A) Vision and Purpose

The *Oregon Coast Regional STEM Education Center*, composed of Science, Technology, Engineering and Math (STEM) professionals and educators from school districts, government agencies, industries and non-profit institutions in Tillamook and Lincoln Counties, has a shared vision for providing world-class STEM opportunities for rural students and teachers in our region. We seek to expand and strengthen our partnerships, incorporating new districts, agencies and industries to provide a sustainable Regional Hub for STEM teaching and learning on the Oregon Coast. Utilizing our rich, coastal environments we address local and regional issues to provide authentic, challenging, contextual, problem-based learning (PBL) experiences that cut across compartmentalized disciplines and curricula. We prepare teachers to engage students in scientific inquiry, engineering design, technology and math applications through authentic experiences that model real-world problem solving strategies and improve their content knowledge and pedagogy. Teachers then provide students with STEM learning experiences that increase their academic achievement and interest in STEM subjects, college majors, and careers.

Our rural communities' high needs and significant challenges in the area of STEM for students, teachers, and industry are a product of a depressed economy and reflect the significant geographic distances from population centers. Located along a 125 mile-long stretch of the Central and North Oregon Coast, both Lincoln County School District (LCSD) and Tillamook School District (TSD) are classified as rural, high poverty districts, serving over 7000 students. Academic achievement among minority, economically disadvantaged, English learners, and homeless subgroups is below state averages in all tested content areas. Appendix A provides demographics. The coast has experienced dramatic change relative to opportunities and needs in STEM education as the population and industry have transitioned from a resource extraction

based economy to a marine-based research and tourism economy supported by fisheries and dairies. An aging population, significant out-migration of youth, and small number of businesses and industries on the coast limit career development opportunities for our students and fail to provide them with adequate role models or exposure to STEM career opportunities in general.

We will leverage existing resources and develop new STEM programs and opportunities for students and teachers along the entire Oregon Coast. Marine and aquatic sciences comprise the primary STEM content due to the proximity of local communities to the ocean, and significant Oregon State University, state, and federal ocean science research efforts centered in Newport. The presence of informal, ocean science education organizations (Oregon Coast Aquarium and HMSC Visitor Center), a host of government and non-profit groups' environmental education programs, and significant external funding has supported network building and STEM programming to date. Emerging STEM career opportunities in ocean observing, resource management, climate change, and marine technology poise us to develop Collective Impact Partnerships that will help prepare students for STEM majors and STEM careers.

As a result of this collaboration our expected outcomes are to 1) ensure rural, coastal students develop the expected knowledge, skills, experience and motivation necessary to enter post-secondary education leading to employment in higher paying, in-demand careers in STEM related fields, including the opportunity to attain these outcomes locally, 2) provide access for coastal businesses, industries, and government entities to an educated STEM talent pool that is prepared, innovative, and motivated, 3) ensure that coastal schools and educators have the tools and support necessary to deliver world-class STEM instruction, and 4) provide coastal students and community members with the scientific literacy and critical thinking skills necessary to make informed decisions regarding complex regional issues.

(B) History and Content

Current STEM collaborations demonstrate that our partnership is ideally positioned; ready, and able to expand into a *Regional STEM Hub.* Our network of strong and effective partnerships (see Appendix B for acronyms of key project organizations) has a record of improving STEM teaching and learning. We now seek to strengthen our partnerships with business and academic communities within Lincoln and Tillamook counties, while also expanding to include coastal districts, partners, and communities in adjacent counties to the North and South.

Our long history of programmatic success is the foundation for this broader partnership initiative. A methodical, long-term approach to partnership and program development began in 2006 with a core group of partners (LCSD, Oregon Coast Aquarium, Oregon State University/Oregon Sea Grant) that focused on an Ocean Literacy initiative for all LCSD students and teachers. From that partnership, a successful MSP 3-year project (2009-2012), the Oregon Coast Aquatic and Marine Science Partnership, provided teacher training and student learning experiences, developing teacher-scientist partnerships that included over 60 teachers and 80 scientists. A second MSP grant (2012) expanded to Tillamook School District, its partners, and over a dozen new partners to form the *Oregon Coast Regional STEM Education Center*, the basis for the proposed Oregon Coast Regional STEM Hub. Established partnerships with community-based marine and natural resource organizations support professional development of staff and provide students with a variety of settings for real world, place-based learning opportunities.

We have an established history and strong evidence of delivering effective ocean science, natural resources, technology and engineering related teacher professional development and student learning experiences. Instructional programs supported by our many partners in both counties offer unique opportunities for our teachers and their students to become involved in a

host of STEM activities, and also engage our students with STEM professionals as role models and mentors. Over the past seven years, we have worked together to address identified educator and student needs, creating new programs and resources, such as the Coastal Learning Symposium, which provides professional development to over 300 coastal educators annually, and student STEM challenges, such as the Oregon Regional MATE ROV competition and the Oregon Coast Renewable Energy Challenge (student engineered wind and wave energy devices). Our partnerships are authentic, long lasting, award winning (Appendix C), and serve as the strong foundation needed for a successful, expansion into a Regional STEM Hub.

Current partnership resources are provided through a combination of funding by individual partners, in-kind contributions, and grants. The school districts and institutional partners have demonstrated a strong, long-term commitment as evidenced by their significant funding of personnel and time dedicated to sustaining and enhancing partnerships. LCSD funds (.3 FTE) support a Community Curriculum Resource Liaison to focus on STEM partnerships. The 3rd Annual Coastal Learning Symposium, held in October 2013, is a fully paid in-service day for LCSD teachers and represents a significant financial commitment (~$100,000). TSD funds a district-wide Natural Resource Coordinator (~ $90,000) to build partnerships, coordinate natural resource projects, design and articulate curriculum, and support staff professional development.

Oregon Sea Grant, BLM and ODFW personnel in all coastal counties provide a variety of support to teachers, including scholarships for classes and labs at Hatfield Marine Science Center (HMSC), curriculum kits for classroom use, and the Salmon in the Classroom program. Staff coordinate a Science Fair for elementary and middle school students and organizes volunteer mentors to support students with their projects. The Aquarium provides financial and personnel support with a School Partnership Liaison position and with Dollar Days, when admission for all

LCSD and TSD students on school visits is only $1. The Aquarium launched the new online *Oceanscape Network* to support middle and high school students and teachers in conducting inquiry-based science (Appendix D).

The commitment of partners for involvement beyond the grant includes the continuation of funded positions, and significant effort of university faculty, informal science, and STEM professionals' time in collaborating with teachers and students, discounted admission and lab fees at HMSC and the Aquarium, and provision of space and technology support for on-line and in-person professional development. The partners have a solid working relationship and collaborate on seeking grants, foundation and other funding to support the current work and expansion plans.

Our coastal communities have special attributes and resources that will enable this partnership to be effective. Oregon State University's HMSC, centrally located on the Oregon Coast, is an almost 50 year old, collaborative institute made up of seven OSU Colleges, six state and federal agencies, and over 300 researchers and resource managers. OSU has mounted a significant new effort to create a Marine Studies Campus based at HMSC to serve 500 undergraduate students. HMSC Director, Dr. Robert Cowen, *has committed to hosting the future physical location of the Oregon Coast Regional STEM Hub* (Partner Commitment). HMSC, OSU, and Oregon Sea Grant will help lead the development of the regional K-20 STEM Hub with an explicit focus on marine and aquatic sciences. Centering such a Hub at HMSC will maximize the existing synergies and partnerships for a coast-wide presence. Through Oregon Sea Grant, OSU has an extended reach up and down the entire Oregon Coast of extension agents connecting with stakeholders in the school districts and communities that we now seek to include in our planned expansion. Over 40,000 students per year visit the Oregon Coast Aquarium and special pricing and programs

support our rural, coast students. NOAA MOC-P and OSU's research vessels are a unique resource not available anywhere else. The vessels and their crews provide opportunities for student engagement including ship tours, career programs, and mentors for science fairs and the MATE ROV program. In Tillamook, the Watershed, Estuary, Beach and Sea (WEBS) program provides education and opportunities for research on Netarts Bay. As a partner WEBS is committed to expanding their $50,000/year support coast-wide. Tillamook Estuaries Partnership (TEP) funds hundreds of student field trips through their "Day at the Bay" program.

Additional partners and stakeholders who should be involved for long-term sustainability of this Regional STEM Hub include several who have been involved in partnership activities at various levels, but whose involvement needs to be strengthened and formalized. These include the coastal community colleges, Confederated Tribes of Siletz Indians, USFWS, Oregon State Parks, and 4-H programs. The Central Oregon Coast Chapter of the National Organization for Women (COCNOW) has contacted us about supporting a special *Girls in STEM* initiative, and the American Association of University Women has provided funding in TSD to support girls' STEM programming. In addition, though we have a strong relationship with several academic departments (Fisheries/Wildlife, SMED, CEOAS, Forestry) at OSU and OHSU, new collaborations with mathematics and engineering faculty are planned.

Several new entities have been recruited to join our partnership during Phase 1, including Georgia Pacific and the Tillamook Creamery Association (significant businesses/industries in our region.) We will also expand our programs to North Bend and Coos Bay School Districts to the south, capitalizing on our connections with South Slough National Estuarine Research Reserve (SSNERR). Smaller Tillamook County Districts (Nestucca, NeahKahnie) and the north coast's Warrenton-Hammond, Astoria, and Seaside districts have also agreed to join the Oregon

Coast Regional STEM hub. We plan to engage other stakeholders, such as community government officials from the Ports of Newport, Tillamook, Coos, and Garibaldi, County Commissioners/ Economic Development Councils, and parent organizations.

Our proposed STEM Hub already has a strong relationship with other regional efforts. Our second 3-year MSP grant has 23 partners, including proposed Hub partners. LCSD has new, STEM focused 21st Century Community Learning Centers and the Oregon Regional STEM Center currently provides training and resources to after school site coordinators. This training is focused on student engineered wave and wind energy devices, and ROVs. Both TSD and LCSD have Oregon Educator Mentoring Grants and utilize mentors who are also MSP STEM Fellows working with beginning teachers. Oregon Sea Grant and the Oregon Coast Aquarium are also partners with SSNERR and others in the NOAA B-WET funded Oregon Coast Education Program (OCEP) that focuses on teacher PD and resource development around watershed and coastal education throughout Oregon. These partnerships will serve to strengthen the Oregon Coast Regional STEM Center expansion.

The STEM Hub will implement strategies that support partner districts to fulfill their Achievement Compacts and increase opportunities for rural students to take advantage of STEM opportunities in college and careers. Tillamook SD participates in Teach Oregon, a project supported by ODE and Chalkboard, that is building partnerships between school districts and universities in order to better prepare teacher candidates and strengthen the teacher workforce in Oregon. The Oregon Coast STEM Hub would serve as a valuable resource to teacher preparation programs by offering innovative placements and STEM related professional learning opportunities for teacher candidates. Partner districts are engaged in several other regional and

statewide efforts (Regional Achievement Collaboratives, Collaboration Grants) that have the potential to maximize student achievement in STEM and on new Common Core measures.

(C) Partnership Plan Development

Although we are applying under Phase 1 criteria, significant work has already addressed many required elements of Phase 2 (Appendix E). Our 5-year MSP established formal and informal partnerships and we have a leadership team representing core and supporting partners. Our Partnership Plan involves undertaking a community engagement process that draws additional stakeholders into our STEM Hub and formalizes our Partnership Plan. This process (Phase1) includes contracting with a facilitator who will guide us through 1) refining and re-formalizing our vision, 2) designing a business/operational plan and governance structure, 3) assessing assets and mapping data, 4) defining our STEM strategies for increasing student STEM achievement and career and college readiness, 5) selecting common outcomes and measures, and 6) developing long term funding and sustainability plans.

A series of community meetings and work sessions will be held with partners and stakeholders working with consultants from the Nonprofit Association of Oregon. With over 30 years' experience with nonprofit organizations, foundations, and government agencies, they will bring substantial expertise to our group and can help move us forward quickly to Phase 2. Meeting and work sessions will be held in geographic locations on the North, Central, and South Coast to ensure representation and inclusiveness along the entire coast.

Project Manager, Tracy Crews, Oregon Sea Grant (OSU), will coordinate meetings, work with LCSD fiscal agent on budgeting, work with graduate student(s) on data collection and analysis, manage Phase 1 and 2 activities, and complete required reports. Communications coordinator, Cait Goodwin, also from Oregon Sea Grant, will handle communications and public

relations, Web site management, meeting minutes and documents (business plan, partnership agreements and governance documents) that will be submitted for ODE approval.

The core partners have agreed not to form a new, separate entity, but rather to formalize a Collective Impact Partnership leveraging the strengths and expertise of individual members to achieve a shared vision and common outcomes. Specific partners will assume roles and responsibilities for the various activities of the partnership. LCSD Business Manager Julie Baldwin will serve as Project Director for the STEM Hub and as fiscal agent for the grant and contracts. Ruth McDonald, LCSD Resource Liaison, will continue developing and coordinating partnerships that align with the STEM Hub. LCSD will provide fiscal services for the hub. TSD's Claire Thomas and Oregon Coast Aquarium's Rachael Bashor will act as professional development facilitators during Phase 2, expanding on their current roles in the MSP project. Two (2) new satellite coordinators will be selected from partner districts to represent and coordinate with local partners from the North and South Coast. In phase 2, twenty (20) Mentor teachers from partner districts will serve as school/district liaisons and PLC facilitators.

As our business, governance, and sustainability plans develop and are implemented, various partners may serve as the lead organization for specific activities, such as grants, contracts and fundraising. We currently possess substantial data on current education and economic indicators and stakeholder needs for Tillamook and Lincoln County. Additional data and input will be needed from new partner school districts, community colleges, and stakeholders. Dr. Shawn Rowe, OSU, will coordinate graduate researchers in collecting data and determining what additional assessments are needed in Phase 1. Phase 1 and Phase 2 timelines and activities are outlined in tables in Appendix F. Our logic model (Appendix G) guides our Phase 1 planning and development and Phase 2 implementation work.

(D) Programmatic Strategies

Our partners have a history of documented success developing, supporting, and increasing teacher effectiveness in ocean and coastal resource science, while also incorporating technology, engineering, and math into the curriculum. A core principle for marine and aquatic STEM programs' effectiveness is the involvement of diverse groups, such as post-secondary institutions, government agencies, non-profits, industry, and the scientific community as partners and content experts. We plan the continued use of these evidence-based, promising approaches in order to achieve the goals and needs of the partnership. These include a primary focus on professional development opportunities for teachers and informal STEM educators that emphasize place-based, authentic, problem-based learning (PBL) for students. MSP project evaluation results over the past six years found participating teachers had higher percentages of students meeting and exceeding benchmarks on Oregon Assessment of Knowledge and Skills in Science and Math as compared to non-participants' students. Recent results of student STEM Interest Surveys for grades 3-8 in LCSD and TSD found higher rates of indicated interest in STEM classes and careers among students of participating teachers. MSP evaluation results have shown unequivocally that participating teachers significantly increased their science and math content and pedagogical knowledge and skills.

The Oregon Environmental Literacy Plan, Ocean Literacy Principles, and ODE STEM Initiative serve as foundations for our STEM Hub strategies. Multiple partners (OFRI, ONREP, OCA) have played a significant role in using coastal natural resources as a vehicle for STEM education in conjunction with local government agencies, industry, and research groups to provide STEM opportunities for students. Partners outside of Oregon also provide PD for

teachers (MBARI, UW), demonstrating our ability to connect coastal teachers with national STEM experts.

The current blended learning model is proving to be extremely successful as a cost-effective and practical solution to establish a meaningful and sustained Professional Learning Community (PLC) among diverse and geographically distant schools and teachers. We have developed an interactive, online PLC format using *GoToMeeting* software that allows face-to-face, real time interaction among teachers participating from their own classroom. The use of this blended model of in-person seminars and online workshops resulted in our teachers engaging in nearly 100 hours annually of job-embedded learning. Because our STEM Hub expands along much of the Oregon Coast, incorporating this online model will be a critical strategy component. The effectiveness of this blended online/in-person model serves as a model for regional hubs.

Success stories arising from current strategies and programs include teacher awards for curriculum development and outstanding instruction, participation of teachers in research activities, and a host of collaborative activities between teachers and research professionals in designing and delivering instruction in the classroom and beyond. Appendix H outlines some of our current and proposed strategies. A formal partnership will ensure these strategies provide a legacy on which to build continued success for our teachers and students. Thus far, significant gains in carrying out authentic, problem-based, place-based learning have taken place among project teachers. The STEM Hub will provide a forum to host lesson plans, pedagogical resources, and researcher-teacher "matchmaking". The Hub will be an essential resource to tap when planning vetted activities such as HMSC Career Days and challenge events (ROV, wave and wind challenges). It will also provide a venue for mentoring activities, including peer-to-peer mentoring and scientist-teacher learning partnerships.

All current strategies and approaches are geared toward supporting teachers in addressing Common Core standards and State science standards through a focus on integrating multiple content areas into STEM PBL units. We have begun addressing the Next Generation Science Standards (NGSS), with 16 teachers recently completing a NSF pilot project for web-based teacher PD. During the last two years, Dr. Cheryl Beaver, WOU, has collaborated with our teachers helping them learn to embed authentic math work sample assessments into their PBLs. Dr. Beaver has committed to continuing and expanding this work with the new partners in our Hub. Clair Thomas, TSD, is coaching teachers to integrate authentic Science Inquiry Work Samples into their PBLs and has a complete professional development package that can be delivered to any partner. New partner Dr. Eric Weber, Co-director of the STEM PhD program at OSU, will develop building-based, job-embedded PD, emphasizing mathematics, and will coordinate opportunities for STEM graduate students to work with teachers and conduct research in our partner schools. Each year STEM lesson plans and units written by project teachers are posted on our MSP website (Appendix I), and the new, expanded Hub's website will also act as a repository for vetted materials that can be used by teachers statewide.

Additional evidenced based strategies for addressing the CCSS and NGSS will be developed as part of our Phase 1 work, particularly to address needs highlighted by data and asset mapping. Data from recent studies suggest that elementary science teachers will need support to teach both the disciplinary core ideas and crosscutting concepts in the NGSS (Noyce Foundation, 2013, Horizon Research, 2013). The frequency and duration of elementary science instruction is noticeably inadequate and in steady decline. Analysis of data on instructional time indicates the amount of time on science is correlated with student performance. Sadly, Oregon is dead last among states in the amount of elementary science instruction per week, an average of just 1.9

hours. Finally, schools and districts must equip teachers with the supplies and materials they need for science instruction. Teachers cannot be expected to successfully implement the NGSS without the resources to carry out instructional activities that provide students with opportunities to use the scientific practices in the standards. Our Hub will ensure a focus on addressing these needs in our rural schools.

In order to reduce the Achievement Gap in our region our partnership will implement the principles expressed in the Oregon Education Investment Board's Equity Lens, and design targeted activities and opportunities for Native American, Hispanic, female, and economically disadvantaged, rural students. We will also continue development and support for summer STEM camps for Girls and Latinos.. Elementary camps would have high school age counselors, and be staffed by teacher candidates, possibly from the Teach Oregon Project. STEM internships will be offered through the STEM Hub so that underrepresented high school students can experience short-term placement with local STEM partner organizations. The STEM Hub will provide resources to parents of Hispanic and economically disadvantaged students to help build academic skills at home.

Oregon Sea Grant/OSU is also partnering with OMSI in a NSF funded grant that seeks to promote a change in community attitudes towards females in engineering fields, such that engineering is a worthwhile field, and girls can advance and succeed in engineering as a career. In a 4-year project, Creative Solutions offers a set of hands-on engineering challenges that frame engineering as altruistic, personally relevant, and social enriching- attributes that traditionally appeal to females. The project also highlights examples of positive role models and encourages sharing between participants. Once developed and piloted at OMSI, this program will be brought to the Oregon Coast by OSG to be replicated and implemented in a rural community, initially

focusing on afterschool programs in Lincoln County. Resources and lessons learned during this process will be shared with partners in the Oregon Coast STEM Hub. Other planned strategies for ensuring equity and diversity are recruiting female and Spanish speaking researchers/college students at HMSC and our coastal community colleges with the aim of connecting them with Hispanics and female students as role models and mentors. Our Phase 1 needs assessment and data from new school district partners will help determine additional strategies for implementing the Equity Lens principles to close the achievement gap.

(E) Application Process

The process used to develop and finalize this application involved representatives from all core partners, with a shared vision of becoming a Regional STEM Hub. The core partners met in Spring 2013 and agreed to form a single regional STEM hub that maintains our current ocean sciences/natural resources emphasis. In early December 2013, the group convened, and determined the proposal writing team and fiscal agent. They also determined additional stakeholders to be invited to join with the Oregon Coast Regional STEM Hub. Dr. Shawn Rowe, OSU, SMED, offered to assist the team and to provide a graduate student's time in assessing current and projected data needs. The group determined that a Project Manager representing a current core partner would coordinate the work of the grant and logistics of the developing Hub. In addition, an outside facilitator will assist in formalizing our Collective Impact Partnership, business plan, governance, and partnership agreements. Personnel from core partners collaborated on developing the logic model (LCSD, OSU/OSG, OCA), the written proposal and budget. Feedback from partners (TSD, CMOP, OCCC, OCA) was incorporated in early January for the final proposal. A copy was sent to new and prospective stakeholders and to core partners for approval.