

Appendix I

Community Health and Learning Review

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1 Introduction

This appendix documents the additional efforts and analyses that the Navy performed in order to address public and agency comments regarding potential impacts to public health and student academic performance. Since the public and agency comments requested the preparation of a Health Impact Assessment (HIA), the Navy compared National Environmental Policy Act of 1969 (NEPA) regulatory requirements for analyzing public health effects to non-regulatory guidance documents for the preparation of a HIA; researched industry standards for airport-related HIAs prepared both in the United States and internationally; consulted with the U.S. Environmental Protection Agency (USEPA) Region 10 and Washington State Department of Health (WADOH) on contents of a suggested HIA; and reviewed 260 published articles to update the Navy's literature review. See Appendix A-8 for details on the literature review process. Since there is no definitive science to show that a cause-and-effect relationship exists between health effects and intermittent exposure to noise, the Navy analyzed public health factors and student scholastic performance metrics to compare the overall health of Island County residents with the overall health and scholastic performance of residents in the rest of the State of Washington. In general, Island County is among the healthiest places to live, work, and play in Washington, and Island County students in local school districts are more academically successful than many of their peers across the State of Washington as a whole. All information included in this appendix was reviewed and considered in the analysis contained in the Final Environmental Impact Statement (EIS). Section 2 discusses the results of Island County's 2015 Community Health Assessment. Section 3 compares Island County school district test scores and graduation rates to those of the remainder of the State of Washington. Section 4 discusses additional efforts and analyses that the Navy took to address the need to conduct a HIA.

2 Island County Health Factors

Based on public comments received on the Draft EIS, the public is concerned about potential noise impacts to physical health, mental health, pregnancy, heart disease and cardiac arrest, cancer, gastrointestinal functioning, brain damage, and health risks to children and the elderly. The data included in Table 1 were chosen based on these concerns raised during the public comment period. Table 1 includes health information from the *Island County 2015 Community Health Assessment: Health Indicator Summary Statistics*, published in February 2016. This information was collected by the United States Centers for Disease Control and Prevention and WADOH through birth and death certificate records, hospital reporting systems, cancer registries, annual telephone surveys, and biennial student surveys. Data related to physical health, mental health, pregnancy and birth outcomes, total population hospitalizations, child hospitalizations, chronic and non-communicable disease, and mortality were included for Island County and Washington State.

The annual *County Health Rankings* measures vital health factors in nearly every county in America. Health outcomes in the *County Health Rankings* represent how healthy a county is; the measure includes two types of health outcomes: length of life and quality of life. Health factors in the *County Health Rankings* represent what influences the health of a county; the measure includes four types of health factors: health behaviors, clinical care, social and economic factors, and physical environment (County Health Rankings, 2017). According to the 2017 *County Health Rankings* for Washington State, Island County was ranked third in Washington State for health outcomes and fifth in Washington State for health factors (University of Wisconsin Population Health Institute, 2017). This is similar to the 2011

County Health Rankings for Washington State, in which Island County was ranked third for health outcomes and fourth for health factors. According to the Island County 2012 Community Health Assessment, “Island County is among the healthiest places to live, work and play in Washington” (Island County, 2012). According to the 2015 Island County Community Health Survey, the most common health challenges for respondents and their families are emergency preparedness; job opportunities and training; time and/or knowledge to exercise; noise originating from aircraft, shooting ranges, neighborhood dogs, and/or traffic; and access to exercise and recreation opportunities (Island County, 2015).

Island County was also identified as one of the healthiest areas in the country by *U.S. News & World Report*. That publication’s “Healthiest Communities” ranking compares counties using 80 metrics across 10 health-related categories, including population health, equity, education, economy, housing, food and nutrition, environment, public safety, community vitality, and infrastructure. Out of 2,974 counties surveyed, Island County was ranked the 257th healthiest in the nation and the fifth healthiest in the State of Washington. Island County was also listed in *U.S. News & World Report’s* “Healthiest Communities Honor Roll,” which includes four top-performing communities in each of the U.S. Census Bureau’s nine regional divisions (*U.S. News & World Report*, 2018).

Summary: As demonstrated by the information collected from the Centers for Disease Control and Prevention, WADOH, and the Island County Board of Health, Island County is among the healthiest places to live and to work in the State of Washington. Island County ranks third for health outcomes and fifth for health factors among the 39 counties that comprise the State of Washington.

Table 1 Island County and Washington State Health Factors

<i>Health Factor</i> ^{1, 2}	<i>Island County</i> ³	<i>Washington State</i>
Physical Health		
Adults reporting good, very good, or excellent health	84.0% (2011-2013)	84.3% (2013)
Years of healthy life at age 20 years ⁴	52 (2013)	50 (2013)
Adults reporting ≥14 days per month where poor health interferes with normal activities	14.8% (2011-2013)	14.7% (2013)
Mental Health		
Adults reporting ≥14 days per month of poor mental health	10.9% (2011-2013)	12.5% (2013)
Adults receiving needed emotional support only sometimes, rarely, or never	17.7% (2011-2013)	22.8% (2013)
Adults ever diagnosed with depression	27.7% (2011-2013)	23.5% (2013)
10th grade students feeling so sad or hopeless for 2 or more weeks in a row that they stopped doing normal activities	34.8% (2014)	34.9% (2014)
10th grade students seriously considering suicide in the past year	22.8% (2014)	20.5% (2014)
6th grade students seriously considering suicide in the past year	18.5% (2014)	15.0% (2014)

Table 1 Island County and Washington State Health Factors

<i>Health Factor^{1, 2}</i>	<i>Island County³</i>	<i>Washington State</i>
<i>Pregnancy and Birth Outcomes</i>		
Pregnant women diagnosed with gestational diabetes	6.6% (2013)	7.0% (2013)
Premature births (<37 weeks)	6.3% (2013)	9.6% (2013)
Live births with low or very low birth weight	3.9% (2013)	6.4% (2013)
Live births with high or very high birth weight	14.3% (2013)	10.7% (2013)
<i>Hospitalizations (total population)</i>		
Rate of hospital admission per 100,000 population (age-adjusted)	7,092 (2013-2014)	8,564 (2013-2014)
Diseases of the circulatory system: Rate per 100,000 total population (age-adjusted)	892 (2013-2014)	1,002 (2013-2014)
Diseases of the musculoskeletal system and connective tissue: Rate per 100,000 total population (age-adjusted)	650 (2013-2014)	574 (2013-2014)
Diseases of the digestive system: Rate per 100,000 total population (age-adjusted)	736 (2013-2014)	723 (2013-2014)
Diseases of the respiratory system: Rate per 100,000 total population (age-adjusted)	499 (2013-2014)	554 (2013-2014)
<i>Child Hospitalizations (1-14 years)</i>		
Diseases of the respiratory system: Rate per 100,000 population	166 (2013-2014)	260 (2013-2014)
Mental illness: Rate per 100,000 population	130 (2013-2014)	76 (2013-2014)
Diseases of the digestive system: Rate per 100,000 population	99 (2013-2014)	141 (2013-2014)
Endocrine, nutritional, and metabolic diseases: Rate per 100,000 population	79 (2013-2014)	74 (2013-2014)
<i>Chronic and Non-Communicable Disease</i>		
Adults ever told they have diabetes (excluding gestational)	7.9% (2011-2013)	8.6% (2013)
Adults currently with asthma	12.6% (2011-2013)	9.9% (2013)
10th grade students ever told they have diabetes	5.7% (2014)	3.2% (2014)
10th grade students ever told they have asthma	20.0% (2014)	22.0% (2014)
Breast cancer incidence rate per 100,000 (age-adjusted)	163 (2012)	172 (2012)
Prostate cancer incidence rate per 100,000 (age-adjusted)	119 (2012)	111 (2012)
Colorectal cancer incidence rate per 100,000 (age-adjusted)	32 (2012)	37 (2012)
Lung cancer incidence rate per 100,000 (age-adjusted)	47 (2012)	60 (2012)

Table 1 Island County and Washington State Health Factors

<i>Health Factor^{1, 2}</i>	<i>Island County³</i>	<i>Washington State</i>
Mortality		
Major cardiovascular disease (leading causes of death for total population, age-adjusted rate per 100,000)	148.3 (2013)	188.4 (2013)
Malignant neoplasms (leading causes of death for total population, age-adjusted rate per 100,000)	129.0 (2013)	156.1 (2013)
Alzheimer’s disease (leading causes of death for total population, age-adjusted rate per 100,000)	33.4 (2013)	43.6 (2013)
Chronic lower respiratory disease (leading causes of death for total population, age-adjusted rate per 100,000)	28.8 (2013)	69.4 (2013)
Diabetes mellitus (leading causes of death for total population, age-adjusted rate per 100,000)	17.3 (2013)	21.3 (2013)
Intentional self-harm (suicide) (leading causes of death for total population, age-adjusted rate per 100,000)	23.2 (2013)	14.0 (2013)

¹ Source: Island County, 2016. Island County’s primary sources included:

- U.S. Centers for Disease Control and Prevention Behavioral Risk Factor Surveillance Survey (BRFSS)
- WA Dept. of Health, Vital Statistics
- WA Dept. of Health, Center for Health Statistics
- WA Dept. of Health, Center for Health Statistics, Birth Certificate Data
- WA Dept. of Health, Comprehensive Hospital Abstract Reporting System (CHARS)
- WA Dept. of Health, Center for Cancer Registry
- Washington State Healthy Youth Survey

² To contrast Island County with the state, Washington figures are shown, but a direct comparison is not made. Interpreting data based on few survey respondents or a small number of events can be difficult because random fluctuation can be relatively large. Considerable caution should be used in interpreting data where the number of events is small. Generally, a 95% confidence interval should be assumed for each rate, percent, or other measure. Island County can be assumed as different from the state only if the differences are statistically significant at the p<.05 level. Thus, while a line of Island County and state data may look different, the difference may not be statistically significant (Washington State Department of Health, 2012).

³ Dates listed for data sources vary between indicators because different data sources collect data at different intervals. In situations where multiple years are cited for one data point, the sample size for a single year was too small to be statistically significant, and consequently the survey results were combined for the purpose of drawing an accurate assessment of the data.

⁴ The metric “years of healthy life at age 20 years” is defined by WADOH as “Additional years a 20-year-old is expected to live in good, very good, or excellent health. ‘Years of healthy life’ is calculated by adjusting life expectancy derived from death certificate data with health status measured by the question, ‘Would you say your health in general is excellent, very good, good, fair, or poor’”(Island County, 2016).

3 Local School District Test Scores and Graduation Rates

There are many reasons for academic success, such as an engaging curriculum, teacher experience, parental involvement, students’ attitudes toward education, and school environment. To measure overall academic success of students, the State of Washington, Office of Superintendent of Public Instruction, calculates and publicly distributes state testing scores for Smarter Balanced Assessments: English Language Arts and Math; Measurement of Student Progress: Science; End of Course: Biology; as well as four-year graduation rates for all school district in the state (See Table 2). As shown in the table, average test scores and graduation rates within Oak Harbor, Coupeville, and Anacortes School Districts

are, for the majority of measured categories, above Washington State school averages. The average four-year graduation rate across Washington State is 78.10 percent; average four-year graduation rates for Anacortes, Coupeville, and Oak Harbor School Districts, respectively, are: 89.10 percent, 84.50 percent, and 85.80 percent (see Table 2) (OSPI [Office of Superintendent of Public Instruction] 2017a, 2017b, 2017c, 2017d).

Summary: Students in the local school districts are more academically successful than many of their peers across the State of Washington as a whole.

Table 2 Washington State and Local School District Average Test Scores and Graduation Rates

<i>Grade Level</i>	<i>Smarter Balanced Assessments: English Language Arts</i>	<i>Smarter Balanced Assessments: Math</i>	<i>Measurement of Student Progress: Science</i>	<i>End of Course: Biology</i>
Washington State Average				
3rd Grade	54.30%	58.90%	n/a	n/a
4th Grade	57%	55.40%	n/a	n/a
5th Grade	60.10%	49.20%	65.30%	n/a
6th Grade	56.50%	48%	n/a	n/a
7th Grade	58.50%	49.80%	n/a	n/a
8th Grade	59.70%	47.80%	67.50%	n/a
10th Grade	n/a	n/a	n/a	72.20%
11th Grade	75.50%	21.80%	n/a	n/a
4-Year Graduation Rate	78.10%			
Anacortes Average				
3rd Grade	69.50%	62.70%	n/a	n/a
4th Grade	69.60%	70.60%	n/a	n/a
5th Grade	71.20%	58.60%	74%	n/a
6th Grade	70.80%	55%	n/a	n/a
7th Grade	68%	65.30%	n/a	n/a
8th Grade	74.50%	70%	85.40%	n/a
10th Grade	n/a	n/a	n/a	81.40%
11th Grade	n/a	44.6	n/a	n/a
4-Year Graduation Rate	89.10%			
Coupeville Average				
3rd Grade	67%	65.80%	n/a	n/a
4th Grade	79.60%	63%	n/a	n/a
5th Grade	79%	53.40%	79%	n/a
6th Grade	50.60%	34.10%	n/a	n/a
7th Grade	61.10%	35.20%	n/a	n/a
8th Grade	51.70%	23.50%	64.70%	n/a
10th Grade	n/a	n/a	n/a	66.60%
11th Grade	75.30%	21.10%	n/a	n/a
4-Year Graduation Rate	84.50%			

Table 2 Washington State and Local School District Average Test Scores and Graduation Rates

<i>Grade Level</i>	<i>Smarter Balanced Assessments: English Language Arts</i>	<i>Smarter Balanced Assessments: Math</i>	<i>Measurement of Student Progress: Science</i>	<i>End of Course: Biology</i>
Oak Harbor Average				
3rd Grade	53.70%	58.10%	n/a	n/a
4th Grade	57.80%	58.90%	n/a	n/a
5th Grade	64.80%	53.10%	74.10%	n/a
6th Grade	53.10%	42%	n/a	n/a
7th Grade	59.30%	50.10%	n/a	n/a
8th Grade	67%	50.60%	67%	n/a
10th Grade	n/a	n/a	n/a	78.10%
11th Grade	75%	34.50%	n/a	n/a
4-Year Graduation Rate	85.80%			

Sources: OSPI, 2017a-d

4 Comparison of a Health Impact Assessment and Environmental Impact Statement and Review of Other Health Impact Assessments

This section documents the steps taken and determinations made by the Navy to formulate a response to U.S. Environmental Protection Agency (USEPA) and Washington Department of Health (WADOH) comments regarding the preparation of a HIA to supplement the Final EIS prepared pursuant to NEPA. This section is organized as follows:

- 4.1: Comparison of the HIA and NEPA processes with respect to this EIS
- 4.2: Review of industry practices in the preparation of HIAs
- 4.3: Agency consultation
- 4.4: A discussion of how public health practitioners view available literature

USEPA recommended a HIA to characterize baseline conditions and projected health impacts, and it provided five scientific literature studies that may be useful in the noise analysis. Similarly, WADOH requested a HIA to better understand the potential impact of the Proposed Action on the health of the community and provided a short literature summary for consideration.

Introduction

In the 1990s, the World Health Organization began promoting HIAs to help decision makers and local communities craft smarter policies that protect public health and wellness, especially when NEPA-like legislation and a framework of environmental regulations had not been enacted by a country, state government, or local municipality. As such, HIAs are often prepared to support decision making for large-scale infrastructure projects in developing countries and for major capital investment projects in Europe, Asia, Australia, and New Zealand. These HIAs are typically prepared by the public agency with authority and oversight for the project, such as a department of transportation or an airport authority.

For many reasons, HIAs are not commonly used in the United States. At the federal level, the Navy and other federal agencies comply with NEPA and a framework of environmental regulations to protect the environment and human health. This national policy, as implemented by Council on Environmental Quality (CEQ) regulations, requires the comprehensive analysis of environmental resources, including human health and safety considerations related to the Proposed Action; therefore, the preparation of a separate HIA that focuses on public health would generally be superfluous. At the state or local level, only about 20 jurisdictions have established state or local environmental review requirements (CEQ, 2017). Only a few state legislatures have considered HIAs or components of an HIA as part of their decision-making process. For example, Washington State enacted legislation in 2007 requiring the preparation of a HIA for a state bridge replacement project (discussed in Part A of Section 4.2). In 2009, Massachusetts enacted legislation requiring HIAs for state transportation projects, and, in 2011, Vermont enacted legislation for the Vermont Department of Health to recommend a plan to implement a “public health impact assessment process” to evaluate the health effects of local, municipal, and state policy and planning decisions. While many state legislatures and local jurisdictions are exploring how HIAs may inform policies, plans, and programs, most state and local jurisdictions do not yet require the preparation of HIAs for their infrastructure projects (Robert Wood Johnson Foundation and PEW Charitable Trust, 2015). Based on a USEPA review of 81 HIAs prepared in the United States by 2014, HIAs are used most frequently by local governments in California. “While the use of HIA to inform decision-making is on the rise, it is used most frequently at the local level and less frequently at the county, state and federal levels” (USEPA, 2014).

To better understand the need to supplement the EIS with a HIA, the Navy compared the HIA and NEPA processes, and reviewed completed HIAs prepared by the State of Washington for state projects and HIAs prepared both nationally and internationally for airport-related projects, as discussed in Sections 4.1 and 4.2 below. The HIAs reviewed are available to the public using online sources and selected from infrastructure projects--either located within the State of Washington or related to airports. Section 4.3 describes Navy coordination efforts with other organizations and agencies to share the information learned and to ensure the professional and scientific integrity of the information, in accordance with 40 Code of Federal Regulations (CFR) 1502.24, while Section 4.4 is a discussion of how public health practitioners view available literature.

4.1 Comparison of the HIA and NEPA Processes with Respect to this EIS

A HIA is a decision-support tool that provides a means of factoring evidence-based health considerations into the decision-making process. An HIA has been described as “a systematic process that uses an array of data sources and analytic methods, and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program, or project on the health of a population and the distribution of those effects within the population. HIAs provide recommendations on monitoring and managing those effects” (National Academies, 2011). NEPA requires a comprehensive review, and public disclosure, of the effects of major federal actions on the human environment in order to support informed federal decision making and to increase transparency regarding a Proposed Action. Both EISs prepared pursuant to NEPA and HIAs follow a series of procedural steps: screening; scoping, or selecting which health effects to assess and which analytic approaches to employ in the assessment; assessing; reporting; and monitoring. Neither the USEPA nor any government regulator has adopted comprehensive guidance on HIA use or HIA methodology, or provided guidance on how a HIA complements or provides information different from a comprehensive EIS prepared under NEPA.

Similar to the NEPA process, a HIA is a systematic process that helps evaluate the potential health effects of a project before it is built or implemented. The HIAs discussed in Section 4.2 bring potential public health impacts and considerations to the decision-making process for projects that fall outside the traditional public healthcare field, such as transportation projects, land-use plans, and waste management/site revitalization projects. Unlike other health-related assessments that focus on a narrow, predetermined set of medical health risks, HIAs purport to offer a broad review of the impacts a proposed project may have on the general overall public health and wellness, such as levels of obesity, injury, asthma, and diabetes, when considering policies, plans, and programs to build safe, thriving communities.

In comparison, NEPA and its implementing CEQ regulations require agencies to thoroughly analyze environmental impacts on the human environment. Over the decades since NEPA's enactment, agencies have institutionalized a process to assess the potential effects of a Proposed Action in order to inform federal decision making and to increase the transparency of the federal agency planning actions. NEPA and related laws explicitly require the consideration of human health effects that are reasonably foreseeable based on the Proposed Action.

In implementing the Navy's NEPA policy as prescribed in OPNAV M-5090.1, the Navy offered two rounds of public scoping to engage elected leaders, agencies, organizations, and private citizens. During these rounds of scoping, their public comments were used to define the scope and breadth of the analysis for preparing the Draft Growler EIS. As a result of public scoping, the Navy considered direct, indirect, and cumulative impacts on 16 environmental resources and prepared a 1,400-page analysis that included the potential noise impacts associated with auditory and nonauditory health effects. The public scoping comments also informed the depth of the analysis and the methodology used to analyze the potential impacts of the Proposed Action and considered vulnerable population groups.

As a result of public scoping and the need to use the best available science, the Navy prepared a thorough literature review of auditory and nonauditory health effects of exposure to military aircraft noise and consulted with the Navy-Marine Corps Public Health Center (NMCPHC) and Federal Interagency Committee on Aviation Noise (FICAN) at various times during the preparation of the Growler EIS. In addition, the Navy provided courtesy briefings and considered comments received from the public and other government agencies, including the USEPA and WADOH. This analysis of available literature is found in Section 4.2 of the EIS, and more detailed information is provided in Section 3.2.4 of the EIS and Appendix A1 of the Aircraft Noise Study (Appendix A).

In sections 3.2 and 4.2 of the EIS, the Navy presented a comprehensive noise analysis with supplemental noise metrics in order to assess the potential effects of intermittent exposure to military aircraft noise. Specifically, the Navy used the Day-Night Average Sound Level (DNL), the federal standard, for analyzing the long-term community annoyance with noise exposure from aircraft operations. The data associated with DNL analysis were presented using DNL contour maps for land use planning and identified acreage and population within the projected noise contours. In addition, the Navy provided supplemental noise metrics to provide more detailed information on potential impacts of noise exposure as it relates to specific noise effects and population groups. These metrics include Single Event Level (SEL) and Maximum Sound Level (L_{max}) to assess the highest levels of noise that would result from a single aircraft event, such as a flyover. More specifically, the Navy quantified noise effects using supplemental metrics for:

- a. Thirty points of interest, subsequently expanded to 48 points of interest in the Final EIS, such as residential areas, schools, and parks (note: this is an unusually large number of points of interest, but the data were gathered and provided in direct response to scoping questions.)
- b. Indoor speech interference
- c. Classroom/learning interference
- d. Sleep disturbance for residential areas (probability of awakening)
- e. Potential noise effects on recreation
- f. Potential hearing loss for the general population and for the noise-sensitive population.

In Section 2.4 of the EIS, the Navy addressed public-suggested options to reduce noise by relocating aircraft or training. No one location can reasonably accommodate absorption of the Growler community without a significant shift in resources, including the potential need for condemning or acquiring land, construction, and a significant influx of new personnel and dependents. In addition, such a shift would simply move any associated impact from one community to another while exponentially increasing overall environmental impacts due to the need for new facilities, personnel movement, airspace management, and land use planning, among other impacts associated with re-creating a new location for the Growler community. The Navy discussed existing noise mitigation measures in Section 3.2.4.1 of the EIS (i.e., compatible land-use planning, ongoing noise abatement procedures, and use of the noise-complaint phone number) and new technologies for noise-abatement (i.e., chevrons, MAGIC CARPET, and hush house) in Section 4.2.6.

As mentioned previously, the Navy assessed a total of 16 resources, and the scope of this analysis met or exceeded the scope of a typical HIA. For example, the Navy provided detailed air emission calculations for mobile and stationary sources of all criteria pollutants and hazardous air pollutants (HAPs) in Section 4, with details on the air emission calculations found in Appendix B. Other resources analyzed include, but are not limited to, land use, human public health and safety (including impacts to children), socioeconomic, environmental justice as related to vulnerable population groups such as minorities and low-income populations, transportation, infrastructure, hazardous materials and wastes, climate change, and greenhouse gases.

Summary: Although the Growler EIS does not include a stand-alone HIA, by following the Navy's NEPA policy as prescribed in OPNAV M-5090.1, the EIS analysis exceeds the purpose and scope generally associated with HIAs. Furthermore, the EIS analysis satisfies the best practices identified in a HIA review, as described in "Minimum Elements and Practice Standards for Health Impact Assessments, Version 3, dated September 2014" (Bhatia, 2014). The EIS documents extensive public stakeholder engagement, with a transparent literature review on nonauditory health impacts; assesses the potential noise effects using best available science (data, methods, and metrics); assesses air quality and socioeconomic aspects of the Proposed Action, including vulnerable population groups (children, minorities, and the low-income population); and discusses reasonable and actionable noise mitigation actions as appropriate for a military airfield with a vital defense mission.

4.2 Review of Industry Practices in the Preparation of HIAs

The Navy reviewed the following completed HIAs, available from the Centers for Disease Control library or otherwise available to the public online. In general, many of these HIAs took a broad-brush approach to public health and wellness, and discussed health impacts in comparatively general terms. None of the HIAs delved into the level of analysis and detail as provided in the Growler EIS.

The Navy reviewed three HIAs prepared for transportation and site revitalization projects in the State of Washington, a state that has enabling legislation to conduct HIAs as well as the location for the Proposed Action. These documents only considered public health and wellness in a very general sense (i.e., promoting good health through an active lifestyle, access to fresh food, and better healthcare). None of these HIAs reviewed provided as quantitative an analysis of impacts associated with their Proposed Action or long-term health analysis as did this EIS.

- a. **2008 HIA for SR 520 Replacement: A Bridge to a Healthier Community** (87 pages). As mentioned in Section 1, Introduction, the State of Washington had enacted legislation to prepare a HIA as part of a highway and bridge replacement project. The resulting report recommended design elements that would contribute to a healthier community by encouraging a more active lifestyle. The recommended design elements included reducing construction impacts, providing walking and bicycling facilities, incorporating green space and landscaping, and reducing highway traffic noise with quieter road surfacing materials and use of sound barriers that incorporate art and visual design features (Seattle and King Counties, 2008).
- b. **2011 HIA for King Street Station Multimodal Hub** (52 pages). This HIA focused on health equity, safety and injury, air and noise pollution, social capital and mental health, and physical activity and obesity as potential effects from establishing a major transportation hub for general traffic, light rail, local bus service, as well as pedestrians and cyclists. This study incorporated a small literature review and provided the following recommendations: air quality considerations, noise monitoring and other mitigations during project construction (i.e., use of high-efficiency construction equipment with low-emission engines); minimize bus stop closures and consider alternatives for travelers with disabilities; reclaim public space for pedestrians and consider adding green space; improve pedestrian and bicyclist experience; implement iconic design features such as canopies, benches, way-finding tools, and other amenities designed to encourage an active lifestyle; meet and exceed standards and policies for the Americans with Disabilities Act, Seattle Bicycle Master Plan, Seattle Pedestrian Master Plan, and Livable South Downtown Plan; and monitor progress toward supporting an active lifestyle (Seattle County, 2011).
- c. **2012 HIA for Lower Duwamish Waterway Cleanup** (60 pages). This HIA focused on four areas impacted by the waterway cleanup project: construction impacts, economic impacts, social and cultural impacts, and fish-consumption impacts. Overarching recommendations included a public notification system to alert residents of construction activities; following established industry best practices for the cleanup efforts; mitigating negative economic impacts of construction activities by hiring local workers; identifying the dominant languages in the affected population and translating messages accordingly; using temporary art created from local artists to offset the stress of construction activities; and creating community recreation opportunities (Daniell, 2013).

The Navy reviewed three HIAs, prepared for airport-related actions at two international and one U.S. airports, that were chosen because the full-text document was available online. While abstracts for other airport projects were available online, the full HIAs were not readily available. A comparison of these airport HIAs with the EIS is provided below.

- a. **2007 New Parallel Runway at Brisbane Australia** (41 pages). This HIA is Appendix D7 of an EIS and Master Development Plan to add a new parallel runway to the airport. The HIA included a small literature review of the potential health effects of aircraft noise exposure and calculated

changes in ambient air pollutants of some criteria pollutants and some hazardous air pollutants (HAPs). The analysis focused on annoyance, sleep disturbance, and impacts to cognitive abilities of children. The literature review looks very similar to Appendix A1 of the Aircraft Noise Study (included as Appendix A of the EIS) and focuses on annoyance as the main outcome from noise exposure (Brisbane Airport Corporation, 2007).

- b. **2010 HIA for Santa Monica Airport** (21 pages). This HIA was conducted by a group of pediatric residents at UCLA that considered a limited literature view, patient comments, and their own observations as medical practitioners. It considered particulates and polycyclic aromatic hydrocarbons (PAH) in soil samples. It determined that noise of aircraft takeoffs from the Santa Monica Airport were above Federal Aviation Administration (FAA) thresholds and considered the effects of noise on hearing loss, psychological distress, and cognitive abilities of children without an objective, quantifiable analysis. Unlike other HIAs, this HIA was not conducted as part of a capital improvement project but was instead conducted by individuals associated with a local health advocacy program. The HIA recommended eliminating or significantly reducing jet takeoffs to reduce exposure to byproducts of jet fuel exhaust and loud “single event noise”; installing high-efficiency particulate air (HEPA) filters in adjacent schools and homes to mitigate exposure to air pollution; enforcing FAA noise thresholds for noise abatement strategies at commercial airports, such as soundproofing of schools and homes; adopting noise and health disclosures to notify potential buyers and residents in the vicinity of the airport; maintaining a runway buffer zone of at least 660 meters from residents; and permanently closing the heavily encroached upon airport (UCLA Pediatric Residents, 2010).
- c. **2015 Updated HIA for London City Airport** (110 pages). This updated report is a conclusive document reflecting the whole project and not an update summary. The scope, focus, and conclusions did not materially change from the original report but reflected changes in construction permit application and additional nonauditory health information related to aircraft noise, such as annoyance, night time construction noise and possible sleep disturbance, and cardiovascular effects. It predicted minor changes in air quality, noise, and transportation that “were not sufficient to quantify any adverse health outcome.” Moreover, it accounted for other direct, indirect, and induced socio-economic benefits and the airport’s commitment to the community support, charitable events, and local employment as a net health benefit (London City Airport, 2015).

Other Studies of Interest:

- a. **2015 Comparison of Health Impact Assessment of the Proposed Third Runway by the Hong Kong Airport Authority (HKAA) with Other Airports** (29 pages). The 2014 Environmental Impact Assessment prepared by HKAA provided a HIA that analyzed both criteria pollutants and some HAPs, provided a basic literature review, and focused on annoyance, self-reported sleep disruption, and cognitive performance of children in schools. In 2015, the Dashing Policy Research Center commissioned the 2015 study to compare the environmental health standards, the methodologies used for the 2014 HKAA HIA, plus the results of 10 other HIA studies prepared for airport projects in other countries.

The 2015 comparison study of 11 different airport HIAs (prepared between 1991 and 2014) underscores that there is no standard framework or protocols for conducting HIAs, even for similar actions. Regarding air quality, some studies did not consider air quality; some studies only considered particulate matter; other studies consider some or all National Ambient Air

Quality Standard (NAAQS) criteria pollutants regulated in the United States; and still others only considered some HAPs associated with gasolines, oils, and fuels. Some HIAs provided a limited literature review on auditory and nonauditory health effects, while others did not consider potential hearing loss or health effects. Two HIAs considered the annoyance of odors. Only two of the 11 HIAs included public stakeholder input. A wide variety of health topics were considered in different HIAs. The individual HIAs considered a small subset, but not all, of the following health topics: potential hearing loss, annoyance, mental distress, perception of risk/accident potential, impaired cognitive levels, sleep disruption and sleep disorders, respiratory conditions, cardiovascular diseases, and cancer incidence. The various HIAs concluded that annoyance, sleep disturbance, and reduced cognitive abilities were likely but that hearing loss, increase in respiratory effects, and cancer incidents were unlikely. Furthermore, some HIAs considered economic benefits of employment, community regeneration, business retention, and tourism as a net health benefit. The conclusion of this 2015 comparison study was that the 2014 HKAA HIA was adequate for its intended purpose for a vital public transportation project (Hong Kong Airport Authority, 2014).

- b. **2008 report entitled “Effects of Aircraft Noise: Research Update on Selected Topics.”** This report, published by the National Academies Press for the National Academies of Sciences, Engineering, and Medicine, synthesized research studies related to aviation noise since 1985. This report noted that “the effect of aviation noise on health is an intricately complex and notoriously difficult field of study” and that lifestyle choices, life’s stressors, hereditary factors, and genetic composition are some of the confounding factors that “may distort the results of an aviation noise health effects study.” The report condensed the health effects literature studies into one chapter, which discussed the cardiovascular system, children, and hearing impairment. Subsequent chapters summarized literature studies with respect to annoyance; sleep disturbance; speech interference; effects on schools; effects on parks; open spaces and wilderness areas; low-frequency noise and vibration; effects on wildlife and domestic animals; effects on property values; and, finally, the effects of meteorology and topography on aviation noise. The report concluded that “despite decades of research, including the review of old data and multiple new research efforts, health effects of aviation noise continue to be an enigma. Most, if not all, current research concludes that it is, as yet, impossible to determine causal relations between health disorders and noise exposures” (National Academies, 2008).
- c. **2005 Sound Noise Limits: Options for a Uniform Noise Limiting Scheme for Larger European Airports** (Appendix B, Noise Mitigation Measures). This report assesses the effectiveness of various noise mitigation measures available for commercial European airports. It analyzed four possible ways to mitigate aircraft noise: reducing noise at the source through research and development; land use planning to keep people and incompatible land uses away from the noise; ongoing noise-abatement procedures; and, as a last resort, operating restrictions. These noise-mitigation measures are very similar to those discussed in Appendix H of the Final EIS (Van Essen et al., 2005).

Summary: The Navy’s process of preparing the Growler EIS meets and exceeds the intent, the scope, and the content for a typical HIA. In fact, it fulfilled all applicable best practices identified and listed in the USEPA April 2014 factsheet: “A Review of Health Impact Assessments in the US: Current State of Science, Best Practices and Areas of Improvement.” In most cases, the Growler EIS analysis provides an objective, data-driven analysis that far exceeds the more general information contained in most other

HIAs. It is fair to conclude that while some HIAs provided a basic and fairly concise summary of existing literature, those HIAs did not conduct a location-specific analysis of environmental and health impacts normally found in an EIS. Furthermore, the noise mitigation measures discussed in the Growler EIS analysis are similar to noise mitigation initiatives used at commercial airports based on the three airport-related HIAs reviewed and the 2005 report on commercial European airports. In addition, a Noise and Health Reader's Guide was developed to assist readers in locating information within the EIS related to potential health effects of noise. This guide is organized by topic and includes where to find information on the latest science related to noise and health, standards the Navy uses to assess potential impacts, and potential impacts of the Proposed Action. This guide is included as part of the 30-page Executive Summary for the EIS.

4.3 Agency Consultation

Following the publication of the Draft EIS, the Navy received comments from USEPA Region 10 suggesting that the Navy prepare an HIA. The comments did not provide information detailing what information in the Draft EIS was missing or incorrect or how an HIA would provide information different than what was already included in the Draft EIS. The Navy reviewed the link provided in the USEPA comments, but the link provided very generalized information regarding HIAs that did not inform how the Navy should augment its analysis. The Navy searched and reviewed numerous HIAs prepared for other projects and found that HIAs served a similar but more limited role to that of NEPA documents, but none contained the level of quantitative and qualitative analysis of potential health impacts found in the Draft EIS. None of the HIAs provided new or unique research but instead conducted limited literature reviews.

As a result of the Navy's findings under Sections 4.1 and 4.2 above, Navy staff reached out to USEPA Region 10 to obtain additional guidance. As a result of those discussions, and due to the extensive discussion of potential health impacts already included in the Draft EIS, the Navy accepted the USEPA's recommendation that it expand the discussion on viability of noise mitigation measures.

Additionally, the Navy consulted with WADOH to discuss its request that the Navy consider 82 research studies and prepare an HIA. The Navy had already reviewed over 200 literature studies suggested in the Draft EIS public comments, and many studies suggested by WADOH were previously considered in the Navy's literature review or referenced in/by studies that the Navy had already considered. Nonetheless, the Navy agreed to review its literature study to confirm it was comprehensive. In addition, the Navy expanded its analysis and has provided an overview of the public health statistics as reported by WADOH and compared overall health in Island County to the rest of Washington State (Section 2 above).

The Navy believes that the comments are suggesting a broader, long-term research study aimed at attempting to determine whether there is a link between aircraft noise and health impacts, and not an HIA since an HIA would provide less comprehensive, at least duplicative, analysis than what is found in this EIS. The analysis in this EIS far exceeds the analysis contained in all of the HIAs reviewed by the Navy. It should be noted that numerous studies have already been conducted on this topic, and there are inconsistent or inconclusive results, as discussed in Appendix A1 of the Aircraft Noise Study (Appendix A). Such a study, to have any rigor or scientific validity, would have to be conducted over many years or even decades and is well outside what is required by NEPA or the scope of the Navy's statutory mission. As noted above, the Navy examined the most current and available literature in preparation of the analysis (see Appendix A1 of the Final EIS). It also prepared extensive qualitative and

quantitative analyses using numerous supplemental metrics based on the best available science to predict future impacts, including hearing loss, annoyance, sleep disturbance, and impact to children.

In order to determine whether relevant research might be ongoing or impending, the Defense Noise Working Group (DNWG) consulted the National Institutes of Health (NIH). Based on the information provided by the NIH, no such research studies are underway or planned. The NIH confirmed that the potential health effects associated with highway noise and aviation noise are not considered a national medical priority. Should the USEPA, WADOH, or another agency wish to prepare a research study, the Navy would likely participate alongside other federal agencies such as the Federal Aviation Administration, Department of Defense, and Department of Transportation.

Conclusion: The USEPA's suggestion of a supplemental health assessment did not specifically identify any incomplete information in the Draft EIS (See 40 CFR 1502.22), and it did not call into question the Draft EIS methodology for analyzing these impacts (See 40 CFR 1502.24). Creating a stand-alone HIA with the contents of the Navy's analysis did not serve any practical purpose since this information is already provided in the EIS.

4.4 A Discussion of How Public Health Practitioners View Available Literature

While WADOH health statistics did not indicate a health concern, the WADOH literature review was prepared with an abundance of caution in order to determine whether a public health consequence may exist with regard to annoyance, sleep disturbance, cognitive impairment, and cardiovascular disease. The 2008 Report by the National Academies performed a more detailed synthesis of the available literature and found that "it is as yet impossible to determine cause and effect relationship between health effects and aviation noise exposure." In preparation of the Final EIS, the Navy reviewed 260 published articles as suggested by public comment. In doing so, the Navy identified that many of these studies had been already reviewed and included in the Navy's literature review or were referenced in or by studies the Navy has already considered. However, expanded information has been incorporated as appropriate throughout the Final EIS. The studies did not change the overall findings of the Navy's original literature review. See Appendix A-8 for details on the literature review process.

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