
APPENDIX C:
FINDING OF NO SIGNIFICANT IMPACT (FONSI) –
OOI PROGRAMMATIC EA (FEBRUARY 2009)

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FINAL
FINDING OF NO SIGNIFICANT IMPACT
PURSUANT TO THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA),
42 U.S.C. 4321, *et seq.*

OCEAN OBSERVATORIES INITIATIVE

The National Science Foundation (NSF) is considering a proposal to fund the construction and operation of the Ocean Observatories Initiative (OOI), a network of ocean infrastructure, mobile platforms, and sensors and, accordingly, served as the lead federal agency for preparation of the programmatic environmental assessment (PEA). The proposed OOI is an interactive, globally distributed and integrated network of cutting-edge technological capabilities for ocean observatories, enabling the next generation of complex ocean studies at the coastal, regional, and global scale.

A PEA was prepared to analyze the potential impacts on the human and natural environment associated with the installation and operation of the OOI. The final PEA, entitled, “Final Programmatic Environmental Assessment for National Science Foundation-Funded Ocean Observatories Initiative (OOI)” (Attachment 1) was prepared by TEC, Inc. on behalf of NSF and is incorporated into this FONSI by reference as if fully set forth herein. The PEA was prepared in compliance with NEPA (42 USC 4321, *et seq.*) and the CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508). The NEPA process ensures that environmental impacts of proposed major federal actions are considered in agency decision-making processes. The NSF sought public comment in the NEPA process by publicizing this PEA and soliciting comment. Additionally, in accordance with Executive Order 12372, *Inter-governmental Review of Federal Programs*, the NSF also notified appropriate state and federal regulatory agencies of the preparation of the PEA and its availability for public comment (FR. V. 73, No. 80, P. 22180). These agencies included: the United States Army Corps of Engineers; Oregon and Washington state historic preservation offices; and Oregon, Washington, New York, Rhode Island, Massachusetts, and Connecticut coastal zone management offices. After the consideration of all comments, the PEA was finalized on June 28, 2008.

Because the OOI action proposes to occur over several different locations across the Atlantic and Pacific oceans and would be phased in over time, it was determined that a programmatic approach would be the most efficient in terms of overall analysis. A programmatic analysis at a conceptual level of detail provides early identification and analysis of potential impacts, methods to mitigate anticipated impacts, and a strategy to address issue areas at a tiered level if necessary. The PEA assembled and analyzed the broadest range of potential direct, indirect, and cumulative impacts associated with all proposed OOI activities in addition to other past, present, and reasonably foreseeable projects in the region of influence. The PEA also set up a framework for addressing the time- and site-specific aspects of the proposed OOI, as well as more detailed technical information (when it becomes available) through site-specific tiered EAs or other appropriate environmental documentation. If required, further environmental analysis at the site-specific stage of the OOI will tier from the PEA (Attachment 1, page 7).

NSF engaged in informal consultation with the United States National Marine Fisheries (NMFS), pursuant to the Marine Mammal Protection Act (MMPA), and obtained the agency’s concurrence with NSF’s determination that the “potential for and actual take of marine mammals is not likely to occur.” This concurrence was also contingent upon implementation of mitigation and monitoring measures during cable installation and cable-laying activities. NSF engaged in informal consultation with NMFS, pursuant to Section 7 of the ESA, and obtained the agency’s concurrence with NSF’s determination that the OOI is “not likely to adversely affect threatened or endangered species”, and determined that “the proposed action will not affect proposed critical habitat.” NSF also engaged in informal consultation with the United States Fish

and Wildlife Service, pursuant to Section 7 of the ESA, and obtained the agency's concurrence with NSF's determination that the "proposed OOI project is not likely to affect any listed endangered or threatened species or any designated critical habitat." NMFS was also consulted regarding Essential Fish Habitat (EFH) issues. The OOI is not anticipated to have an adverse effect on EFH.

1.0 PROPOSED ACTION

To provide the U.S. ocean sciences research community with the basic sensors and infrastructure required to make sustained, long-term, and adaptive measurements in the oceans, the NSF's Ocean Sciences Division developed the OOI from community-wide, national, and international scientific planning efforts. The OOI infrastructure would include cables, buoys, deployment platforms, moorings, junction boxes, electric power generation (solar, wind, fuel cells, and/or diesel), mobile assets (i.e., autonomous underwater vehicles [AUVs] and gliders), and two-way communications systems. This large-scale infrastructure, proposed to be constructed over a period of five years with an anticipated 2010 construction start, is designed to support sensors located at the sea surface, in the water column, and at or beneath the seafloor.

The OOI design is based upon three main technical elements across global, regional, and coastal scales. At the global and coastal scales, mooring observatories would provide locally generated power to seafloor and platform instruments and sensors and use a satellite link to shore and the Internet. Figure 1-1 of Attachment 1 (page 3) illustrates the geographic locations of the proposed OOI infrastructure components. Up to four Global-scale Nodes (GSN) or buoy sites are proposed for ocean sensing in the Eastern Pacific and Atlantic oceans. The Regional-scale Nodes (RSN) off the coast of Washington and Oregon are designed to consist of seafloor observatories with various chemical, biological, and geological sensors linked with submarine cables to shore that provide power and Internet connectivity. Coastal-scale Nodes (CSN) would be represented by the Endurance Array off the coast of Washington and Oregon and the Pioneer Array off the coast of Massachusetts. In addition, there would be an integration of mobile assets such as AUVs and gliders with the GSN, RSN, and CSN observatories. Under the Proposed Action, the CSN, RSN, and GSN would consist of the following elements:

- CSN – the Endurance Array (Newport and Grays Harbor lines) off the coasts of Washington and Oregon and the Pioneer Array in the mid-Atlantic Bight south of Massachusetts,
- RSN – a configuration with five Primary Nodes and two shore stations, and
- GSN – four sites.

1.1 COASTAL-SCALE NODES (CSN)

The CSN would support long-term and high space-time resolution observations to understand the physics, chemistry, ecology, and climate sciences of key regions in the complex coastal ocean. It would consist of two main arrays: the Endurance Array and the Pioneer Array.

1.1.1 Endurance Array

The Endurance Array would be comprised of two lines of moorings, one located off the coast of central Oregon (Newport Line), and a second at a contrasting site in central Washington (Grays Harbor Line). The array would employ surface moorings, subsurface profiler moorings and gliders. Two of the mooring sites on the Newport Line would be connected to the cable providing power and bandwidth to the Regional Scale Nodes (see section 1.2).

1.1.2 CSN (Pioneer Array)

The Pioneer Array is designed to extend ~40 kilometers (km) across the continental shelf ~ 75 nautical miles (nmi) south of Massachusetts. The array would employ surface moorings, subsurface profiler moorings, gliders, and AUVs to sample on multiple horizontal scales from the air-sea interface to the seafloor. In contrast to the Endurance Array, the Pioneer Array would be able to be moved to a new location

approximately every 3-5 years to compare and contrast different shelf-break systems. The PEA addresses the general location of the Pioneer Array in the Mid-Atlantic Bight. The site-specific location of the Pioneer Array and eventual removal and relocation of the Pioneer Array will be assessed by subsequent environmental reviews.

1.2 REGIONAL-SCALE NODES (RSN)

The proposed RSN would enable oceanic plate-scale studies of water column, seafloor, and sub-seafloor processes using high-powered, high-bandwidth instrument arrays cabled to shore. Five Primary Nodes were chosen based on their proximity to diverse tectonic features and water column settings. These nodes would be installed in the North East Pacific Ocean off the coast of southern Washington and northern Oregon at locations spatially coincident with the Juan de Fuca Plate and a suite of mesoscale oceanographic processes that operate in a 300–400-km wide swath that extends from south of Vancouver Island to southern Oregon. Under the Proposed Action, the RSN would be comprised of four components:

1. *Shore Stations* – The shore stations are the cable-landing sites that house the Power Feed Equipment and Network Termination Equipment for the submarine telecommunications backbone cable. The shore stations provide power to the RSN and are network gateways between the Primary Nodes and the terrestrial data center. Two existing submarine telecommunications shore stations are identified for potential use as RSN cable landing sites: Warrenton and Pacific City, Oregon.
2. *Wet Plant or Primary Infrastructure* – From the shore stations, main branches of the backbone cable span long distances to the Primary Nodes, which are located in areas of high scientific interest on the Juan de Fuca Plate. The Primary Nodes convert the high voltage from the shore stations to a lower, useable voltage for distribution to the Secondary Infrastructure. The Primary Nodes and backbone cable make up the Primary Infrastructure. The backbone infrastructure of the RSN would initially comprise 1,238 km of up to four types of standard submarine telecommunications electrical-optical cable; 472 km would be buried and 766 km would be on the surface of the seafloor. Each node would be enclosed in a trawl-resistant frame (TRF), which protects the electronic equipment of each node from fishing activities.
3. *Secondary Infrastructure* – The Primary Nodes distribute low voltage and data at a lower rate to 18 Low-voltage Nodes (LVNs) positioned geographically around the Primary Nodes. In addition, Primary Nodes are able to distribute the higher voltage and higher data rates directly to Secondary Nodes, which in turn can distribute power and data to LVNs. The secondary infrastructure would include ~164 km of 25-millimeter (mm) diameter cable. The LVNs, Secondary Nodes, and the cables that connect them to the Primary Nodes make up the Secondary Infrastructure.
4. *Tertiary Infrastructure* – The LVNs are connected to either a Medium-Power Junction Box (MPJbox) or a Low-Power Junction Box (LPJbox). The Jboxes then provide the correct power and data interface to small groups of scientific instruments or sensors. The tertiary infrastructure would include ~25 Jboxes, 120 km of 25-mm diameter cable, and 213 sensors (seafloor and vertical moorings). The Jboxes, cable, and sensors make up the Tertiary Infrastructure.

1.3 GLOBAL-SCALE NODES (GSN)

The GSN would include moored buoy, open-ocean observatories to support air-sea, water-column, and seafloor sensors operating in remote, scientifically important locations and provide data and near-real time interaction to diverse communities of scientific and educational users. The scientific goals are to provide sustained atmospheric, physical, biogeochemical, ecological, and seafloor observations at high latitudes. The OOI's design process has identified three strategic high-latitude sites and one mid-latitude site as comprising the initial GSN under the Proposed Action:

1. Station Papa in the southern Gulf of Alaska; depth = 4,250 meters (m)
2. Southern Ocean off Chile; depth = 4,800 m

3. Irminger Sea southeast of Greenland; depth = 2,800 m
4. Mid-Atlantic Ridge; depth = 4,460 m

Station Papa, Southern Ocean, and Irminger Sea are all anticipated to have an acoustically linked discus buoy, one subsurface and two flanking subsurface moorings, and five gliders. The Mid-Atlantic site would have an Extended Draft Platform mooring with a benthic node, one subsurface and two flanking subsurface moorings, and five gliders.

1.4 SENSORS

To measure changes and variability in the chemical, biological, and geological processes in the ocean, the proposed OOI is designed to be equipped with a complex suite of sensors. These sensors would be deployed from a number of platforms including water column moorings and on the seafloor. It is important to note that the actual sensors to be deployed as part of the OOI program would be determined based on scientific objectives, costs, and the on-going discussions between engineers and investigators. It is expected that additional sensors would be added as the OOI program proceeds and the scientific objectives change based on researcher needs and priorities. Although these sensors would be largely commercial off-the-shelf sensors, some are anticipated to require modification for extended deployment and a small number would require further development to meet the scientific objectives and requirements of the proposed OOI. This would maximize the utility of the proposed OOI to the broader ocean research community. As additional sensors are proposed, they will be examined for potential environmental impacts, and additional environmental documentation will be prepared, if necessary, that will be tiered from the PEA.

1.4.1 Active Acoustic Sensors

The active acoustic sources proposed for use in the OOI include:

- Acoustic Doppler Velocimeter (ADV). ADVs are active sensors with an operating frequency of 5-6 megahertz (MHz), a source level of ~220 decibels reference 1 micropascals at 1 m (dB re 1 μ Pa @ 1 m), and a pulse length of 600 microseconds (μ s). They would be placed on moorings or on the seafloor to investigate turbulence, boundary layers, directional waves, and sediment transport.
- Acoustic Doppler Current Profilers (ADCP). This instrument can be placed on the seafloor, attached to a buoy or mooring cable, or mounted on an AUV or glider. The ADCP measures water currents by transmitting high frequency (~150-1,200 kHz) very short pings (0.6-1.5 milliseconds [ms]) of sound into the water. The source level is anticipated to be ~220 dB re 1 μ Pa @ 1 m.
- Bio-acoustic Profilers (BAPs). BAPs monitor the presence and location of zooplankton within the water column by transmitting short (~300 μ s) narrow-beam (10°) signals at ultrasonic frequencies (200 kHz), which measure acoustic backscatter returns. The source level is 213 dB re 1 μ Pa @ 1 m.
- Altimeters. Altimeters would be used to assist AUVs and gliders with determining their altitude above the sea floor. They use generally high frequency (170 kHz) sources that emit a narrow (<5°), downward directed beam with a source level of 206 dB re 1 μ Pa @ 1 m.
- Multibeam Echosounder (MBES). During research activities, the ocean floor would be mapped with an MBES. The MBES emits brief pulses of high-frequency (100 kHz) sound in a narrow (1-2°) fan-shaped beam at a source level of 225 dB re 1 μ Pa @ 1 m.
- Acoustic Modems. Acoustic modems would be used for communication between mooring profilers, benthic sensors, and surface and subsurface buoys. They operate as a narrow-beamed (<5°), 20-30 kHz signal with a pulse duration of 1-2,000 ms.
- Tracking Pingers. These pingers enable the tracking of AUVs and gliders once they are deployed. These pingers operate at a frequency of 10-30 kHz and emit a very brief (7 ms) pulse at source levels of 180-186 dB re 1 μ Pa @ 1 m.
- Horizontal Electrometer-Pressure-Inverted Echosounder (HPIES). The HPIES is proposed as a core sensor on the RSN located on the seafloor near the full water column moorings. This instrument

package combines a bottom pressure sensor, 12-kHz inverted echosounder, and a horizontal electrometer. The echosounder would operate at a source level 172, 177, 182 dB re 1µPa @ 1 m at depths of 1,000, 2,000 and 3,000 m, respectively. There would be 24 narrow beamed (<5°), 6-ms pings per hour.

- Sub-bottom Profiler (SBP). The SBP is normally operated to provide information about the near-surface features and bottom topography that is simultaneously being mapped by the MBES. It operates at mid-frequencies (2-7 kHz) with a source level of 203 dB re 1µPa @ 1 m.

1.5 INSTALLATION AND OPERATION & MAINTENANCE (O&M)

Proposed installation and O&M activities would use standard methods and procedures currently used by the undersea telecommunications industry. However, methods may change based upon site-specific surveys, ship schedules, and final determination of types of equipment to be installed (e.g., sensor types, models, etc.). Under the Proposed Action, the installation of the CSN, RSN, and GSN components of the proposed OOI Network is expected to take ~201 days at sea (DAS) and involve five classes of vessels. Annual O&M operations for the OOI Network would take an estimated 230 DAS for all locations. If subsequent proposed installation and O&M activities are significantly different than the proposed installation or O&M methods described in the PEA, then additional environmental documentation would be prepared to assess any potential impacts to the environment.

1.6 SPECIAL OPERATING PROCEDURES (SOPs) FOR INSTALLATION AND O&M OF THE PROPOSED OOI

Table 1 lists the SOPs that would be implemented as part of the Proposed Action to avoid and minimize any potential impact to biological resources and commercial fishing activities.

Table 1. SOPs to be Implemented under the Proposed Action

<i>SOP</i>	<i>Applicability</i>
1. Cable and equipment locations for all components of the proposed OOI would be published on NOAA Charts, through Notices to Mariners (NOTMARs), and accurate locational information will be made available to fishers to assist their avoidance of the instruments. A contact phone number will be established where fishers can report possible entanglements.	CSN RSN GSN
2. Onshore construction activities would avoid sensitive coastal dune, bluff, and wetland habitats, scenic locations, or public access points, and be sited on relatively level ground and to the maximum extent practicable on previously disturbed or developed land.	RSN
3. For onshore construction activities, appropriate best management practices (BMPs), based on the Oregon Department of Environmental Quality’s Erosion and Sediment Control Manual, would be incorporated into a stormwater pollution prevention plan (SWPPP) and submitted to the ODEQ in partial fulfillment of the Clean Water Act (CWA) Section 301 National Pollutant Discharge Elimination System (NPDES) permit.	RSN
4. The shallow water exit points for HDD would be sited in sandy bottom areas. Pre-installation cable route surveys would be performed to identify bottom conditions, plan cable burial accordingly, and to minimize the crossing of rocky and/or geologically unstable areas.	RSN
5. The Oregon Fishermen’s Cable Committee (OFCC) will be notified regarding the proposed submarine cable, moorings, and associated sensors. An agreement would be negotiated with the OFCC to minimize risks to, interference with, and/or interruption of commercial fishing activities and of submarine cable operations.	CSN (Endurance Array), RSN

Table 1. SOPs to be Implemented under the Proposed Action

<i>SOP</i>	<i>Applicability</i>
6. The cables would be buried ~1 m deep where substrate conditions allow, using a combination of plow and/or remotely operated vehicle (ROV). In so far as practicable, cables would be buried to water depths of ~1,100 meters (m). In addition to complying with any permit conditions, it is expected that the cable routes will be inspected at 5-year intervals after the installation to determine whether there are exposed sections of cable that could be snagged by fishing gear, and such areas will be reburied to the extent possible.	RSN
7. During initial installation, where it is anticipated that burial cannot be achieved, the cable would be armored and fishers notified of the location of the exposed cable.	RSN
8. The RSN cable route and locations of moorings would be submitted to the U.S. Navy for comment/approval.	RSN
9. Owners of all existing and proposed cables would be contacted to coordinate crossings, if necessary. To the extent possible, all crossings would meet the recommendations of the International Cable Protection Committee (ICPC).	RSN
10. As much as possible, cables would be laid perpendicular, rather than parallel to, steep offshore slopes. Perpendicular placement is more stable and reduces the risks of damage from underwater landslides or differential slippage of cable sections down side slopes.	RSN
11. Site-specific surveys will be completed at the proposed mooring locations for the Pioneer Array; the proposed locations of the Primary Nodes, Secondary Nodes, low-voltage nodes (LVNs), and Jboxes of the RSN; and Endurance Array mooring locations to ensure adequate, acceptable positions for the siting of OOI infrastructure. For a more effective placement of sensors on the seafloor, AUV operations may be conducted at the node locations.	CSN (Endurance and Pioneer Arrays), RSN
12. For horizontal directional drilling (HDD) operations, an HDD Monitoring and Spill Contingency Plan would be prepared and submitted to the U.S. Army Corps of Engineers (USACE) and Oregon Department of Environmental Protection (ODEP) as appropriate in conjunction with CWA Section 404/401 permitting for the Proposed Action. The plan would include, but not necessarily be limited to the following: <ul style="list-style-type: none"> • description of superficial and bedrock geological conditions and the proposed bore profile at each HDD location; • assessment of the likelihood of a “frac-out” involving the release of drilling fluids from the bore hole into the overlying ocean waters; • procedures to monitor drilling fluid returns, regulate drilling pressure, and add loss circulation materials as necessary to plug fractures along the bore path and minimize the possibility of a frac-out; • to minimize the release of drilling mud when the drill punches through on the seabed, operators will switch from drilling mud to water only to lubricate the bore during the last stage of the operation before the drill reaches its exit point; • procedures for monitoring the bore path between the bore entry and the planned exit point to detect a release of drilling mud; • a Contingency Plan for the containment and cleanup of a discharge of drilling mud onto the shore or seabed; and • reporting procedures to document the implementation of the plan and its effectiveness. 	RSN

2.0 PURPOSE AND NEED

The OOI would build a network of sensors designed to collect ocean and seafloor data at high sampling rates over years to decades. These sensors would be linked to shore using the latest communications technologies, enabling scientists to reconfigure these sensors from their laboratories and use the incoming data in near-real time in their models. Scientists and educators from around the country, from large and small institutions, and from fields other than ocean science, would be able to take advantage of OOI's open data policy and emerging cyberinfrastructure capabilities in distributed processing, visualization, and integrative modeling. Researchers would make simultaneous, interdisciplinary measurements to investigate a spectrum of phenomena including episodic, short-lived events (tectonic, volcanic, biological, severe storm-related), to more subtle, longer-term changes or emergent phenomena in ocean systems (circulation patterns, climate change, ocean acidity, ecosystem trends). Through a unifying cyberinfrastructure, researchers would control sampling strategies of experiments deployed on one part of the infrastructure in response to remote detection of events by other parts of the infrastructure. The long-term introduction of ample power and bandwidth to remote parts of the ocean by the OOI would provide the ocean science community with unprecedented access to detailed data on multiple spatial scales, studying the coastal-, regional-, and global-scale ocean, and using mobile assets (AUVs, gliders, and vertical profilers) to complement fixed-point sensors. The discoveries, insights, and the proven new technologies of the OOI effort would continuously transfer to more operationally oriented ocean-sensing systems operated by other agencies and countries. Increased ocean coverage, the growth of technical capability, development of new and more precise predictive models, and increasing public understanding of the ocean would all be tangible measures of the OOI's contribution to transforming ocean science. In this manner, OOI would play a key role in keeping the U.S. science effort at the cutting edge of ocean knowledge.

3.0 ALTERNATIVES CONSIDERED

Numerous alternative configurations were considered for the CSN, RSN, and GSN components of the proposed OOI. As a result of extensive technical and NSF review of numerous planning and technical supporting documents, no other action alternatives to the Proposed Action emerged that would satisfy the identified purpose and need and scientific objectives and siting criteria. Consequently, only the Proposed Action and the No-Action Alternative were carried forward for analysis in the PEA.

4.0 SUMMARY OF ENVIRONMENTAL EFFECTS

4.1 CSN (ENDURANCE ARRAY) AND RSN

4.1.1 Air Quality

The Proposed Action is located within the jurisdiction of Grays Harbor County, Washington; and Clatsop, Tillamook, and Lincoln counties, Oregon. All affected counties are in attainment of the National Ambient Air Quality Standards as well as state and regional air quality standards. Therefore, a Clean Air Act conformity determination is not required. The Proposed Action would result in minor temporary emissions from surface vessels during installation and O&M activities of the RSN and CSN. However, these vessel emissions would not represent a substantial increase above existing conditions, as only a small number of vessels would be used and for only a few weeks per year. The Proposed Action would not compromise air quality attainment status in Washington and Oregon or conflict with attainment and maintenance goals established in their State Implementation Plans. Therefore, the Proposed Action would have a negligible impact on air quality.

4.1.2 Terrestrial Biological Resources

Under the Proposed Action, existing shore stations and beach manholes would be used for the landing of the RSN submarine cable. Although the exact location of the proposed HDD activities has not been determined

at this time, preliminary analysis indicates that there would be no significant impacts to terrestrial biological resources at the proposed Warrenton and Pacific City shore station sites. A site-specific evaluation would be done prior to any HDD activities and if necessary, additional environmental documentation would be completed to assess the potential impacts to terrestrial resources. The CSN would not have a terrestrial component and therefore it is anticipated that there would be no significant impacts to terrestrial biological resources from implementation of the Grays Harbor and Newport lines of the Endurance Array.

4.1.3 Transportation

Generally only two to three vessels would be used during installation and O&M activities associated with the proposed OOI, and then only for a few weeks per year. Projected increases in vessel traffic due to implementation of the Proposed Action would constitute a negligible portion of the total existing vessel traffic in the ROI. In addition, proposed activities associated with the installation and annual O&M of the proposed OOI would not restrict or change existing vessel traffic patterns within the ROI. All eight mooring buoys of the Endurance Array would be marked in accordance with U.S. Coast Guard (USCG) requirements and locations of all buoys would be published on NOAA charts. Therefore, there would be no significant impacts to transportation within the region of influence (ROI) with implementation of the Proposed Action.

4.1.4 Land Use

Proposed terrestrial activities associated with the proposed cable landings at Warrenton and Pacific City, Oregon would be sited in accordance with established land use guidelines addressing safety, functionality, and environmental protection zones where appropriate. The proposed shore stations are existing facilities and no additional construction is required. With implementation of SOPs during RSN HDD activities, there would be no significant impacts to terrestrial resources. In addition, no changes to existing land use are anticipated to occur with implementation of the Proposed Action.

4.1.5 Marine Biological Resources

The vessels and activity associated with installation of RSN cable, surface and subsurface moorings, and associated scientific sensors on the sea floor may cause marine species to temporarily avoid the immediate vicinity of the proposed CSN (Endurance Array) and RSN, but this impact would not be significant due to the small scale and temporary nature of the proposed activities. The vessel used for cable and mooring deployment would move very slowly during the activity and would not pose a collision threat to marine mammals, including Endangered Species Act (ESA)-listed species.

There are no documented incidents of marine mammal entanglement in a submarine cable during the past 50 years. The cables are designed to be taut against the seafloor, without loose slack. Entanglement of marine species is not likely because the submarine cable would be buried in water depths less than 1,100 m. For water depths greater than 1,100 m, where the cable is not buried, the rigidity of the cable would cause the cable to lie extended on the sea floor and not coil thereby eliminating the potential for entanglement. Entanglement of marine species within mooring cables in the water column is considered highly unlikely because of the rigidity of the mooring cables and the ability of marine species to detect and avoid the mooring lines.

Once installed on the seabed, the proposed mooring anchors and scientific sensors would be equivalent to other hard structures on the seabed, again posing no risk of adverse effect on marine organisms.

Electromagnetic fields (EMF) are produced when electricity is transmitted through cables buried in the seafloor. The concern with EMF is the sensitivity of particular groups of the marine animals to EMF, especially the potential responses (e.g., attraction, repulsion, disorientation, or other behaviors) of fish (particularly elasmobranchs [i.e., sharks, skates, and rays]), sea turtles, and marine mammals, and the effectiveness of mitigation, primarily through burying or shielding of the cable. It is expected that due to the

low voltage transmitted, the smaller cable size, and the armoring and burying of the OOI cables, that potential impacts from EMF on fish, sea turtles, or marine mammals, including ESA-listed species would not be significant.

Impacts on EFH may entail temporary mechanical disturbance of the substrate, and long-term coverage of relatively small areas of substrate by RSN cable, TRFs, mooring anchors, LVNs, Jboxes, and cabled scientific sensors. The substrate in the affected area offshore consists of sand, sand and mud, and mud. The cables, anchors, and instruments themselves would constitute ~4 hectares (ha) of new hard substrate. Use of the sea plow and/or ROV to install the RSN cables would impact an approximately 2-m wide swath of substrate during installation, and a total area of 94 ha. Therefore, a total of 98 ha of EFH may be impacted by proposed CSN and RSN installation activities. Over time, the natural movement of sediments by ocean currents and burrowing organisms would reestablish natural bottom topography. The short-term and minor increases in turbidity and sedimentation would not affect the ability of EFH to support healthy fish populations and affected areas are expected to recover quickly. Repair activities and/or future removal of the proposed cable, moorings, and associated infrastructure would have impacts on seafloor geology similar to those of installation at the affected locations. Therefore, the implementation of the proposed Endurance Array and RSN would not have an adverse affect on EFH in the area.

The use of up to six gliders within a survey area of ~16,000 nmi² around the Endurance Array is not expected to affect marine species, as the proposed gliders would move within the water column similar to a dolphin or whale. Gliders are sealed, contain no motors, fuels, or hazardous materials; and move at very slow speeds (~0.5 knot), thereby eliminating the potential for collisions with marine mammals and ESA-listed species.

The proposed active acoustic sources associated with the Endurance Array and RSN would generally operate at frequencies much higher than those frequencies considered audible by fish and marine mammals. The ADV, BAP, and the ADCP would all operate at frequencies greater than 180 kHz, with most operating at frequencies greater than 200 kHz. For the HPIES, MBES, SBP, altimeters, acoustic modems, and tracking pingers operating at frequencies between 2 and 170 kHz, fish and marine mammals would not be disturbed by any of these proposed acoustic sources given their low duty cycles, the brief period when an individual animal would potentially be within the very narrow beam of the source, and the relatively low source levels of the HPIES, pingers, and acoustic modems. Therefore, implementation of the proposed deployment of the Endurance Array and RSN is not expected to result in significant acoustic impacts to fish and marine mammals, including ESA-listed species.

NSF consulted with NMFS under MMPA and section 7 of the ESA. The conservation and other protective measures requested by NMFS will be included in the implementation of the proposed CSN (Endurance Array) and RSN component of the OOI network (See Attachment 2).

4.1.6 Geological Resources

Under the Proposed Action, potential impacts to geological resources from the proposed (CSN) Endurance Array (Grays Harbor and Newport lines) would only be associated with the placement of 14, 2 m² mooring anchors and associated sensors on the seafloor (at 25, 50, 80, 150, and 500 m). Impacts would include temporary mechanical disturbance of soft sediments, and long-term coverage of relatively small areas of substrate by the anchors and scientific sensors. Over time, the natural movement of sediments by ocean currents and burrowing organisms would reestablish natural bottom topography. These impacts on soft-bottom substrates are considered minor and would result in short-term insignificant impacts to geological resources.

Impacts to onshore geological resources from the installation of the RSN cable would include temporary soil disturbance by grading, excavation, and equipment operations to support HDD activities at two locations: Pacific City and Warrenton, Oregon. At each site, it is anticipated that HDD activities may temporarily

disturb approximately 0.2 ha in close proximity to existing beach manholes for existing cables. The onshore drilling sites would be configured to avoid impacting sensitive coastal habitats that would be especially vulnerable to erosion. In accordance with CWA NPDES requirements, the OOI would obtain coverage under the State of Oregon's general permit for construction stormwater discharges. This would include the preparation and implementation of a SWPPP with BMPs to minimize erosion and sediment transport from construction sites, and to restore disturbed areas to a stable condition after construction. As a result, no significant impacts to onshore geologic resources are anticipated to occur.

Impacts on offshore geology would entail temporary mechanical disturbance of the substrate, and long-term coverage of relatively small areas of substrate by TRFs, mooring anchors, LVNs, Jboxes, and cabled scientific sensors. As described previously, the substrate in the affected area offshore consists of sand, sand and mud, and mud. The cables, anchors, and instruments themselves would constitute ~4 ha of new hard substrate. Soft sediments would be excavated and dispersed a short distance around the bore exits, sites where equipment would be placed, and cable burial corridors. Use of the sea plow and/or ROV to install the cables would impact an approximately 2-m wide swath of substrate during installation, and a total area of 94 ha. Over time, the natural movement of sediments by ocean currents and burrowing organisms would reestablish natural bottom topography. If necessary, the placement of cables on rock substrate would cause minor physical abrasion (grooving) of the substrate. Repair activities and/or future removal of the proposed cable, moorings, and associated infrastructure would have impacts on seafloor geology similar to those of installation at the affected locations. These impacts on soft- and hard-bottom substrates are considered minor and not significant.

4.1.7 Water Quality

The onshore portion of the Proposed Action is not anticipated to affect water quality. Project activities are expected to occur on level sites without surface water features or direct drainage to the ocean. A project-specific SWPPP incorporating BMPs for erosion and sedimentation control would be prepared and implemented to prevent the discharge of sediment or pollutants or runoff from the sites.

The offshore cables consist of metallic and synthetic, essentially inert materials (glass fibers, plastic (polyethylene), copper, steel, waterproof nylon yarn). Based on observations of previously installed underwater cables, the cables would soon be covered with marine growth or buried by sand, and would not break down for a very long period of time. The available information, although limited, suggests that cable constituents (such as copper and zinc) are not normally leached into surrounding waters unless the cable is damaged, and that in any case, the amounts are small and unlikely to affect the organisms that grow on the cables. Ultimately, as cable components disintegrate, decompose, or corrode, the constituent elements would be dispersed into surrounding media, with no significant effect on sediment or water quality.

The HDD process would not directly or cumulatively introduce toxic or hazardous substances or chemicals, organic substances, or solid wastes into bodies of water or on land to cause the level of these substances to exceed regulatory standards. The bentonite clay used in the drilling process is a non-toxic clay that is not a hazardous substance. It is possible that drilling mud could escape from the bore into the surrounding geologic formation. Any material migrating to the surface would be rapidly dispersed by wave and current action and would not be expected to persist or accumulate in appreciable amounts. During the final stage of drilling, bentonite addition to the drilling fluid would be discontinued, and only water would be used, thus minimizing the release of the clay sediment when the bore exits the seabed. The drilling contractor would follow procedures established in a project-specific Drill Monitoring and Cleanup Plan to minimize the possibility of a release of drilling mud into the ocean, and to remove any accumulation of drilling mud on the seafloor.

The only hazardous substances that would be used in the proposed project are lubricants and fuel contained in marine vessels and equipment. Vessels would be required to adhere to federal, state, and Implementing

Organization (IO) requirements for the management of hazardous materials and hazardous waste. Vessels engaged in installation would adhere to all USCG (CWA §311) requirements regarding the containment, cleanup, and reporting of spills, which would assure that the effects are minimized. Therefore, no significant impacts to marine water quality with implementation of the Proposed Action are anticipated.

Small-scale increases in turbidity would occur due to installation of the cables and instruments on the seafloor. Turbidity would be minor and temporary throughout the installation activities. Sediments would rapidly disperse and/or settle back to the seabed. Coarse sediments (sand or larger) would resettle within seconds in the immediate area, whereas fines (silt to clay) tend to drift and remain in suspension for minutes to hours, depending on particle sizes and bottom currents. There would be no permanent or significant effect on marine water quality due to suspended sediments. The outer layers of submarine cables are insoluble and readily become encrusted with marine organisms and are not expected to break down for decades. Inner metallic components are sealed from the surrounding media. Any by-products of corrosion or dissolution of cable components in seawater would be rapidly dispersed and diluted in the water column and, as such, are not anticipated to have a significant effect on water quality.

4.1.8 Cultural Resources

Under the Proposed Action, potential impacts to cultural resources from the proposed (CSN) Endurance Array would only be associated with the placement of two mooring anchors (at 25 m or approximately 3 nmi from shore) on the seafloor for the Grays Harbor Line, four mooring anchors (two each at 25 and 50 m) on the seafloor for the Newport Line, and associated scientific sensors on the seafloor in the immediate vicinity of the moorings. The proposed RSN cable route would be sited to avoid all known cultural resource sites. Site-specific surveys would be conducted prior to placement of any RSN cable and mooring anchors to determine if any undiscovered cultural resources are within the immediate vicinity of the proposed RSN cable and Endurance Array moorings. With the implementation of pre-cable laying surveys and the routing of the RSN cable and placement of Endurance Array moorings to avoid known cultural resources, there would be no significant impacts to cultural resources with implementation of the CSN (Endurance Array) and RSN components of the Proposed Action.

NSF and the CSN IOs would establish a communication process with the Quinault Nation to establish points of contact to exchange information on proposed OOI activity and Tribal fishing regulations in order to avoid disruption of Tribal usual and accustomed fishing patterns. Therefore, implementation of the Proposed Action would not result in adverse effects to historic resources, cultural resources, or to usual and accustomed fishing rights.

4.1.9 Socioeconomics (Fisheries)

The proposed installation and O&M activities of the CSN (Endurance Array) and RSN would have two potential impacts to commercial fisheries operations in the ROI: 1) presence of the cable installation vessel would preclude fishing activities within a limited area (~1.6 km) for a temporary period (a few hours to several days), and 2) commercial fisheries that use equipment that contacts the bottom could potentially snag unburied portions of the cable or scientific sensors, causing damage to or loss of their fishing gear, or damage to the cable or scientific sensors on the seafloor.

Notice would be given to fishing vessels regarding the proposed CSN and RSN installation operations to prevent contact that could potentially damage fishing gear. No exclusions are proposed along the cable route, so interference would not occur between the cable installation vessel and commercial fisheries. Potential interference with commercial fishing activities could occur during cable and mooring installation operations, but these would be temporary and localized. As the cable vessel and installation operations progress, fishing activities would not be precluded along the entire proposed cable route or Endurance Array lines. Only small areas would not be available for fishing while the cable plow and cable-laying vessel are in a specific area.

The IOs for the proposed CSN and RSN and representatives from the OFCC have been in preliminary discussions about a formal agreement that would address concerns of the fishing industry regarding installation of the cable and potential impacts on fishing revenues from potential loss of gear. Such agreements have been incorporated into the considerations and approvals of previous commercial fiber optic cable projects in Oregon coastal waters. These earlier agreements have provided a model for the preliminary discussions. With the implementation of SOPs and the incorporation of an agreement between the OFCC and the OOI owner, there would be no significant impacts to commercial fisheries with implementation of the Proposed Action.

4.2 MID-ATLANTIC BIGHT CSN (PIONEER ARRAY)

4.2.1 Geological Resources

Under the Proposed Action, potential impacts to geological resources from the proposed Pioneer Array would only be associated with the placement of 12 mooring anchors and associated sensors on the seafloor ~75 nmi from shore. The placement of these anchors and sensors would result in short-term insignificant impacts to surface sediments in the immediate vicinity of the proposed Pioneer Array assets, and there would be no significant impacts to marine geological resources.

4.2.2 Air Quality

The Proposed Action is not located within the jurisdiction of any state and is also outside U.S. Territory. There are no emissions standards for vessels or activities operating beyond 12 nmi of shore. Proposed activities would result in minor temporary emissions from surface vessels or surface buoys during installation and O&M activities of the Pioneer Array. However, these emissions would not represent a substantial increase above existing conditions as only a small number of vessels and surface buoys would be used. The proposed installation and O&M activities associated with the Pioneer Array would take place more than 75 nmi from the shoreline of any state and therefore would not compromise air quality attainment status in New York, Rhode Island, Connecticut, and Massachusetts. Therefore, the Proposed Action would have a negligible impact on air quality within the ROI.

4.2.3 Water Quality

Proposed installation and O&M activities at the proposed Pioneer Array would not introduce any materials or substances into the marine environment that would adversely affect marine water quality. The only potential sources of hazardous materials would be unanticipated accidents or spills that resulted in a discharge of fuel, lubricants, or sensor components (e.g., batteries) from a project vessel or associated OOI equipment and sensors. Based on existing IO requirements and procedures for management of such materials on board vessels and the design of scientific equipment and sensors, such events are extremely unlikely to occur. If such a spill were to occur, it would be a localized occurrence, and adherence to standard containment, cleanup, and reporting requirements would assure that the effects are minimized. In addition, residual material would be dispersed by natural processes.

The proposed Pioneer Array would be capable of being upgraded to a methanol-based fuel cell power generation system. Pure 100% methanol (M100) would be used in the proposed fuel cells. An alcohol, methanol is a clear, odorless, volatile liquid, and mixes completely in water. Based on a review of existing information on the fate and transport of methanol in the environment, it was determined that methanol was unlikely to accumulate in surface water in the event of an accidental spill of a fuel cell. In surface water, the complete solubility of methanol would result in rapid wave-, wind-, and tide-induced dilution to low concentrations. Relative to conventional gasoline and diesel fuel, methanol is significantly less toxic to marine life than oil or gasoline and is considered a safer and more environmentally benign fuel.

The project would not alter currents or circulation regimes. A minor and localized area for which the anchors, scientific sensors, and connecting cables would be placed would likely have some re-suspension of sediment, but these effects would be temporary. Therefore, no impacts to water quality with implementation of the Pioneer Array component of the proposed OOI are anticipated.

4.2.4 Cultural Resources

Under the Proposed Action, potential impacts to cultural resources from the proposed Pioneer Array would only be associated with the placement of 12 mooring anchors and associated sensors on the seafloor beyond 75 nmi of shore. Prior to deployment of the proposed moorings and anchors, a site survey would be conducted within an approximate 1-km radius of each proposed anchor site to determine if any known or unknown cultural resources (e.g., shipwrecks) are within the vicinity. All obstructions and/or cultural resources would be avoided based on these surveys and after consulting the Automated Wreck and Obstruction Information System (AWOIS). Therefore, the placement of the proposed Pioneer Array would not result in significant impacts to cultural resources.

4.2.4 Marine Biological Resources

The vessels and activity associated with installation of 12 surface and subsurface moorings and associated scientific sensors on the sea floor may cause marine species to temporarily avoid the immediate vicinity of the proposed Pioneer Array, but this impact would not be significant due to the small scale and temporary nature of the proposed activities (estimated time to deploy a mooring with one vessel is 12-24 hours). The vessel used for mooring deployment would move very slowly (1-2 knots) during the activity and would not pose a collision threat to marine mammals. Entanglement of marine species is not likely because the rigidity of the mooring cables and the ability of marine species to detect and avoid the mooring lines. Once installed on the seabed, the proposed mooring anchors and scientific sensors would be equivalent to other hard structures on the seabed, again posing no risk of adverse effect on marine organisms.

Impacts from the placement of proposed mooring anchors or nodes, and cabled scientific sensors on the seafloor would include temporary mechanical disturbance of soft sediments, and long-term coverage of relatively small areas of substrate by the anchors and scientific sensors. Based on the expected size and number of anchors and scientific sensors on the seafloor, ~30 m² of EFH may potentially be impacted during installation activities. Over time, the natural movement of sediments by ocean currents and burrowing organisms would reestablish natural bottom topography. The short-term and minor increases in turbidity and sedimentation would not affect the ability of EFH to support healthy fish populations and affected areas are expected to recover quickly. Therefore, the implementation of the proposed Pioneer Array would not have an adverse affect on EFH in the area.

The use of up to 10 gliders and 3 AUVs within a survey area of ~9,000 nmi² around the Pioneer Array is not expected to affect marine species as the proposed gliders and AUVs would move within the water column similar to a dolphin or whale. Gliders are sealed, contain no motors, fuels, or hazardous materials; and move at very slow speeds (~0.5 knot), thereby eliminating the potential for collisions with marine mammals. AUVs also move at low speeds (~3.5 knots) with little potential for collisions with marine species. AUV batteries are sealed with little potential for leakage. Therefore, the use of gliders and AUVs associated with the proposed Pioneer Array would not have an adverse affect on marine species, including ESA-listed species, in the ROI.

The proposed active acoustic sources associated with the Pioneer Array would generally operate at frequencies much higher than those frequencies considered audible by fish and marine mammals. The ADV, BAP, and the ADCP would all operate at frequencies greater than 180 kHz, with most operating at frequencies greater than 200 kHz (see Table 2-6). For the HPIES, MBES, SBP, altimeters, acoustic modems, and tracking pingers operating at frequencies between 2 and 170 kHz, fish and marine mammals would not

be disturbed by any of these proposed acoustic sources given their low duty cycles, the brief period when an individual animal would potentially be within the very narrow beam of the source, and the relatively low source levels of the HPIES, pingers, and acoustic modems. Therefore, implementation of the proposed deployment of the Pioneer Array is not expected to result in significant acoustic impacts to fish and marine mammals, including ESA-listed species.

4.3 GLOBAL SCALE NODES (GSN)

4.3.1 Geological Resources

Under the Proposed Action, potential impacts to geological resources from the proposed four GSN sites would only be associated with the placement of 12 mooring anchors and associated scientific sensors on the seafloor in International Waters. Impacts would include temporary mechanical disturbance of sediments, and long-term coverage of relatively small areas of substrate by the anchors, scientific sensors, and connecting cables. Over time, the natural movement of sediments by ocean currents and burrowing organisms would reestablish natural bottom topography. These impacts on bottom substrates are considered minor and would result in short-term insignificant impacts to geological resources at these remote and isolated locations.

4.3.2 Air Quality

The proposed GSN sites are not located within the jurisdiction of any state and are also outside U.S. Territory in International Waters. There are no emissions standards for vessels or activities operating beyond 12 nmi of shore. The Proposed Action would result in minor temporary emissions from surface vessels during installation and O&M activities of the GSN sites. However, these vessel emissions would not represent a substantial increase above existing conditions, as only a small number would be used and for only a few weeks per year. The proposed installation and O&M activities associated with the GSN sites would take place more than 75 nmi from the shoreline and therefore would not compromise the air quality of any country. Therefore, it is anticipated that the Proposed Action would have only a negligible impact on air quality.

4.3.3 Water Quality

Proposed installation and O&M activities at the proposed GSN sites would not introduce any materials or substances into the marine environment that would adversely affect marine water quality. The only potential sources of hazardous materials would be unanticipated accidents or spills that resulted in a discharge of diesel fuel, lubricants, or sensor components (e.g., batteries) from a project vessel or associated OOI equipment and sensors. Based on existing IO requirements and procedures for management of such materials on board vessels and the design of scientific equipment and sensors, such events are extremely unlikely to occur. If such a spill were to occur, it would be a localized occurrence, and adherence to standard containment, cleanup, and reporting requirements would assure that the effects are minimized. In addition, residual material would be dispersed by natural processes.

Although currently proposed as being powered by solar or wind power, the proposed Southern Ocean and Irminger Sea discus buoys would be capable of being upgraded to a methanol-based fuel cell power generation system. Pure 100% methanol (M100) would be used in the proposed fuel cells. An alcohol, methanol is a clear, odorless, volatile liquid, and mixes completely in water. Based on a review of existing information on the fate and transport of methanol in the environment, it was determined that methanol was unlikely to accumulate in surface water in the event of an accidental spill of a fuel cell. In surface water, the complete solubility of methanol would result in rapid wave-, wind-, and tide-induced dilution to low concentrations. Relative to conventional gasoline and diesel fuel, methanol is significantly less toxic to marine life than oil or gasoline and is considered a safer and more environmentally benign fuel.

The project would not alter currents or circulation regimes. A minor and localized area for which the anchors, scientific sensors, and connecting cables will be placed would likely have some re-suspension of sediment, but would be temporary. Therefore, there would be no impacts to water quality with implementation of the GSN component of the proposed OOI.

4.3.4 Marine Biological Resources

The vessels and activity associated with installation of the GSN components on the sea surface, in the water column, and on the sea floor may cause marine species to temporarily avoid the immediate vicinity, but this impact would not be significant due to the small scale and temporary nature of the proposed activities (estimated time to deploy a discus surface mooring with one vessel is 12-24 hours). The vessel used for mooring deployment would move very slowly during the activity and would not pose a collision threat to marine mammals, including ESA-listed species. Entanglement of marine species is not likely because the rigidity of the mooring cables and the ability of marine species to detect and avoid the mooring lines. Once installed on the seabed, the proposed buoy anchor, flanking mooring anchors, and scientific sensors would be equivalent to other hard structures on the seabed, again posing no risk of adverse effect on marine organisms.

The use of up to five gliders within a survey area of hundreds of square km around the GSN sites is not expected to affect marine species as the proposed gliders move within the water column similar to a dolphin or whale. Gliders are sealed, contain no motors, fuels, or hazardous materials; and move at very slow speeds (~0.5 knot), thereby eliminating the potential for collisions with marine mammals and sea turtles.

The proposed active acoustic sources associated with the GSN sites would generally operate at frequencies much higher than those frequencies considered audible by fish and marine mammals. The ADV, BAP, and the ADCP would all operate at frequencies greater than 180 kHz, with most operating at frequencies greater than 200 kHz. For the MBES, SBP, altimeters, acoustic modems, and tracking pingers operating at frequencies between 2 and 170 kHz, fish and marine mammals would not be disturbed by any of these proposed acoustic sources given their low duty cycles, the brief period when an individual animal would potentially be within the very narrow beam of the source, and the relatively low source levels of the pingers and acoustic modems. Therefore, implementation of the proposed deployment of the GSN sites is not expected to result in significant acoustic impacts to fish and marine mammals, including ESA-listed species.

4.4 CUMULATIVE IMPACTS

CEQ regulations (40 CFR 1500 – 1508) implementing the provisions of NEPA, as amended (42 USC 4321, *et seq.*) provide the definition of cumulative impacts. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. A cumulative impact results from the additive effect of all projects in the same geographical area. Generally, an impact can be considered cumulative if: a) effects of several actions occur in the same locale, b) effects on a particular resource are the same in nature, and c) effects are long-term in nature. The common factor key to cumulative assessment is identifying any potential temporally and/or spatially overlapping or successive effects that may significantly affect individual or populations of marine resources occurring in the analysis areas.

4.4.1 Resource Considerations

Certain resources do not need to be considered for cumulative impacts at this programmatic level because either a) the effects of the proposed action would be so small and localized that the potential additive effects with other actions would be negligible; or b) the effects of the proposed action would be limited sufficiently by statutory or regulatory requirements and procedures that potential additive effects would, again, be negligible. These include the following:

- *Air Quality.* Emissions from the Proposed Action would be minimal in comparison with other local and regional sources and would be transitory during installation and use of the proposed systems.

Local air basin jurisdictions establish emissions thresholds for significance and mitigation that help ensure that individual project emissions do not individually or cumulatively have a significant impact on air quality. Emissions from the Proposed Action would be below levels of significance and do not involve permanent stationary sources. In the offshore waters, emissions from proposed activities would involve relatively small quantities of pollutants produced by project vessels; such emissions would be transient and rapidly dispersed. Therefore, cumulative impacts on air quality are anticipated to be insignificant or non-existent.

- *Geology and Water Quality.* Effects of the Proposed Action are sufficiently small in magnitude and limited in extent that potential additive effects are negligible. Potential water quality impacts are also limited by CWA requirements for permitting, which would be followed for onshore and in-water construction. Therefore, cumulative impacts on geological resources and water quality are anticipated to be insignificant or non-existent.
- *Transportation.* Marine transportation effects would be minimized by coordination with local coastal authorities and the avoidance of heavily used vessel transit corridors, the latter by design of the system. NOTMARs would be used to minimize the potential conflicts with other vessels, during installation, and the depiction of the structures on NOAA navigation charts would minimize conflicts thereafter. Surface buoys or other structures would be marked in accordance with USCG regulations and readily avoidable.
- *Hazardous Materials.* The only potential sources of hazardous materials would be unanticipated accidents or spills that resulted in a discharge of fuel, lubricants, or sensor components (e.g., batteries) from a project vessel or associated OOI equipment and sensors. Based on existing requirements and procedures for management of such materials on board vessels and the design of scientific equipment and sensors, such events are extremely unlikely to occur. If such a spill were to occur, it would be a localized occurrence, and adherence to standard containment, cleanup, and reporting requirements would assure that the effects are minimized. In addition, residual material would be dispersed by natural processes, but the potential for additive effects with other discharges of hazardous materials in the same location(s) is considered negligible. Therefore, significant cumulative impacts are not anticipated to occur.
- *Cultural Resources.* Site-specific evaluations and compliance with the requirements of the National Historic Preservation Act would ensure that the Proposed Action avoids impacting properties listed or potentially eligible-for-listing on the National Register of Historic Places. Therefore, significant cumulative impacts to cultural resources are not anticipated to occur.
- *Terrestrial Resources at Shore Stations.* Project SOPs would ensure that any new onshore construction would have minimal or no impact on sensitive natural resources. Since the proposed shore stations are on previously developed and disturbed sites on the immediate coast, the impacts on land are essentially contained within an existing “footprint” and there is little to no potential for cumulative effects with development or other activities onshore. Implementation of BMPs in conjunction with obtaining coverage under the NPDES general permit for construction would effectively avoid potential cumulative effects on surrounding lands and waters. Finally, the permitting for the new infrastructure onshore would address consistency with zoning requirements, local land uses, and resources of the adjacent coastal areas. Therefore, significant cumulative impacts on terrestrial resources at any of the proposed shore station locations are not anticipated.

The remaining resources that require further consideration for cumulative impacts include the following:

- *Marine Biology.* Marine biological resources, including the species and communities of marine benthic, water column, and surface water habitats affected by the Proposed Action, are subject to potential cumulative impacts through the incremental effects of multiple actions on habitats, species’ populations, or ecological processes. Cumulative effects on habitats can result from incremental

degradations and losses that ultimately diminish the capacity of the habitat to support species, communities, and ecological processes. Owing to the dispersal of populations, incremental effects on species at one location can interact with effects occurring elsewhere to affect the overall distribution and abundance of the species.

- *Socioeconomics (Fisheries)*. Potential cumulative effects on Socioeconomics (Fisheries) reflect primarily the potential for structures installed on the seabed and within the water column to interfere with commercial fishing. These potential impacts would be reduced, but not eliminated, through coordination with local fishing groups, such as the OFCC, and the implementation of agreements regarding damage to fishing gear and preclusion from fishing areas, as part of the Proposed Action.

4.4.2 Cumulative Impacts Analysis

CSN (Endurance Array) and RSN. Installation and use of the Grays Harbor and Newport lines of the Endurance Array would entail relatively small, localized areas of disturbance to the seabed during installation. The extent of disturbance to the seabed associated with the RSN is of wider extent, but still affects a very small area of the seabed in any particular location. Disturbance would be predominantly in soft-sedimentary habitats, which are subject to natural disturbances (bioturbation by fishes and invertebrates) and strong sediment deposition and transport in the dynamic cross-shelf environment. These natural phenomena ensure that alterations of the soft-bottom habitat are temporary. Once in place, the permanent structures of the RSN would either remain buried or provide hard surfaces for attachment and sheltering of fishes and invertebrates, a beneficial effect. Overall, cumulative effects on marine biological resources would be insignificant.

The CSN and RSN structures could potentially interfere with commercial fishing to varying degrees, depending on gear type, and in conjunction with restrictions imposed under the Fishery Management Plans. Coordination with the local fishing community would reduce these potential impacts, and it is possible that the presence of structures may contribute to resource sustainability by providing localized refuges from fishing. Overall, however, because of the expanding, incremental loss of access to fishing grounds due to the placement of structures on the seabed and in the water column, the potential exists for the proposed action to have cumulative effects on commercial fishing. It is anticipated that such impacts would be mitigated by the finalization of fishing agreements with the affected parties (i.e., OFCC).

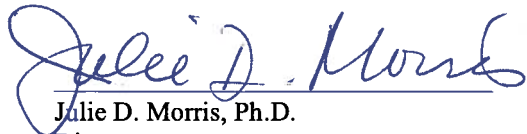
CSN (Pioneer Array). For the same reasons discussed above for the Endurance Array, the proposed Pioneer Array would have negligible cumulative effects on marine biological resources. Potential effects would be negligible due to the extremely small “footprints” of the array components (surface and subsurface mooring buoys). The Pioneer Array is proposed as a relocatable array that may be moved to another location 3-5 years after its initial proposed deployment as covered under the Proposed Action. The precise location and eventual relocation of the Pioneer Array, including the retrieval of assets from the proposed location south of Massachusetts, would be covered under separate NEPA documents. However, it is not expected that the retrieval or redeployment of the Pioneer Array would have any cumulative effects based on the current analysis.

GSN. Use of the proposed GSN sites would impact relatively small areas of the seabed, water column, and ocean surface of relatively remote areas. With the wide dispersion of research and other activities across these areas, no significant cumulative effects are anticipated.

5.0 CONCLUSION

NSF has reviewed and concurs with the conclusions of the TEC programmatic environmental assessment (Attachment 1) that supports the conclusion that implementation of the proposed activity would not have a significant impact on the environment. Consequently, implementation of the proposed activity is not a major federal action having a significant impact on the environment within the meaning of NEPA, and an

environmental impact statement will not be prepared. Therefore, on behalf of NSF, I authorize the issuance of a Finding of No Significant Impact for the proposed Ocean Observatories Initiative.



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