete at home and abroad. Information on ITA's work on standards can be found at: https://www.trade.gov/standards-information-and-resources.

In FY2022, ITA participated in a variety of trade-related international standards activities including standards development along with engaging in policy dialogues and capacity building efforts. ITA experts participated in the U.S. Technical Advisory Group (TAG) to ISO/TC293, Feed Machinery to support U.S industry's engagement through ITA's Market Development Cooperator Program (MDCP). ITA representatives also joined the virtual TAG for the recently

formed ISO Special Advisory Group on Smart Farming (SAG SF), tasked with developing a gap analysis and standardization road map for smart farming applications.

ITA regularly notifies relevant U.S. stakeholders about opportunities to participate in new standards development activities that might have trade implications with the aim of preventing future market access issues for U.S. exporters. In FY2022 ITA also worked with NIST, the National Telecommunications and Information Administration (NTIA) and the Department of State to publish a monthly newsletter highlighting international standards development activities in critical and emerging areas where U.S. engagement could benefit commercial goals.

During FY2022, three U.S. Commercial Service officials from the U.S. Embassy in Mexico City and the U.S. Consulate General in Guadalajara participated in the working group for Mexican technical regulation NOM-194 on safety devices for passenger vehicles, convened to review public comments on the draft technical regulation.

ITA participates in the ANSI Unmanned Aircraft Systems Standards Collaborative. An ITA specialist continues to participate in the Smart Textiles Subcommittee of ASTM Committee D13 on Textiles and a staff member of the Commercial Section in the U.S. Embassy in Mexico City participates in the monthly sessions of Mexico's National Textile Standards Committee to monitor standards that could impact U.S. textiles and apparel exporters.

In FY2022 ITA was represented on interagency teams addressing standards policy and development in the International Civil Aviation Organization (ICAO), the World Health Organization (WHO) and in Codex Alimentarius. ITA worked on standards capacity building in the Asia-Pacific Economic Cooperation (APEC) Forum and the Association of Southeast Asian Nations (ASEAN) in areas including food safety, medical devices, cybersecurity, autonomous and electric vehicles, and conformity assessment. ITA engaged on standards issues with the ASEAN Consultative Committee on Standards and Quality (ACCSQ), including organizing workshops and discussions on advanced manufacturing and digital trade standards – particularly those related to cybersecurity and promoting digital trust - and work on standards for critical and emerging technologies through the Quad (Australia, India, Japan, and U.S.) including on Artificial Intelligence (AI) and advanced communications.

Bilateral engagement on standards issues was ongoing with various trading partners including through the U.S.-Brazil Commercial Dialogue, the U.S.-Singapore Partnership for Growth and Innovation, and the U.S.- European Union (EU) Trade and Technology Council (TTC), among others. ITA maintained Standards Attaches in Beijing, Brussels, Johannesburg, Mexico City, and Sao Paulo.

ITA staff serve as part of the U.S. delegation headed by the Office of the U.S. Trade Representative (USTR) to the World Trade Organization's (WTO's) Committee on Technical Barriers to Trade (TBT) that addresses specific standards-related trade concerns. ITA, in coordination with USTR, pursued standards and conformity assessment-related trade concerns on the floor of the WTO TBT Committee against a number of countries in FY2022, including but

not limited to China, India, Indonesia, the European Union, and Saudi Arabia. During FY2022, ITA also participated as part of the USG delegation for negotiations with Uruguay on a good regulatory practices (GRP) annex under the U.S-Uruguay Trade and Investment Framework Agreement (TIFA), in GRP negotiations with Taiwan, towards development of a GRP declaration under the Summit of the Americas, and in collaborative discussions with Kenya on TBT and standards. ITA regularly works with U.S. industry to address issues of non-compliance with trade agreement commitments found in the WTO TBT Agreement and respective Free Trade Agreement (FTA) TBT chapters.

Finally, ITA co-manages the Industry Technical Advisory Committee on Standards and Technical Trade Barriers (ITAC 15) with USTR which provides input to the Secretary of Commerce and USTR on standards-related policy matters.

National Institute of Standards and Technology (NIST)

NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve the quality of life. Below are a few of NIST's activities in several high priority areas addressing practical aspects of critical and emerging technologies and fundamental research illuminating potential new areas of interest for manufacturers.

As specified in the NTTAA, in authorizing legislation, and in OMB Circular A-119, NIST, through its Standards Coordination Office (SCO), assists and guides federal agencies in leveraging voluntary consensus standards and private sector conformity assessment mechanisms in their programs, procurement, and regulatory activities. SCO chairs the Interagency Committee on Standards Policy (ICSP) and works closely with federal agencies to reduce unnecessary duplication and complexity in standards and conformity assessment practices. The ICSP created two new working groups on Artificial Intelligence and Advanced Communications Technologies to advance interagency standards coordination in these critical areas. SCO provides consultation and advice to other Federal agencies in implementing conformity assessment programs, and holds leadership roles in ANSI governance, policy, and program oversight committees. SCO also hosts www.Standards.gov to serve as a standards and conformity assessment related resource for Federal agencies, industry, and the public.

5G Network Security

Through participation in 5G security-focused standards setting groups, NIST provides contributions and impact specifications relevant to our various areas of cybersecurity expertise. Some of these areas include cybersecurity risk management, identity and access management, and cryptography, including quantum safe cryptography. NIST participates actively in 3rd Generation Partnership Project (3GPP)'s Service and System Aspects – Security (SA3) working group.

Artificial Intelligence

NIST chaired the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) Joint Technical Committee 1 Subcommittee (JTC 1 SC) 42 (Artificial Intelligence) working group (WG) 2 on AI and Data. The efforts of WG 2 advanced and matured ISO/IEC 5259 - Parts 1-5 Data Quality for Analytics and Machine Learning. NIST has been very active in ISO/IEC JTC 1 SC 27 Information security, cybersecurity, and privacy protection. SC 27 initiated an approved work item (AWI) project, ISO/IEC AWI 27090 *Cybersecurity — Artificial Intelligence — Guidance for addressing security threats and failures in artificial intelligence systems*. ISO/IEC AWI 27090 in its final form, will provide guidance for organizations to address security threats and failures in artificial intelligence (AI) systems.

Automotive Industry

NIST leads the U.S. TAG to ISO/IEC TC 22 SC 32 WG 12 Software Update for Road Vehicles and published the first international standard on updates to vehicles *ISO 24089:2023 – Software update engineering for road vehicles.* NIST staff served as the co-chair for the Cybersecurity Assurance Levels (CAL)/Targeted Attack Feasibility (TAF) project group that is working on follow-up work to the first international standard on automotive cybersecurity under the Joint Working Group for ISO and Society of Automotive Engineers (SAE) International.

Biometrics

NIST served as the chair of ISO/IEC JTC 1 SC 37 on Biometrics and contributed to the activities of multiple working groups under SC 37 focused on image quality for both face and fingerprint and demographic variations in performance. NIST actively engaged in the drafting of ISO/IEC 29794-5 *Information Technology – Biometric sample quality – Part 5: Face Image Data* and ISO/IEC CD 19795-10 *Information Technology – Biometric performance testing and reporting – Part 10: Quantifying biometric system performance variation across demographic groups*. NIST staff were also heavily involved with preparing updates to ISO/IEC 29794-4 I*nformation technology – Biometric sample quality – Part 4: Finger image data*. NIST has also supported cross-cutting work on new terminology for use in evolving voice biometric standards with the aim of facilitating a uniform understanding of voice biometrics across U.S. government agencies.

Biotechnology

NIST manages the U.S. TAG to ISO TC 276 on Biotechnology. ISO TC 276 develops standards and reports addressing biobanks and bioresources, analytical methods, bioprocessing, data processing, and metrology related to biotechnology. NIST also serves as the chair of ISO TC 276 WG3 on analytical methods. TC 276 published 8 standards in FY 2022 and has 18 standards documents under development. NIST actively participates in all projects developed under this technical committee.

Blockchain

NIST actively participates in the activities of ISO TC 307 on Blockchain and Distributed Ledger Technologies and its U.S. mirror committee. NIST has contributed to ISO 22739 - *Blockchain and*

distributed ledger technologies — Vocabulary and several other projects on identity, security, and interoperability, including a collaboration on digital currencies that is synchronized with interagency colleagues active in ISO TC 68 on Financial Services.

Biomedical

NIST served as a member of the Bioimaging North America (BINA) Quality Control and Data Management Working Group, with a focus on building a metrology suitcase for calibrating fluorescent microscopes and on image quality metrics. NIST also served as a member of the Quality Assessment and Reproducibility for Instruments & Images in Light Microscopy (QUAREP-LiMi), Image Quality WG 10 and Stage Control WG 6. In addition, NIST engaged in the Data Management WG focused on uploading, storing, and downloading large microscopy datasets. The group aims to prepare a white paper that discusses funding the infrastructure for biomedical research.

Cyber Infrastructure

NIST played key leadership roles in support of cyber infrastructure standardization. A NIST representative served as the INCITS Subcommittee Vice Chair for ISO/IEC JTC 1 SC 38, the WG 3 Ad-Hoc Chair within SC 38, and the SC 38 Advisory Group Stakeholder Engagement Chair. NIST served as Chair of the Industry Internet of Things (IoT) (II) Consortium Architecture Task Group and various draft standards within the II Consortium. In addition, NIST actively participated in ISO/IEC JTC 1 SC 41 (IoT and Digital Twins) WG 3 activities, served as lead architect on ISO/IEC 30141 Internet of Things Reference Architecture ed2, and served on Advisory Group 8, also within ISO JTC 1, on Meta Reference Architecture and Reference Architecture for Systems Integration.

Cybersecurity

NIST contributes to various international standards development efforts related to cybersecurity risk management. The latest revision of ISO/IEC 27002 information security controls was published in February 2022 and contains attributes and concepts that align with the functions of the NIST Cybersecurity Framework. NIST serves as editor for a project (ISO/IEC 27028) developing guidance on using these attributes in ISO/IEC 27002 and will remain active within ISO/IEC JTC 1 SC 27 to help promote alignment between ISO standards and NIST resources, including the transition to the NIST Cybersecurity Framework Version 2.0. NIST also served as co-editor of recently published ISO/IEC 27070 - *Security techniques — Requirements for establishing virtualized roots of trust*. NIST participated in revisions to ISO/IEC 27017 - *Security techniques — Code of practice for information security controls based on ISO/IEC 27002 for cloud services*.

Cryptography and Post-Quantum Cryptography

NIST has made contributions to the revision of ISO/IEC 18031 *Information technology — Security techniques — Random bit generation* to facilitate alignment with NIST Special

Publication (SP) 800-90. NIST also contributed to ISO/IEC14888-4 *Information security – Digital signatures with appendix – Part 4: Stateful hash-based mechanisms* to facilitate alignment with the stateful hash-based signatures specified in NIST SP 800-208. NIST staff has served as a co-editor on ISO/IEC preliminary work item (PWI) 19541 -- *Inclusion of key encapsulation mechanisms for Post-Quantum Cryptography*.

Cryptographic Module Validation

The Cryptographic Module Validation Program (CMVP) is the validation authority for Federal Information Processing Standards (FIPS) 140-3. FIPS 140-3 "Security Requirements for Cryptographic Modules" and NIST SP 800-140 "FIPS 140-3 Derived Test Requirements (DTR): CMVP Validation Authority Updates to ISO/IEC 24759" align with the following ISO/IEC standards: ISO/IEC 19790 and ISO/IEC 24759, respectively. Two NIST staff members participated in ISO/IEC JTC 1 SC 27 WG 3 activities to develop both standards.

Digital Evidence and Forensic Science

NIST served as Liaison to the Scientific Working Group on Digital Evidence (SWGDE) Executive Committee and as Project Lead on Quality Management for SWGDE. NIST also served as Vice Chair for the Organization of Scientific Area Committees Digital Evidence Sub-Committee and participated in the (American Society for Testing and Materials) ASTM E.30 on Forensic Sciences.

Identity Management and Authentication

NIST participates in several committees and standardization initiatives related to identity management and authentication, including ISO/IEC 24760 series - *A framework for identity management*, ISO/IEC 23220 - *Building blocks for identity management via mobile devices* series, ISO/IEC 18013 Part 5 - *Mobile driving license (mDL) application* and Part 7 - *Mobile driving license (mDL) add-on functions*.

Interoperable Health Information

NIST held leadership positions as the Health Level 7 (HL7) Conformance Work Group Co-chair, HL7 v2 Management Board Member, and HL7 Healthcare Device Work Group Co-chair. A NIST representative also served as the test lead for Integrating Healthcare Enterprise (IHE) devices and participated in IHE-DEV technical and planning committees. NIST contributed to various activities within the HL7 V2 Management Working Group (V2MG) and the HL7 Terminology Services Management Working Group.

Internet of Things (IoT)

NIST is actively engaged within JTC1 SC 27 WG 4 on IoT Security activities, including significant contributions to ISO/IEC 27404 - *Cybersecurity labelling framework for consumer IoT* and ISO/IEC 27402 - *IoT security and privacy - Device baseline requirements.* Within IETF, NIST co-

chairs the Software Updates for Internet of Things (SUIT) working group focused on designing a firmware update solution suitable for tiny IoT devices.

Privacy

NIST provided extensive technical contributions to ISO/IEC 27557 - *Application of ISO 31000:2018 for organizational privacy risk management*. This standard offers a framework for assessing organizational privacy risk, with consideration of the privacy impacts on individuals as a component of overall organizational risk. NIST also engaged on ISO/IEC 31700 - *Privacy-by-design for Consumer Goods and Services*, a multi-part publication focused on supporting consumer trust in the digital economy. NIST contributed to Part 1 on high-level requirements, and Part 2 on use cases. NIST contributions for both documents promoted alignment with NIST privacy risk management and privacy engineering guidance. NIST also serves as project editor for the revision of ISO/IEC 27018 – *Security Techniques —Code of practice for protection of personally identifiable information (PII) in public clouds acting as PII processors,* which is updating privacy controls for use by cloud service providers.

Usability

NIST contributed to standards on the testing of usability-related information. As experts in Joint Working Group 28 of ISO/IEC JTC 1 SC 7 on software and systems engineering, NIST participated in writing the ISO/IEC TC 159 SC 4 and ISO 2506x series of standards on Common Industry Formats (CIF) for Usability Reports. NIST also worked on revisions for the following documents: ISO/Technical Report (ISO/TR) 25060 – *General framework for usability-related information*; ISO 25062 – *Reporting usability evaluations* and ISO 25066 – *Evaluation report*.

International Cooperation

NIST co-chairs the 1) U.S.-EU Trade and Technology Council, Technical Standards Working Group with ITA and 2) The QUAD Critical and Emerging Technology Working Group's Technology Standards Sub-Group with the Department of State. These efforts identify areas of standards cooperation aligned with technology leadership and trade facilitation and are focused on cooperative work in areas such as artificial intelligence and advanced communications technology.

National Oceanic and Aeronautic Administration (NOAA)

NOAA's mission hinges on the effective sharing of its data for use by the public, industry, and academia. That sharing is underpinned by standardization of data acquisition and data management practices. NOAA seeks to establish and use voluntary standards with selected industrial associations, academia, and national organizations of state and local governments (e.g., the American Association of State Climatologists), as well as through participation in professional societies (e.g., American Meteorological Society (AMS)) and Standards Development Organizations (e.g., Open Geospatial Consortium (OGC)) as well as international organizations (e.g., United Nations (numerous committees) and International Hydrographic

Organization (IHO)). All NOAA line organizations participate in standards development activities, which are coordinated through NOAA's Data Governance Committee (DGC), which is chaired by the NOAA Chief Data Officer.

Standards used in many NOAA activities are established in conjunction with other Federal agencies either through joint participation in national (e.g., Federal Geographic Data Committee (FGDC)) and international (e.g., United Nations committee of experts on Global Geospatial Information Management (UN-GGIM)) organizations or by means of bilateral and multilateral agreements with other nations.

The following presents highlights examples of the ways that NOAA actively engages in not only the adoption of but also the development of voluntary consensus standards:

- NOAA is an active leader, participant, and contributor to the FGDC, the lead entity (established by Geospatial Data Act of 2018 (GDA)) for the development, implementation, and review of policies, practices, and standards relating to geospatial data across the Federal government and the National Spatial Data Infrastructure (NSDI), which per Executive Order 12906 (Coordinating Geographic Data Acquisition and Access) is the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data. NOAA leads four NSDI data themes and contributes to many others.
    - NOAA and Census co-led the Department of Commerce's response to the recently completed 2022 Department of Commerce Inspector General's GDA Audit. NOAA's Chief Data Officer is the Senior Agency Official for Geospatial Information. NOAA and Census co-developed an action plan to address the Audit's five recommendations.
- NOAA leads the Integrated Ocean Observing System (IOOS), a part of the Global Earth Observing System of Systems (GEOSS), which ascribes to the GEOSS data sharing principles as a core capacity. The U.S. IOOS Program Office is organized into two divisions that implement policies, protocols, and standards to implement IOOS and oversee the daily operations and coordination of the System. For more information on IOOS standards, visit the IOOS Data Standards and Requirements webpage.
- NOAA's National Geodetic Survey (NGS) represents the U.S. on the UN-GGIM's Subcommittee on Geodesy (UN SCoG), which developed the Global Geodetic Reference Frame (GGRF). The GGRF includes information on infrastructure, education, training, governance, and the adoption of internationally accepted standards.
- NOAA's Center for Operational Oceanographic Products and Services (CO-OPS) represents the U.S. on the Global Sea Level Observing System Group of Experts (GLOSS GE), a component of the IOC/Global Ocean Observing System (GOOS), whose efforts are focused on e establishing high quality, global water level data sets to support a broad research and operational user base. GLOSS's main work is to establish and disseminate best practices and standards for operating water level stations and support international data centers.

- NOAA's Office of Coast Survey (OCS) and CO-OPS represent the U.S. in the IHO, an international organization that coordinates the activities of national hydrographic offices, promotes uniformity in nautical charts and documents, and issues survey best practices, provides guidelines to maximize the use of hydrographic survey data and develops hydrographic capabilities in Member States. OCS is also active in several regional hydrographic commissions.
- NOAA has strengthened its long-standing relationship with the Open Geospatial Consortium (OGC) by becoming a Strategic member and continues championing open standards and innovation at OGC. As a Strategic Member, NOAA supports the consortium's OGC applicable programming interface (API) and cloud-native geospatial modernization efforts by championing the standards applicable to Findable, Accessible, Interoperable and Reusable (FAIR) environmental data (such as OGC API - Environmental Data Retrieval), and benefit from, and contribute to, the OGC Community's collective problem solving via the OGC Innovation Program. For more information on OGC's efforts to ensure geospatial information interoperability, visit the OGC Standards webpage.
- NOAA contributes U.S. expertise to help the global community deal with the meteorological, climatological and hydrological threats via its membership in and engagement with the World Meteorological Organization (WMO), an agency of the United Nations (UN) that serves as the international standardization organization in the fields of meteorology, hydrology, climatology and related environmental disciplines. The WMO's standards and best practices include Technical Regulations, an international framework for standardization and interoperability, which consists of standard and recommended practices and procedures adopted by World Meteorological Congress for universal application by all members, as well as Guides, which describe practices, procedures and specifications which members are invited to follow or implement in order to achieve compliance.
- NOAA participates in national standards organizations ANSI and INCITS and the international standards organization ISO TC211.
- NOAA applies environmental management standards set by ISO to NOAA data. Examples of ISO standards in use in NOAA include:
    - ISO 14721: "Open Archival Information System (OAIS)" which defines the reference model for an OAIS. This standard is the basis for archival activities supporting NOAA environmental data.
    - ISO 26324: "Information and documentation - Digital object identifier system" which specifies the syntax, description and resolution functional components of the digital object identifier system. NOAA assigns unique, resolvable, and persistent identifiers to archival datasets and technical reports. Building upon this standard, NOAA recently developed a report on digital object identifiers (DOI) recommendations for use across NOAA and is in the process of updating its Public Access to Research Results (PARR) Plan to also address DOIs.
    - ISO 19115: "Geographic information – Metadata" which defines the schema required for describing geographic information and services by means of metadata. NOAA participates in the ISO TC211, a committee that focuses on

standardization in the field of digital geographic information and maintains standards for Geographic information/Geomatics.
    - ISO 19139: “Geographic information — XML schema implementation” which defines XML based encoding rules for conceptual schemas specifying types that describe geographic resources. The encoding rules support the unified modeling language (UML) profile as used in the UML models commonly used in the standards developed by ISO/TC 211.

- NOAA National Weather Service (NWS) meteorological data and reports comply with WMO Standards. NOAA serves as one of the WMO Information System (WIS) Global Information System Centres (GISC) and provides a portal to search all WMO Region IV data center metadata. Additionally, NOAA operates several WMO-recognized global centers, including the Aviation Weather Center (AWC), the Space Weather Prediction Center (SWPC), the National Hurricane Center (NHC), and the Ocean Prediction Center (OPC). For more information on the NWS role in support of the WMO, visit the NWS’ WMO webpage.
- U.S. marine fisheries are scientifically monitored, regionally managed, and legally enforced under a number of requirements, including ten national standards, that taken together provide principles that must be followed in any fishery management plan to ensure sustainable and responsible fishery management. As mandated by the Magnuson-Stevens Fishery Conservation and Management Act, NOAA Fisheries has developed guidelines for each national standard. For more information on the standards, visit the NOAA Fisheries Standards webpage.
- NOAA's National Centers for Environmental Information (NCEI) is the Nation’s leading authority for environmental data and manages one of the largest archives of atmospheric, coastal, geophysical, and oceanic research in the world. In this role, NCEI follows and implements the ISO metadata standard to facilitate data search and discovery. Metadata at NOAA can be represented in number of different standards and formats including Directory Interchange Format (DIF), Ecological Metadata Language (EML), Sensor Model Language (SensorML), Climate Science Modeling Language (CSML), and NetCDF Markup Language (NcML). NCEI uses the ISO 14721 OAIS Reference Model standard as the basis for archival activities supporting NOAA environmental data. NCEI also provides distributed data access via the Open source Project for a Network Data Access Protocol (OPeNDAP) compliant THREDDS and ERDDAP data servers.

National Telecommunications and Information Administration (NTIA)

NTIA contributes to the development and application of national and international telecommunication standards by leading, participating in, making technical contributions to, and collaborating with various voluntary national and international telecommunication standards committees, such as the 3GPP, International Telecommunication Union (ITU-R, ITU-T), the Institute of Electrical and Electronics Engineers (IEEE) Standards Association, Radio Technical Commission for Aeronautics (RTCA), and Alliance for Telecommunications Industry Solutions (ATIS).

In addition, NTIA's Institute for Telecommunication Sciences (NTIA-ITS) established and continues to play a significant role in the Video Quality Expert Group (VQEG), which performs technical validation that is a prerequisite to standardization. VQEG is currently focused on collaborative efforts to develop new and improved methods for subjective and objective video quality assessment. VQEG contributes these updated methods to the ITU, where ITU Recommendations are modified to accommodate rapid changes in video technologies.

In FY 2022, NTIA staff held 88 positions in 9 standards bodies, including 18 Chair/Co-Chair/Vice-Chair positions.

- NTIA staff filled key leadership positions in the ITU-T, including Head of the U.S. Delegation to Study Group (SG) 11 (Signaling requirements, protocols, test specifications and combating counterfeit products), Chair of the Telecommunication Standardization Advisory Group (TSAG) Rapporteur Group on Restructuring, and Vice-Chair of Q1/17 (Security standardization strategy and coordination).
- NTIA staff also filled key leadership positions in the ITU-R, including Head of the U.S. Delegation to SG1 (Spectrum management) and SG3 (Radiowave Propagation); Head of Delegation to SG1 Working Party (WP) 1A; Head of Delegation to SG5 (Terrestrial services) WP 5B and 5C; International Chair of SG5 WP 5C and 5D; Deputy Head of Delegation to SG7 (Science services) and SG7 WP 7C; International Chair and U.S. Chair of SG3 WP 3K; U.S. Chair of Working Parties 3J and 3L; and Chair of Correspondence Groups CG-3L-7 (Radio Noise), CG-3J-11 (Reference Standard Atmospheres), and CG-3K-3M-9 (Aeronautical Propagation).
- Within the Inter-American Telecommunications Commission (CITEL), NTIA holds Vice-Chair position within the Permanent Consultative Committee I for Telecommunications/Information and Communications Technology (PCC.I) Working Group for the Preparation and Follow-up of the World Telecommunication Standardization Assembly (WTSA), World Conference on International Telecommunications (WCIT), and World Telecommunication Development Conference (WTDC); Deputy Head of Delegation to the Permanent Consultative Committee II (PCC.II) for Radiocommunications; and International Working Group Chair of the CITEL PCC.II Working Group relative to CITEL's Preparation for World Radiocommunication Conferences.

International Telecommunications Union (ITU)

NTIA-ITS leads U.S. efforts at the ITU-R Study Group 3 (SG3), the technical group that focuses exclusively on radio wave propagation. At SG3, NTIA-ITS contributes inputs and ensures the technical accuracy and correctness of international radio wave propagation standards. SG3 Recommendations on radio wave propagation are treaty-level agreements and play a role in international agreements on spectrum allocations and sharing scenarios, such as the on-going discussions of 5G mid-band spectrum and mmWave spectrum.

In FY 2022, three of the 14 U.S. technical contributions to Study Group 3 were authored or coauthored by NTIA-ITS. NTIA-ITS submitted a proposal to replace the software GRWAVE with the ITS-developed LFMF-SmoothEarth for Recommendation ITU-R P.368 (Ground-wave propagation curves for frequencies between 10 kHz and 30 MHz), which is used to support broadcast services. NTIA-ITS chairs three Study Group 3 Correspondence Groups. Correspondence Group CG-3K-3M-9 (aeronautical propagation) is working towards improvements in Recommendation ITU-R P.528 as well as a new site-specific

aeronautical propagation Recommendation. Correspondence Group CG-3L-7 (radio noise) continued its work on improving prediction of radio noise and produced editorial amendments to Recommendation ITU-R P.372 which corrected a few figures and improved software usability. Lastly, Correspondence Group CG-3J-11 (reference standard atmospheres) continued to analyze and process the 2021 release of the European Centre for Medium-Range Weather Forecasts (ECMWF) Reanalysis data (ERA5), aiming to create a model for a single, global, reference standard atmosphere.

NTIA's Office of International Affairs (OIA) followed and/or provided inputs to various ITU-T Sector Study Groups, which consider "Recommendations" on such diverse subjects as M2M/IoT (Machine to Machine/Internet of Things) traffic, OTT (Over the Top), Distributed Ledger Technology (DLT), Revised Internet Network Architecture proposals (e.g., New IP, Polymorphic Networking), facial recognition, Security by Design and Cybersecurity testing, and IoT/Smart Cities. In addition to these topics, OIA, with technical support from NTIA-ITS, has been participating heavily in ITU-T Study Groups 11 and 13 to counter regional adversary efforts to develop alternate Internet Protocol standards in the ITU rather than in more appropriate SDOs; NTIA-ITS led the U.S. delegation in those study groups. NTIA's work in ITU-T focuses on industry-led, bottom-up, consensus-based standards and appropriately working with U.S. government colleagues to help ensure the ITU-T avoids duplication of efforts with other standards development organizations such as 3GPP and Internet Engineering Task Force (IETF). NTIA-OIA also provides U.S. leadership in the ITU-T Telecommunications Specification Advisory Group (TSAG) to assure that the rules of operation to create ITU-T Recommendations do not disadvantage U.S. industry.

NTIA's Office of Spectrum Management (NTIA-OSM), International Spectrum Policy Division (ISPD) participated in and/or led delegations to several ITU-R working party and study group meetings. Specifically, ISPD staff led delegations for ITU-R Study Group 1 (Spectrum Management), WP 1A (Spectrum Engineering Techniques), and participated in WP 1B (Spectrum Management Methodologies and Economic Strategies) and WP 1C (Spectrum Monitoring). ISPD staff supported NTIA-ITS activities in ITU-R SG3 and followed all activities in ITU-R SG6 (Broadcasting services) which has four separate working parties related to end-to-end broadcasting over terrestrial systems.

NTIA-OSM ISPD staff co-led SG 4 (Satellite Systems) participation for the U.S. and participated in and helped manage U.S. participation in WP 4A (Fixed Satellite Service (FSS) and Broadcasting Satellite Service (BSS) systems) and WP 4B (Technical aspects for FSS, BSS, and Mobile Satellite Service (MSS)). ISPD Staff also participated in WP 4C (Orbit/spectrum utilization for MSS and Radio Determination Satellite Service (RDSS)) and SG 5 (Terrestrial Systems), where they served as international vice chair and led U.S. delegations to WP 5B (Maritime, Radar, and Aeronautical systems) and WP 5C (Fixed Systems). In addition, ISPD staff participated in WP 5A (Mobile Systems) and WP 5D (International Mobile Telecommunications (IMT) - broadband systems, i.e., 3G/4G/5G/6G) where they hold lead positions for specific sub-groups both internationally and for the U.S. delegations.

ISPD staff also participated in the Task Group 6/1 which is addressing broadcasting/broadband sharing in the 470-960 MHz band in Region 1 (Europe, Middle East, Africa). ISPD staff participated in the SG 7 (Space Sciences) meetings and participated and supported federal government leads for WP 7A (Time Signals and Frequency Standard Emissions), WP 7B (Space Radiocommunication Applications), 7C (Remote Sensing Systems) and 7D (Radio Astronomy).

ISPD staff also participated in the ITU Coordination Committee for Vocabulary which works on non-regulatory definitions commonly utilized within the ITU (all three sectors). ISPD staff participate in

International Civil Aviation Authority (ICAO) meetings which develop international procedures for civil aviation; International Maritime Organization (IMO), a treaty level organization for development of requirements for commercial maritime operations including safety of ships and ports; and North Atlantic Treaty Organization (NATO) spectrum management committees which develop positions and recommendations for World Radio Conferences (WRCs). Finally, ISPD staff participate in the CITEL PCC.II (Radiocommunication and Broadcasting) meetings to develop regional positions for WRC and to develop recommendations and reports on spectrum management throughout the Americas.

3rd Generation Partnership Project (3GPP)

Direct participation by NTIA in 3GPP, the dominant cellular communications standards development organization, allows NTIA to advance U.S. commercial, economic, and government interests by providing technical input to promote strong unbiased standards that support fair competition in next generation/5G cellular technologies. NTIA-ITS is currently engaged in 3GPP Technical Specification Groups (TSG) for Radio Access Networks (RAN) and Services & Systems Aspects (SA) and attends the RAN Plenary meetings. NTIA-ITS participates in 3GPP Working Groups for Services (SA WG1), System Architecture and Services (SA WG2), and Security and Privacy (SA WG3), as well as RAN WG1, focused on the physical layer for LTE and 5G. Additionally, NTIA-OIA participates in TSGs SA and RAN at a Plenary level.

In FY 2022, NTIA-ITS continued to provide other U.S. Government stakeholders a comprehensive understanding of the 3GPP New Radio (5G NR—the global standard for the air interface of 5G networks) capabilities, the services 5G NR was built to deliver, and deployment scenarios in both licensed and unlicensed spectrum for the evolution to 5G. ITS provided briefings to other agencies (under interagency agreements) on agency-specific concerns with regard to standardization developments with respect to spectrum sharing, vehicle-to-everything communication, non-terrestrial networks, unmanned aerial vehicle and cyber security topics relative to security vulnerabilities in 4G and 5G systems architecture.

NTIA-OSM attends 3GPP Technical Specification Group RAN 1 and RAN 4. NTIA-OSM's goals are to: gain a more in-depth understanding of 3GPP standards and models used in compatibility studies; monitor 3GPP proposals that have a potential to impact federal operations; identify 3GPP spectrum standards that could be adopted for federal systems; and verify that 3GPP standards are being properly used in domestic and international spectrum sharing studies.

Internet Engineering Task Force (IETF)

In FY 2022, OIA scaled back its engagement with the IETF compared to prior years but continues to monitor IETF work.

O-RAN ALLIANCE

The Open Radio Access Network (O-RAN) ALLIANCE was founded in 2018 by a number of large mobile broadband network operators to develop technical specifications for Open RAN, or O-RAN architecture. The O-RAN ALLIANCE initially discouraged membership by governmental entities, but after extensive discussion in 2022, governmental agencies are now permitted to join as members. NTIA is currently in the process of obtaining internal clearance and approval for O-RAN alliance membership. Pending approval, NTIA-ITS and NTIA's Office of Policy Analysis and Development (OPAD) will send members to participate in and observe O-RAN Alliance work. In FY 2022, NTIA-ITS carried out the first of two 5G Challenge competitions focused on accelerating the adoption of open interfaces, interoperable subsystems, and modular, multi-vendor solutions. During the first-year event, 5G Challenge Event: RAN

Subsystem Interoperability, NTIA-ITS executed a first-of-its-kind independent, objective interoperability testing event that assessed how vendor products adhere to 3GPP standards and O-RAN ALLIANCE specifications in multi-vendor networks.

Wireless Innovation Forum (WInnForum)
NTIA-ITS participates as a member of WInnForum. Following the 2015 Federal Communications Commission (FCC) allocation of the 3550-3700 MHz spectrum band for the Citizens Broadband Radio Service (CBRS) through a three-tiered access system that includes Environmental Sensing Capability (ESC) sensors and Spectrum Access System (SAS) databases, NTIA-ITS participated in the development of the underlying standards for this three-tiered access system and, in collaboration with the FCC and industry Cooperative Research and Development Agreement (CRADA) partners, developed the certification test requirements to assess compliance with the standards. The final certification test system for ensuring SAS conformance with Part 96 of the FCC's rules, which includes the test harness component developed through WInnForum, will be delivered to the FCC in FY 2023.

Radio Technical Commission for Aeronautics (RTCA)
RTCA is the standards body for aircraft manufacturers and operators. The NTIA-OSM is a paid member of RTCA and has worked over the past year to help develop technical documentation of the future capabilities for radio altimeters and will continue supporting the work in development of a new RTCA standard (Minimum Operating Performance Standard – MOPS) for radio altimeters operating in the 4.2-4.4 GHz band.

Video Quality Experts Group (VQEG)
Since its creation in 1997, NTIA-ITS has supported VQEG with leadership and electronic working methods. In FY 2022, NTIA-ITS contributed to discussions to create a new video quality metadata standard. Many video quality encoders produce quality assessments that are discarded due to the lack of a standard mechanism to propagate the quality assessments in video streams. The VQEG solution will enable intelligent industry responses to quality of experience (QoE) problems in various video transmission and streaming services. VQEG conducts open meetings, which enables broad international participation from industry, academia, and governments. This idea will be forwarded to ITU-T, the Motion Picture Experts Group (MPEG), and the Alliance for Open Media (AOMedia) in FY2023.

United States Patent and Trademark Office (USPTO)

USPTO contributes to the development of international standards for patent and trademark information and documentation primarily through participation of USPTO scientific and technical experts to the Committee on WIPO Standards (CWS) of the World Intellectual Property Organization (WIPO). The standards developed are used by the USPTO and other international intellectual property organizations around the world to harmonize intellectual property information practices. The standards harmonize practices regarding electronic data processing procedures with respect to filing, examination, and publication of intellectual property data. The standards facilitate the exchange, sharing, dissemination, access and retrieval of intellectual property data and documents. USPTO staff also participate in standardization activities of the International Patent Classification (IPC) Union. The IPC provides a hierarchical system for the classification of patents according to different areas of technology. The worldwide access to patent and trademark data and documents supports U.S. industry and

organizations' knowledge of national and international intellectual property. https://www.uspto.gov/patents-application-process/patent-search/understanding-patent-classifications/international.

2. Please list the government-unique standards (GUS) your agency began using in lieu of voluntary consensus standards during FY 2020. Please note that GUS which are still in effect from previous years should continue to be listed, thus the total number in your agency's report will include all GUS currently in use (previous years and new as of this FY): 0