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2 **Research Plan**
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4 A. Project Responsiveness to NPRB Research Priorities or Identified Project Need:
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6 A guidebook will be created that will enable communities to independently map their interactions with
7 the marine environment. To test and better refine the guidebook, a mapping project will be conducted
8 using the draft guidebook in three communities: King Cove and Sand Point in Alaska, and Nikolskoye in
9 Kamchatka, Russian Federation. An explanation of how maps can be used to influence policy decisions
10 will also be provided to participants.

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12 The participating communities will each identify a Local Research Lead (LRL) to use the guidebook to
13 carry out mapping projects. In cooperation with the LRL, each community (through the local tribal
14 council) will define the parameters of the research (who will be interviewed, what type of values or
15 interactions will be mapped, how this information will be displayed, and how it will be made available).
16 The LRL will consult with the community throughout the process to ensure the process is conducted in
17 accordance with community expectations and that the resulting map(s) accurately represent the
18 information the community would like documented.

19
20 Throughout the mapping process, the PIs will serve as advisors and observers and will identify any
21 challenges with effective use of the guidebook and mapping tools. Monthly teleconferences will serve to
22 communicate project progress, in addition to any other needed communication. After the maps have been
23 completed, the guidebook will be revised to reflect any necessary changes identified during the process.
24 The guidebook will then be widely disseminated throughout Arctic coastal communities.

25
26 The proposed study falls primarily under the ‘Human Dimensions: Social sciences applied to
27 understanding management, policy, and communities’ research priority. It will also contribute to ‘Human-
28 ecosystem relationships,’ ‘Local and Traditional Knowledge,’ and ‘Community Involvement.’
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30 The project will create, test, and revise a guidebook that can be used by communities to map their use of
31 marine areas, supporting the NPRB’s identified need to document ways in which humans interact with
32 marine ecosystems through culture and ways of life, as well as economically. This project will utilize and
33 build on social science methodologies to generate spatial data displaying human values of marine areas,
34 furthering the 2005 NPRB Science Plan goal of improving understanding of human use of marine
35 resources.

36
37 The development and use of community mapping tools will elucidate human-ecosystem relationships by
38 resulting in the creation of maps displaying where important interactions take place. Interview questions
39 will inquire about the values attached to these places, which will increase understanding of complex
40 traditional interrelationships between humans and the environment.

41
42 To date, most community-use mapping projects have been directed by outside researchers, in varying
43 degrees of partnership with local community members. The proposed research will enable communities to
44 assume primary responsibility for the interviewing and mapping process, utilizing the established
45 framework for collecting, documenting, and presenting spatial information. Thus, communities will be
46 highly involved throughout the project as an important goal is building research capacity within rural
47 Arctic communities.

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49 Thus, use of these mapping tools can inform institutional structures that improve participation and
50 encourage wider representation, a priority emphasized by the NPRB Research Plan. In addition, by
51 enabling community members to be the primary creators of these maps, the project is helping to seed the

52 next generation of scientists, resource managers, and leaders, another priority identified by the Research
53 Plan.

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55 A temporal component will be emphasized if local experts believe there has been a significant shift in the
56 past, believe a significant shift is currently taking place or likely to take place in the future. Because
57 spatial patterns of human resource use correspond with patterns in the natural environment (Ellanna *et al.*
58 1985) documenting marine use can provide insights into environmental, and wildlife population change.
59 Significant changes in resource use may be due to climate induced impacts (such as increased storm
60 activity), management and/or industrial development (including increased vessel traffic) (Fidel *et al.*
61 2014). Thus, the project will inform our understanding of how changes in the LMEs are having economic
62 and social impacts in coastal communities, an important priority identified by the Research Plan.

63 Even if communities decide not to include a temporal component in their first set of maps, the creation of
64 initial maps by each community will establish baseline assessments for detecting future changes in local
65 use of marine resources, an important research need. Although the State of Alaska’s Community
66 Subsistence Information System (CSIS) provides some baseline data about harvest quantities, most of the
67 information is not spatially explicit nor does it usually provide time-series data sets from which to
68 understand changes in human use over time. The development and use of a tool that can be used by
69 communities over time can support long-term monitoring, one of the primary goals of the NPRB
70 Research Plan. Thus the project will inform our understanding of how natural variability and human-
71 induced variability (including climate change) in marine ecosystems shape the goods and services
72 provided by the ecosystem to humans over time, an area of research that has received little attention to
73 date.

74 This project will also support the primary Research Plan goals of improving management of fish and
75 wildlife populations and providing long term sustained benefits to local communities. As the Research
76 Plan notes, successful management requires knowledge of impacts of management decisions on human
77 users of the resources. The creation of maps identifying local use can be used to develop management
78 scenarios identifying potential affects on subsistence use and can help policy-makers to outline a set of
79 alternatives that can help inform choices and decisions.

80 The project will also help develop community capacity to conduct research and participate in decisions
81 affecting their marine use, by providing the means through which compelling information about their
82 marine use can be communicated and by including outreach to local leaders about the effective use of
83 maps in management and policy.

84 This project will support one of the most important needs identified by the Research Plan as well as the
85 “Global review of social science integration with natural resource management” (the NPRB Review): to
86 help integrate social science with natural sciences and to support the incorporation of competing ethical
87 and social values in natural resource management. As noted by the NPRB Review, the documentation of
88 local use can explain the emergence of inequalities or social change when confronted with a management
89 decision or a resource scarcity issue. Additionally, the project will contribute to much-needed research
90 regarding the assessment of market and non-market values.

91 The project helps to fill an important research need by supporting social considerations in management
92 decisions, and providing social science data in a manner that is easily formatted for policy-makers and
93 managers. For example, the maps can be used to inform social impact assessments and ecosystem
94 services valuations, two methodologies identified by the NPRB’s social science integration review. Maps
95 provide a degree of quantified information while conveying social and cultural dynamics that are not
96 easily enumerated or monetized.

97 Additionally, the use of these maps can help managers identify and develop clear, transparent social
98 objectives at an early stage of the policy process, one of the benefits of social science integration into
99 decision-making that was highlighted by the NPRB review. Similarly, by empowering local residents in
100 the creation of maps that may be incorporated into decision-making, resulting regulations are likely to be
101 more relevant and better accomplish management goals.

102 A peer-reviewed paper will be submitted at the end of the project that will explore how successful the
103 guidebook was as a tool, how the maps were used, and whether they influenced any policy decisions. This
104 assessment may help improve management decisions and institutions and provide insight into the benefits
105 of using stakeholder participation in management.

106
107 The interviews will gather some local and traditional knowledge (LTK) about important places which
108 may be integrated within the project framework and translated through maps to decision makers. While
109 LTK is not a main focus of the research, this project is one avenue for translating place-based LTK into a
110 more nuanced understanding of marine social-ecological systems, especially when considering the long
111 term understanding that LTK can bring to use areas that have changed over time. As the NPRB Review
112 notes, LTK is useful in a management context because of the breadth and depth of what locals know will
113 supplement scientific knowledge.

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116 Statement of societal relevance:

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118 As shipping, fishing, and natural resource extraction activities expand northward due to climate change,
119 competing interests and uses are becoming more commonplace in the marine environment. Identifying
120 marine areas of significance for Arctic communities is crucial for preventing future conflicts between
121 coastal communities and marine-based industries. Although various local uses of the Alaska marine
122 environment have been documented, very little of this use has been mapped. A spatially explicit
123 identification of these uses is necessary to design appropriate measures to reduce potential conflicts.

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125 There is also a lack of information about the habitat, distribution, and life cycles of many species as well
126 as a lack of understanding about how climate change is affecting these species. The mapping projects
127 undertaken with the tools this project will develop enable communities to document their observations
128 and knowledge about the species they use.

129

130 Climate change effects are happening at a quick pace, faster than experts can document. The remote
131 locations and extensive marine and coastal areas experiencing changes are also hard to reach for people
132 living outside the region, and research funding is limited. A tool that can be used by local communities
133 addresses these challenges and multiplies the amount of information that can be documented about
134 climate change effects on the ecosystem and human use.

135

136 As people who have depended on the sea since time immemorial, indigenous communities seek to
137 maintain their subsistence practices. Traditional lifestyles are intricately connected to emotional, spiritual,
138 and physical well-being, and are vulnerable to climate change and industrial development (Gadamus
139 2013, Raymond-Yakoubian 2013). To protect and maintain their relationship with the marine ecosystem,
140 these communities must have the tools to communicate their values and influence policy. Maps of marine
141 use areas can be an effective tool for use in decision-making (Fidel *et al.* 2012, Huntington *et al.* 2013).
142 Communities must also develop the capacity to use these tools effectively in the policy-making arena.
143 The guidebook will provide the tools for a community to independently create marine use maps, which
144 will include on-line tutorials. The published hardcopy of the guidebook will include tutorials as a
145 companion CD. The guidebook will be published in both Russian and English and widely distributed,
146 thereby having broad impact in providing a voice to communities throughout the Arctic.

147
148 Resource managers need to better integrate sociological information into their decision-making. They also
149 need better information about the marine ecosystem and human uses of it to inform their decisions. The
150 maps created from the tools developed in this project will serve as an avenue to communicate local values
151 of marine uses to outsiders and increase the information available to decision-makers strengthening the
152 decision-making process. In addition, decisions resulting from the maps are more likely to be relevant to,
153 and accepted by rural communities since they will have control of the mapping project.

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155 B. Project Objectives:

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157 1. Workshop in Anchorage to:
- 158 a. bring together the Local Research Lead (LRL), Advisory Committee Member (ACM)
 - 159 from partner villages, project staff, representative from the Exchange for Local
 - 160 Observations and Knowledge of the Arctic (ELOKA) and experts
 - 161 b. set research priorities and goals (what to map and for what purpose)
 - 162
- 163 2. Equipping LRL
- 164 a. Initial introduction of marine use mapping including purpose and use, introduction of
 - 165 guidebook and tools to LRL
 - 166 b. AIA staff will document any support given to guide development of the guidebook
 - 167
- 168 3. Conduct Research
- 169 a. If needed support will be provided by AIA staff
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- 171 4. Debrief
- 172 a. AIA staff will travel to each partner community to debrief with local tribal councils and
 - 173 LRL, these discussions will be essential in developing a guidebook relevant to Arctic
 - 174 communities
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- 176 5. Community meetings
- 177 a. Community meetings will occur in each partner community to inform the broader
 - 178 community about research activities and findings
 - 179
- 180 6. Guidebook publication
- 181 a. A final guidebook will be drafted with lessons learned from the research process and sent
 - 182 out to experts and the local tribal councils involved in the project for review
 - 183 b. The final guidebook will be published in Russian and English and widely distributed
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- 185 7. Publication submission
- 186 a. A paper will be submitted to a peer-reviewed journal that discusses the process, lessons
 - 187 learned and application of the maps to the decision making process
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- 189 8. Presentation at the January 2017 Marine Science Symposium to share findings and lessons
- 190 learned
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- 192 9. Examination of the potential for expansion of the project to communities in other Arctic States
- 193 beyond Alaska and the Russian Federation, including consultation with other Arctic Council
- 194 Permanent Participants.
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C. Project Design and Conceptual Approach:

A primary methodology for documenting traditional use areas is the map biography process (Tobias 2009), which is rooted in social science interviewing techniques and geography. Many variations of this process exist depending upon the cultural context in which the research takes place and the purposes for which the maps are created. Of the resources that have been published dealing with Indigenous use mapping methodology none deal specifically with the marine environment. This is a relatively new area of study. In addition, the tools and guidance needed for communities to create scientifically sound mapped products in the marine environment do not exist (Hughes *et al.* 2013).

Identifying marine areas of significance for Indigenous Peoples is crucial for preventing future conflicts between coastal communities and marine-based industries. The Arctic Marine Shipping Assessment (AMSA 2009) identifies a need for ‘Regional analyses of traditional marine use patterns (spatial and seasonal) for application in the development of strategies and measures to reduce potential conflicts and impacts of multiple users of Arctic waterways.’ This need provided the impetus for AMSA recommendation IIA, which encourages Arctic states to conduct surveys on Arctic Indigenous marine use to fill gaps and provide baseline data to address impacts from Arctic shipping. In addition, the final report of the Arctic Ocean Review (AOR 2013), section 3.4.3(5) states that ‘Arctic states in cooperation with the Arctic Council should assist, as appropriate, the Permanent Participants with documentation of current and historical (a) timing and geographical extent of local uses of the marine environment, and b) levels of traditional marine resources harvests.’ As the Aleut International Association is a Permanent Participant of the Arctic Council it is uniquely situated to take action on these recommendations. This project will address these recommendations by empowering communities to take charge of mapping areas important to their community. The guidebook will be transferable to all rural, indigenous Arctic communities and has the potential to significantly address these international recommendations.

Large vessel traffic is expected to significantly increase in Great Circle Route that passes through the Aleutian Islands (AIRA 2014). This will likely affect traditional lifestyles through direct overlap of traffic and traditional marine use areas, effects to the biological resources that people are dependent upon and increased risk of oil spills and contaminants. These conflicts are not isolated to the Aleutian Islands; similar issues with increased vessel traffic have been identified in the Bering Strait region, along the Northwest Passage. In addition, increased vessel traffic is also just one of many expected industrial developments in the Arctic. As such, identification of areas important to a community’s well-being is a step toward local empowerment in the protection of those areas and is extremely important to the survival of rural Arctic communities.

Nikolskoye, in the Russian Federation is situated in the Commander Islands Nature Preserve (Komandorsky Zapovednik) a UNESCO World Heritage Site. Currently, the administration is developing new management regulations (Marina Sheetova, personal communication, April 2014). Maps of areas important to the community’s well-being may contribute to regulations that respect local traditional uses, which would contribute to conflict reduction and community sustainability.

In most cases the consequences of climate change to community well-being are not well understood, but the rate and magnitude of these changes are likely to challenge the adaptive capacity of Arctic residents (Hovelsrud *et al.* 2011). Climate change effects on the marine ecosystem are affecting subsistence use. The timing of animal migratory patterns are changing, seasonal weather patterns are less predictable, and changes in the timing and nature of freeze up and break up are all challenging long-held subsistence traditions and practices, making survival more difficult for many communities. Baseline assessments of

246 subsistence use areas and the ability to measure changes in area use over time will help communities
247 determine how to adapt to climate change effects on subsistence.

248
249 Community-based research and monitoring has been identified as an important step toward empowerment
250 for adaptation, producing relevant adaptation strategies and effectively integrating information into
251 decision-making in a timely and cost effective manner (Ford & Pearce 2012). Because maps of
252 indigenous use often contain sensitive information and frequently result in policy affecting local
253 communities Arctic residents should have knowledge and power in this realm. This work can position
254 residents to be actors in natural resource decision making. Resulting maps could be used to inform risk
255 and vulnerability assessments in order to reduce spatial and temporal conflict of encroaching
256 development. This may enhance quality of life by providing better protection of areas important to
257 community well-being and allowing Arctic residents to better manage current and future challenges and
258 opportunities.

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260 The project will directly build local capacity to conduct research, create maps and use them in decision-
261 making in King Cove, Sand Point and Nikolskoye using community-based research.

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263 Important use areas will be mapped in the three communities and used to document information that can
264 serve as baseline assessments and that can be used to influence resource management and decision-
265 making related to marine commercial activities.

266
267 The project will result in the development of a community guidebook and mapping tools designed and
268 distributed for use by a wide range of communities throughout the Arctic. The guidebook will include
269 easy-to-use on-line tutorials available either through ELOKA's website or as a companion CD, which will
270 provide the means for Arctic indigenous communities to independently conduct mapping project of their
271 marine use.

272
273 This proposal builds on the work that the principal and co-investigators have developed independently
274 into an integrated, multidisciplinary approach. As background research for this project, Layla, Maryann
275 and Jim published an article on subsistence use mapping in the Arctic. This included a literature review of
276 subsistence use mapping across the circum-arctic, as well as of information about subsistence use and
277 impacts to subsistence. The project involved extensive interviews and discussions with subsistence
278 resource managers, subsistence users, and subsistence researchers, and identified the essential
279 components and methodologies involved in community use mapping in the marine context.

280 Jim has extensive experience in the need for improved marine Indigenous use mapping through the
281 development of the Arctic Marine Shipping Assessment (AMSA) report and the follow-up on the
282 implementation of the report's recommendations, particularly with regard to recommendation IIa on the
283 need for surveys of Indigenous marine use. As the lead for Aleut International Association he has
284 reported on the development of this project to the Arctic Council working groups PAME (Protection of
285 the Arctic Marine Environment) and SDWG (Sustainable Development Working Group). Jim has also
286 worked in the area of indigenous marine resources on community-based projects related to testing for the
287 presence of shellfish toxin, and survey marine subsistence use in the Bering Sea region.

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289 The project builds directly on Layla's previous research regarding marine subsistence use in Alaska,
290 marine commercial activities and their impacts on subsistence use and the ecosystem, and law and policy-
291 making in the marine context in Alaska.

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293 Maryann's background in spatial database management, community-based research, and participatory
294 mapping will provide valuable contributions to this project. She also has extensive experience in working
295 with, and traveling to rural Arctic indigenous communities.

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D. Project Management:

PI Jim Gamble will be responsible for overall project progress and budgeting. Co-PI Maryann Fidel will serve as the Research Lead and will be the main point of contact for partner communities. Co-PI Layla Hughes will advise throughout the project and will lead the development of the guidebook in collaboration with ELOKA.

Jim Gamble has a degree in Biology from the University of Alaska, Anchorage and served as Assistant Director of Aleut International Association from 2007 to 2012 when he was appointed as Executive Director by AIA’s Board of Directors.

AIA is one of six Permanent Participant Organizations in the eight member Arctic Council and Jim serves as AIA’s lead representative on the ACAP, PAME and SDWG working groups. In addition, he has served as lead for AIA, and helped to negotiate the legally binding instrument on Oil Pollution Preparedness and Response which was signed by the Ministers of the eight Arctic States in May of 2013 in Kiruna, Sweden. Jim has also served as AIA’s representative to the Ecosystem Based Management Expert Group and help to develop that groups recommendations on how to more fully utilize EBM in the work of the Arctic Council. Jim also currently serves as lead for AIA to the Arctic Councils Task Force on Scientific Cooperation, and the Task Force on Oil Pollution Prevention. During the past 18 months, AIA has served as Chair of the Indigenous Peoples Secretariat and during this time Jim has Chaired two workshops which have helped to develop, with the other five Permanent Participants, a set of principles for the better inclusion of Traditional Knowledge into the work of the Arctic Council.

Jim has also helped to develop, manage and produce deliverables for numerous community-based monitoring projects undertaken by AIA including a project to develop and test a community based testing regime for paralytic shellfish toxin, the Bering Sea Sub-Network (BSSN), a project to survey marine subsistence use in the Bering Sea, and the Community Observation Network for Adaptation and Security (CONAS), a project that expands on BSSN to look at adaptive capacity and develop a set of adaptive capacity indices in eight communities in the Bering Sea region of Alaska and the Russian Federation.

Maryann Fidel holds an interdisciplinary Master’s of Science in Environmental Science from Alaska Pacific University and has five years of experience working on a community-based monitoring project that includes a participatory mapping portion. Her education includes social science as a means to explore how people interact with the natural environment. She has worked on the BSSN Project, an international community-based monitoring network, from 2009 to its completion in 2013. She started as the Survey Manager at the Aleut International Association where she oversaw the surveying process in eight Bering Sea villages and developed datasets for quantitative, qualitative and spatial (GIS) data. While working on the BSSN project she developed an innovative mapping technique to incorporate abundant data, protect the confidentiality of respondents and be useful in decision-making (Fidel *et al.* 2012). She has traveled frequently to remote indigenous communities to provide training in interview technique and scientific protocol, meet with tribal councils, and conduct community meetings. In 2012 her employment moved to collaborating partner University of Alaska Anchorage, Resilience and Adaptive Management Group where she focused on analysis and writing-up results. Currently, she is Project Manager at the Aleut International Association and has worked to develop CONAS. She has expertise in human use GIS mapping, human dimension of natural resource management, quantitative analysis, qualitative analysis, and social science methodologies.

Maryann is AIA’s representative to the Arctic Council’s biodiversity working group, the Conservation of Arctic Flora and Fauna (CAFF). Currently, she is working on a CAFF project entitled ‘Valuing the

346 Arctic?. A case study selected for this project is examining the effects of increased vessel traffic in the
347 Bering Sea and how society values ecosystem services surrounding this issue.

348 Layla Hughes has 15 years of experience in environmental science, law, and policy. Since 2004, she has
349 focused on Arctic issues, including conflicts between competing marine uses. Layla has in-depth
350 experience in assessing the impacts of marine commercial activities including oil and gas and shipping, as
351 well as intimate knowledge of the issues and concerns of indigenous communities.

352
353 Layla has extensive experience with researching, analyzing and writing about sociological and
354 environmental issues in Alaska. Her most recent subsistence research project, for the Bering Straits
355 Coastal Association, involves a comprehensive literature review of subsistence studies in the Bering Strait
356 area and extensive community meetings and interviews with subsistence users and resource managers to
357 identify research gaps and highlight priorities for future subsistence research.

358
359 In addition to research and documenting use of and impacts to subsistence in the marine environment,
360 Layla has significant experience in participating in the decision-making process and helping local
361 community and conservation interests to inform and influence this process. For example, as an Assistant
362 Borough Attorney at the North Slope Borough (NSB), Layla led the NSB's participation as cooperating
363 agency in the Environmental Impact Statement for the Northeast National Petroleum Reserve-Alaska
364 (NPR-A), assisted with drafting Health Impact Assessments and mitigation measures for impact
365 assessments for the NPR-A and the Outer Continental Shelf, assisted the NSB Planning Department with
366 local permitting, and participated in the NSB's work to address concerns related to offshore exploration
367 drilling. As part of the work on offshore drilling, Layla drafted and conducted interviews with subsistence
368 users, collecting information about subsistence use and impacts to subsistence, and presented and
369 summarized the information for the NSB Law Department's use. She has worked on behalf of subsistence
370 users, including the Alaska Eskimo Whaling Commission and the Arctic Marine Mammal Coalition, to
371 represent subsistence concerns in governmental decision-making processes.

372
373 Layla has far-reaching experience managing multi-year, multi-stakeholder projects as well as organizing
374 numerous individual workshops, including a two day workshop in Anchorage that explored ocean policy
375 and spatial planning from the Alaska Native perspective, focusing intensively on subsistence use and
376 impacts to subsistence, and attended by 40 people from various remote villages in Alaska and Canada.
377 Layla also organized a two-day workshop in Barrow that addressed impact analysis in natural resource
378 decision-making and included people from across the North Slope. As part of this project, Layla lead a
379 discussion among subsistence users about impacts to subsistence, guided subsistence users through a
380 review of government-created impact assessment studies, and assisted participants in drafting comments
381 about subsistence use for submission to decision-makers.

382
383 She has taught courses on impact assessment, permitting, and decision-making at the University of
384 Alaska and Vermont Law School. Layla is a Commissioner on the Alaska Arctic Policy Commission,
385 where she is a member of the Governance and Indigenous Peoples working groups, and she is a member
386 of the Aleutian Island Risk Assessment Advisory Panel, which is crafting risk reduction measures for
387 shipping activity in the Aleutians.

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389 This project will be a close partnership with communities. Each tribal council will be asked to select a
390 person from the local tribal council to serve on the Advisory Committee, and recommend a Local
391 Research Lead (LRL). Both the Advisory Committee Member (ACM) and the LRL will participate in the
392 Anchorage workshop. The ACM will guide the research within their community by determining priorities
393 and goals for the research. They will serve as the main contact in community coordination and data
394 release. The LRL will be responsible for conducting the research within their community. This includes
395 participating in training, conducting interviews with local residents, entering data and creating maps.

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397 Major research activities will be communicated to the local tribal councils through regularly scheduled
398 council meetings.

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449 Project Timeline:
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Date	Objective
September 2015	Anchorage Workshop
September 2015	Update to PAME II 2015
September/October 2015	Equip Local Research Leads (LRL)
October 2015	Research Phase Begins
November 2015 to May 2016	LRL/Tribal Council Debriefs
November 2015 to May 2016	Community Meetings
February 2016	Update to PAME I 2016
May 2016	Research Phase Ends
June to August 2016	Handbook Review by Communities & Experts
September 2016	Project Report and Handbook to PAME II 2016 for review
October 2016	Final Version of Handbook Published in English & Russian
November 2016	Journal submission to report findings
January 2017	Presentation to Alaska Marine Science Symposium
February 2017	Report on findings and best practices to PAME I 2017

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 452 The Project Budget (USD):
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454 Personnel	85,424
455 Travel	36,454
456 Equipment	2,250
457 Supplies	1,760
458 Contractual	14,000
459 Russia Subaward	25,220
460 Indirect	33,022
461 Total	198,130