



US Army Corps  
of Engineers



DEPARTMENT OF  
ECOLOGY  
State of Washington



Combined NEPA/SEPA

## Environmental Impact Statement Proposed Gateway Pacific Terminal/Custer Spur

# Preliminary Draft Human Health Technical Analysis Methodology

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## 1. Introduction

Health Impact Assessment (HIA) is generally defined as “a combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a policy, plan, program or project on the health of a population and the distribution of those effects within the population. HIA identifies appropriate actions to manage those effects” (Bhatia et al., 2011).

The methodology for determining the appropriateness of conducting an HIA and implementing the methodology for the proposed Gateway Pacific Terminal and Custer Spur Expansion (hereinafter referred to as the proposals), is based on the guidance and direction from the following guidance documents:

- *Technical Guidance for Health Impact Assessment (HIA) in Alaska* (State of Alaska HIA Program, Department of Health and Social Services, 2011)
- *Health Impact Assessment, a Guide For Practice* (Bhatia, 2011)
- *A Guide for Health Impact Assessment for use by the California Department of Health* (Bhatia, 2010)
- *A Health Impact Assessment Toolkit: A Handbook to Conducting HIA, 3rd Edition* (Bhatia et al., 2011)

This Human Health Technical Analysis methodology is a summary format of the more in-depth procedural steps described in the above documents. This methodology builds upon these guidance materials without repeating justification and assumptions that can be readily found in the above documents. This methodology provides a proposed structure for a HIA tailored to aspects and potential health issues that the proposal may affect. The following are the HIA procedural steps, which are further described in below:

1. Screening: Develop HIA steering committee and determine whether HIA is useful and warranted.
2. Scoping: Define the work plan.
3. Assessment: Determine how the health of the population could be affected, using quantitative and qualitative methods.
4. Recommendations: Provide final recommendations based on the assessment outcome, including mitigation strategies with the capacity to improve and/or protect health.
5. Reporting: Provide a transparent account of the HIA process that addresses the needs of the audience.

The four guidance documents referenced above also recommend a health action plan and monitoring plan, which are not included in this methodology but may be added after development of the HIA and after other decisions on the proposal are complete. Since an HIA is under consideration as part of the EIS process, it is considered an information document, whereas the action plan and monitoring plan

aspects would only be valuable if the proposal were moving forward. No decisions will be made until after a Final EIS is issued and therefore a health action plan and monitoring plan are pre-mature.

## 2. Screening

The primary objective of screening is to decide whether an HIA would add value to the decision-making process for the proposals. The screening process seeks to answer the following questions:

- Does development of an HIA have the potential to affect, positively or negatively, environmental or social determinants of health (or health effects categories) that affect health outcomes of a population and would those health impacts be likely or unlikely to be considered without the HIA?
- What evidence, expertise or research methods exist to analyze health impacts associated with decisions related to the proposals?
- What partners are available to participate in the HIA process and use HIA findings and recommendations?

The U.S. Army Corps of Engineers (Corps), Washington Department of Ecology (Ecology) and Whatcom County (Co-Lead Agencies) are managing the regulatory framework surrounding the proposals. The Co-Lead Agencies recently completed the scoping process for a combined National Environmental Policy Act (NEPA)/State Environmental Policy Act (SEPA) environmental impact statement (EIS). This scoping process revealed, through significant public input, that health-related impacts could occur in association with the proposals and that development of an HIA is desirable by many members of the public and affected stakeholders and therefore may be advantageous in informing the Co-leads in preparing their final permit decisions.

The level of HIA analysis is typically determined during the screening process. There are three levels of varying intensity from desktop analysis to a comprehensive HIA. However, based on public input received during NEPA/SEPA EIS scoping process, this Human Health Technical Analysis Methodology recommends that a comprehensive HIA be conducted. A comprehensive HIA is defined as an intense investigation that reviews available evidence along with collected data and analyses of new information but that is also a collaborative community process (National Association of County and City Health Officials and Center for Disease Control and Prevention, 2008).

The basic elements of the screening process are outlined in Table 1. The screening process outlines the members of the steering committee, along with the determinants and values the steering committee should consider in determining the value of a HIA for the proposals. Further, screening outlines the categories of likely stakeholders, and key informants who should be consulted in the development of the HIA. Many of these components in Table 1 must be confirmed and augmented as necessary in the comprehensive HIA screening process.

Table 1 Screening questions and issues	
<b>Proposals</b>	
Gateway Pacific Terminal and Custer Spur Expansion	
<b>Steering Committee</b>	
Co-Lead Agencies	
<b>Steering Committee Support</b>	
EIS Project Managers	

<b>Table 1 Screening questions and issues</b>	
<b>Screening Determinants</b>	<b>Preliminary determination based on public scoping input</b>
Will an HIA provide decision-makers for the Proposals, along with stakeholders, with positive and negative health effects, findings, and health-based recommendations?	Yes
Will an HIA increase stakeholder understanding of the Proposals?	Yes
Will an HIA identify community health concerns/issues within the impact areas of the Proposals and are these concerns (and their solutions) related to development of the Proposals?	Yes
Will an HIA add value to the decision-making process related to the Proposals in relation to health inequities (Disparities in health that are a result of systemic, avoidable and unjust social and economic policies and practices that create barriers to opportunity)?	Yes
Other questions derived by the Steering Committee.	
<b>Goals</b>	
The HIA will provide decision-makers for the Proposals, along with stakeholders, with positive and negative health effects, findings, and health-based recommendations.	
The HIA will increase stakeholder understanding of the Proposals.	
The HIA will identify community health concerns/issues within the impact areas of the Proposals and are the solutions for these concerns related to development of the Proposals.	
The HIA will add value to the decision-making process related to the Proposals in relation to health inequities (Disparities in health that are a result of systemic, avoidable and unjust social and economic policies and practices that create barriers to opportunity)?	
<b>Core Values</b>	
Democracy: Emphasize rights in participation in a transparent process that affects lives, either directly or through the joint NEPA/SEPA process	
Equity: Develop an HIA that addresses the aggregate impact of the Proposals on health and distribution of the impact through the population	
Sustainability: Emphasize analysis of both short and long-term impacts	
Ethics: Emphasize comprehensive impact assessment through rigorous qualitative and quantitative evidence assessment based on a wide range of scientific disciplines and methodologies	
<b>Primary stakeholders:</b>	
Community-based organizations	
Residents	
Service providers	
Elected officials at the municipal, regional, state or federal levels	
Small businesses	
Industry, developers, and big business	
Public agencies	

Table 1 Screening questions and issues	
Statewide or national advocacy organizations	
Stakeholder Participation Goals	
Ensure that stakeholders are provided opportunities to inform decisions that could impact lives	
Provide opportunity for stakeholders to voice concerns and solutions	
Provide avenues for stakeholders to present issues that reflect the needs of both current and future affected communities	
Include stakeholder information as evidence to be weighed in HIA assessment	
Key informants for the HIA	Expected Inputs
Washington State Department of Health	Provide information about health risk assessments and health-related trends and issues (help to establish baseline conditions)
Public health consultants	Provide information and collect baseline data, community specific information and demographic sensitivities
Experts in the Health Impact Assessment development, including those from academic, learning, and research institutions	Advise on HIA processes, and stakeholder engagement
Other key informants as determined by the Steering Committee	TBD

Once, the screening issues and questions are agreed upon by the steering committee, the HIA steering committee will make a final determination on the value of completing an HIA for the proposals.

### 3. Scoping

The primary objective of scoping is to develop a work plan based upon decisions made and priorities identified in the screening step. The work plan includes procedural steps, research questions and research methods. The first step in establishing a work plan is defining health determinants that could be affected by the proposals. This Human Health Technical Analysis Methodology references the HIA guidance documents identified above, which provide information on social and environmental determinants of health considered to be the root causes of health and disease. Table 2 lists these determinants, divided into major categories of public, environmental, and social health.

Table 2 Social and environmental determinants of health		
Public services and infrastructure	Environmental conditions	Social, economic and political
Education Public transportation (road, rail) Health care, child care Parks, leisure centers Community centers Economic development Civic design	Housing adequacy Working conditions Public safety Air, soil, and water quality Community noise, odors Disease vectors Shopping (location, range, quality) Views	Poverty Inequality Social cohesion and inclusion Political participation Culture and peer pressure Health trends Environmental policy Local priorities

Public input collected throughout the described NEPA/SEPA scoping process includes many public health concerns. These concerns have been listed as proximal outcomes based on the three major categories of social and environmental determinants of health as shown in Table 3.

Table 3 Public input process proximal outcomes as they relate to social and environmental determinants of health		
Public services and infrastructure	Environmental conditions	Social, economic and political
Changes in public services such as medical, police and fire response times Change in time spent at at-grade crossings (emergency response times) Potential for changes in crime rates Population increase creates demand on infrastructure Change in access to alternative modes of transportation Change in availability of public parks and playgrounds	Accidents and malfunctions that can manifest as fires, explosions, hazardous material losses, and/or spills Change in rail volume and potential for changes in traffic, pedestrian, bicycle safety <ul style="list-style-type: none"> <li>• Change in congestion/speed and time spent in traffic</li> <li>• Change in vehicle miles traveled</li> </ul> Changes in air pollutants and exposure. Potential for climate change Degradation of general soil / groundwater quality Change in stormwater runoff and potential for contamination of waterways Change in discharge, wastewater and toxic substance leakage from all sources Destruction of native marine wildlife habitats Change in noise/vibration levels and exposure	Changes in autonomy, traditional lifestyle, and cultural stability Changes in employment, housing, and housing expenditures Changes in community cohesion Change in neighborhood resources Changes that remove or inhibit access to certain social groups, alter social relationships and patterns, or isolate people or groups from others Changes in cultural continuity

*Technical Guidance for Health Impact Assessment (HIA) in Alaska* (State of Alaska HIA Program, Department of Health and Social Services, 2011) classifies these social and environmental health determinants into health effects categories (HECs), which have been and may continue to be modified and tailored based insights and final outcomes from the screening process. The basic structure provided by the Alaska HIA Guidance document is relevant because, similar to situations common in Alaska, the proposals could affect the interests of Native American Tribes with interests and subsistence patterns in the vicinity of the proposals. Information collected during the public EIS scoping process for the GPT and Custer Spur modification proposals can be associated with HECs to serve as a foundation for the work plan as the first step in scoping the HIA.

HECs have been developed based on the Alaska model to provide a basis for examination of proximal outcomes listed in Table 3. The HECs and the associated pathways influencing that HEC as modeled from the Alaska HIA Guidance document are included in Table 4. The table connects the HEC topics with the public’s stated health-related concerns (listed as proximal outcomes) and associated health hypotheses. The proximal outcomes are indicators of proposal effects, as captured from public input, that may result in a change in the health condition. In brief, this table links public scoping comments, with studies that may be performed and the subcategories for social and environmental determinants of health. This becomes the structure and scope of a potential HIA report.

Table 4. Health determinants and health effects categories of public input proximal outcomes			
Public services and infrastructure (as shown in Table 2)			
Preliminary HIA Analysis Structure		Preliminary Public Input	
Health Effects Category (HEC)	HEC Pathway	Proximal Outcomes	Health Hypotheses
Public Services	Includes the changes to access, quantity and quality of public service. The pathways includes: <ul style="list-style-type: none"> <li>Decreased access to/from emergency service providers to/from community in need increases health risk and stress.</li> <li>Decreased level of service for public transportation increases stress</li> </ul>	Changes in public services such as medical, police and fire response times  Potential for changes in crime rates	Increased risk of injury/death from lack of police and fire protection
Health Services Infrastructure and Capacity	Considers how the Proposals would influence health services infrastructure and capacity. The pathways include: <ul style="list-style-type: none"> <li>Increased revenues can be used to support or bolster local/regional services and infrastructure</li> <li>Increased demands on infrastructure and services by incoming employees or residents injured on the job, especially during construction phases.</li> </ul>	Population increase creates demand on infrastructure  Change in congestion/speed and time spent in traffic Change in vehicle miles traveled	
Environmental Conditions (as shown in Table 2)			
Preliminary HIA Analysis Structure		Preliminary Public Input	
Health Effects Category (HEC)	HEC Pathway	Proximal Outcomes	Health Hypotheses

**Table 4.**  
**Health determinants and health effects categories of public input proximal outcomes**

<b>Accidents and Injuries</b>	<p>Considers impacts related to both fatal and non-fatal injury patterns for individuals and communities. Changed patterns of accidents and injuries may arise due to:</p> <ul style="list-style-type: none"> <li>• Influx of construction-phase and operation phase personnel</li> <li>• Increased traffic on roadways and rail corridors</li> <li>• Increased wait times at rail corridors that influence negative behavior patterns</li> <li>• Distance of travel required.</li> <li>• Project-related income and revenue used for improved infrastructure (e.g., roadways).</li> </ul>	<p>Accidents and malfunctions that can manifest as fires, explosions, hazardous material losses, and/or spills.</p>	<p>Expose nearby persons to injury or death.</p>
		<p>Change in rail volume and potential for:</p> <ul style="list-style-type: none"> <li>• Change in traffic safety</li> <li>• Change in pedestrian and bicycle safety and access (physical activity and safety)</li> <li>•</li> </ul>	<p>Change in traffic related injuries and fatalities; change in chronic disease, change in stress (poor mental health, increased inflammatory response, decreased immune system), increased risk of injury/death from increased police and fire response times</p>
<b>Exposure to potentially hazardous materials</b>	<p>Considers emissions and discharges that lead to potential exposure. Exposure pathways include:</p> <ul style="list-style-type: none"> <li>• Air. Respiratory exposures to fugitive dusts, criteria pollutants, VOCs, mercury, and other substances.</li> <li>• Drinking water</li> <li>• Food. Quality changes in subsistence foods and agricultural products (risk based on analysis of foods or modeled environmental concentrations )</li> <li>• Work. Secondary occupational exposure such as a family member’s exposure on a worker’s clothing.</li> <li>• Indirect pathways, such as changing heating fuels/energy production fuels in communities</li> </ul>	<p>Changes in air pollutants and exposure.</p> <p>Exposure of farm land to coal dust/emissions</p>	<p>Low-birth weight, pre-term birth; asthma, other respiratory disease; cardiovascular disease; cancer; reproductive health; children’s lung development</p>
		<p>Potential for climate change (change in rainfall, sea level rise, and marine life).</p>	<p>Heat related illness, water, food, vector, or rodent-borne disease</p>
		<p>Degradation of general soil / groundwater quality due to industrial operations, minor spillages, traffic and emplacement of fill material.</p>	<p>Contact with and ingestion of contaminated soil/groundwater, skin irritation, stomach aches, colds, flu, neurological systems.</p>

**Table 4. Health determinants and health effects categories of public input proximal outcomes**

<b>Infectious Disease</b>	<p>This category includes influence on patterns of infectious disease: The pathway includes:</p> <ul style="list-style-type: none"> <li>• Changes to groundwater/wetlands can alter habitat for agents that transmit vector-borne diseases. This may become an issue of greater concern in the future with cumulative effects of climate change.</li> </ul>	Change in stormwater runoff and potential for contamination of waterways.	Contact with and ingestion of contaminated water, skin irritation, stomach aches, colds, flu, neurological systems.
		<p>Change in discharge, wastewater and toxic substance leakage from all sources (including spills and air deposition) and potential for:</p> <ul style="list-style-type: none"> <li>• bacterial and viral contamination of fish and shellfish and bioaccumulation of toxins in fish</li> <li>• destruction of native marine wildlife habitats (including change in invasive species)</li> </ul>	Contact with and ingestion of contaminated fish, skin irritation, stomach aches, colds, flu, neurological systems.
<b>Non-communicable and Chronic Diseases</b>	<p>This category considers how the Projects might change patterns of chronic diseases. The pathways include:</p> <ul style="list-style-type: none"> <li>• Nutritional changes that could eventually produce obesity, impaired glucose tolerance, diabetes, cardiovascular disease.</li> <li>• Pulmonary exposures that lead to tobacco related chronic lung disease, asthma; in-home heat sources; local community air quality; clinic visits for respiratory illness</li> <li>• Cancer rates secondary to diet changes or environmental exposures</li> <li>• Increased rates of other disorders, specific to the contaminant(s) of concern</li> </ul>	Change in noise/vibration levels and exposure.	<p>Hypertension, annoyance, sleep disturbance, cardiovascular disease, stroke, increased aggression, depression, cognitive impairment/education outcomes</p> <p>Structural damage that degrades the value of property, increasing stress from economic impact of paying for repair or living in or owning a structure with accelerated aging</p>
		<b>Social, Economic, and Political (as shown in Table 2)</b>	
<b>Preliminary HIA Analysis Structure</b>		<b>Preliminary Public Input</b>	
<b>Health Effects Category (HEC)</b>	<b>HEC Pathway</b>	<b>Proximal Outcomes</b>	<b>Health Hypotheses</b>
<b>Social Determinants of Health (SDH)</b>	<p>Considers how living conditions and social situations influence the health of individuals and communities.</p> <ul style="list-style-type: none"> <li>• psychosocial issues related to drugs and alcohol,</li> <li>• teenage pregnancy</li> <li>• family stress</li> <li>• domestic violence</li> <li>• depression &amp; anxiety</li> <li>• isolation</li> </ul>	Changes in autonomy, traditional lifestyle, and cultural stability.	Drug/alcohol usage, teen/unwed pregnancy, gender violence suicides, and depression
		<p>Changes in employment, housing, and housing expenditures</p> <p>Changes in community</p>	Poverty and ability to meet basic needs; infectious disease, chronic disease, and

Table 4. Health determinants and health effects categories of public input proximal outcomes			
	<ul style="list-style-type: none"> <li>work rotations and hiring practices,</li> <li>cultural change</li> <li>economy, employment, and education</li> </ul> <p>Limitations: While SDH are real and important, it is extremely difficult to establish direct causality between a change in a social determinant and a particular health outcome. The language used to communicate impacts related to social determinants should reflect that SDH influence health in complex ways.</p>	<p>cohesion (real and perceived), change in neighborhood resources (e.g., parks, playgrounds, retail, food options, community center), changes that remove or inhibit access to certain social groups, alter social relationships and patterns, or isolate people or groups from others.</p>	<p>stress</p> <p>Stress-related illness (poor mental health, increased inflammatory response, decreased immune response)</p>
<p><b>Food, Nutrition, and Subsistence Activity</b></p>	<p>This section depends on the subsistence analysis and nutritional surveys (if completed) and considers:</p> <ul style="list-style-type: none"> <li><i>Effect on Diet:</i> This pathway considers how changes in wildlife habitat, fishing/hunting patterns, and food choices will influence the diet of and cultural practices of local communities. While nutritional surveys are the most effective way to assess dietary intake, conclusions can be drawn if certain assumptions are accepted</li> <li><i>Effect on Food Security:</i> This discussion considers project-specific impacts that may limit or increase the availability of foods needed by local communities to survive in a mixed cash and subsistence economy established within the community.</li> </ul>	<p>Changes in cultural continuity (anxiety/stress regarding perceived threats to traditional ways of life)</p>	<p>Drug/alcohol usage, teen/unwed pregnancy, gender violence suicides, and depression</p>

“HECs provide the structure for the HIA team to systematically review each human health area in the light of the project design construction and operations for the proposals. The HECs inform baseline health studies considered in the HIA and inform how the HIA team identifies and measures health impacts” (State of Alaska HIA Program, Department of Health and Social Services, 2011). While Table 4 links the HEC topics with the health hypotheses, Table 5 links the HECs with the proposed EIS studies that could inform whether the proposals may result in impacts affecting health outcomes.

Table 5. Health effects categories and associated EIS areas of study	
Public services and infrastructure (as shown in Table 2)	
Health Effects Category (HEC)	EIS Area of Study
Public Services	Public Services and Utilities
Health Services Infrastructure and Capacity	
Environmental Conditions (as shown in Table 2)	

**Table 5.**  
**Health effects categories and associated EIS areas of study**

Health Effects Category (HEC)	EIS Area of Study
Accidents and Injuries	Hazards and Risks Traffic and Rail
Exposure to potentially hazardous materials	Air Quality Energy/Greenhouse Gas Geology
Infectious Disease Non-communicable and Chronic Diseases	Water Resources (Surface/Subsurface Hydrology) Noise and Vibration
<b>Social, Economic, and Political (as shown in Table 2)</b>	
Health Effects Category (HEC)	Pathway
Social Determinants of Health (SDH)	Indian Fishing and Fishing Treaty Rights Socioeconomics
Food, Nutrition, and Subsistence Activity	Cultural Resources

Once the Steering committee has confirmed the HECs of the HIA, the next step in scoping is identification of HIA team members beyond the HIA steering committee. The HIA team should include research professionals that have experience with HIAs, understand the boundaries of an HIA, how to determine the geographic boundaries and can describe how conclusions on health effects to potentially affected community members were reached such that another like professional might draw a similar conclusion using the same input.

After identification of the HIA team, subsequent scoping steps include identifying geographic boundaries and potentially affected populations to be considered in the HIA. Table 6 outlines specific tasks to inform how the work plan will be defined. There are multiple inputs in determining the work plan. The scoping process includes determining what geographic areas may be affected and the profile of those potentially affected communities for the health topics likely to be affected by the proposals. Table 6 below outlines both the applicable common steps in HIA scoping and proposes a tailored structure for determining the geographic areas and likely associated populations, or even stratified population groups that may be affected. This structure would help organize how baseline data on these communities may be gathered focusing on the applicable health issues associated with that portion of the proposal.

**Table 6.**  
**Additional scoping steps to establish and define work plan**

Collecting data	Responsible team member
Literature review	HIA Team
Community profile	HIA Team, EIS Team, Key Informants
GIS analysis and mapping of existing data	EIS Team, HIA Team, Key Informants
Stakeholder workshops / focus group interviews	(per Outreach Plan)
Proposal analysis	EIS Team

Table 6. Additional scoping steps to establish and define work plan	
Quantitative forecasting	HIA Team – pulling from EIS analyses
Quantitative data collection and analysis	HIA Team – pulling from EIS analyses
Forming recommendations	HIA Team, Steering Committee
Validation	Stakeholder Consultation
Report Preparation	HIA Team
<b>Confirm geographic boundaries of the proposal elements</b>	
<b>GPT Design Elements/ Location</b>	
Upland Terminal Site (Cherry Point Industrial UGA)	
Wharf and Trestle (Strait of Georgia)	
Vessel transit lanes Cherry point via Strait of Rosario or Haro through to Straits of Juan de Fuca – to Exclusive Economic Zone (EEZ)	
<b>BNSF Study Areas</b>	
Custer Spur (Dividing at Custer to Cherry Point Industrial UGA)	
Railroad routes beyond Custer Spur – Washington, possibly extending to mines	
<b>Determine potentially affected communities (PACs)</b>	
Within close geographic proximity to the Proposal areas	
Located in projected release areas for contaminants of concern (e.g., plume)	
Populations that include a likelihood for change in key subsistence resources	
Populations that could experience a change in transportation infrastructure	
Populations that could experience economic change	
Populations that exhibit an existing large burden of diseases or health problems or include an existing high level of exposure to an environmental hazard. Preliminarily, these communities include the Lummi Nation, residents of Ferndale and Custer, and residents of San Juan Islands that reside along primary shipping lanes.	
In addition to the general population of the identified communities, the following <b>vulnerable populations</b> will be considered <b>when stratified data are available</b> : Groups defined by age (e.g., young children (0-5), school children (6-17), seniors (65+)) Groups defined by race/ethnicity (e.g., African American, Hispanic, Non-English speakers and/or recent immigrants/foreign born populations) Groups defined by income (e.g., those living below poverty line, those living below 200% of poverty line, lowest quartile or quintile of earners) Populations with existing health conditions (e.g., asthma, diabetes, cardiovascular disease) that could increase susceptibility to issues related to air quality or other impacts.	
<b>Determine temporal elements for the HIA study</b>	
The HIA will analyze construction-related impacts for two development phases of up to three years per phase. The HIA will examine the operational phase up to year 2035, which is assumed to be 20 years from initiation of operation.	

Table 6. Additional scoping steps to establish and define work plan
<b>Establish and conduct stakeholder participation events</b>
Develop stakeholder participation plan in association with steering committee and HIA team that uses deliberative methods and follows principles of democracy. Due to the high attention of these proposals, a stakeholder participation plan will be a separate deliverable developed in response to potential health trends in potentially affected communities, targeted to identify specific representative with specific objectives outlined and agreed upon with the steering committee.

A final step in scoping and prior to initiating the HIA assessment step, the HIA team, including the HIA steering committee will rank the HECs and their associated potential impacts and health outcomes based upon their greatest potential significance. The HIA team and steering committee will determine significance based on data gathered in the HIA stakeholder interview process and projected stakeholder priorities.

## 4. Assessment

Per the HIA Guide for Practice, the purpose of the assessment stage is to characterize the potential health effects of alternative decisions based on available evidence. The assessment produces three related outputs:

1. Ascertainment of baseline (existing) conditions in the affected population including health status, health determinants, and vulnerabilities to health effects
2. Characterization of the anticipated health effects of alternative decisions
3. An evaluation of the level of confidence or certainty in the health effects characterization

Typical procedures used during the assessment phase include:

- Confirming baseline conditions
- Epidemiological and empirical research
- Geographic information systems (GIS) and geospatial analysis
- Qualitative or quantitative evaluation standards (for example, benchmarks, checklists, thresholds)
- Qualitative research
- Quantitative estimation
- Original empirical investigations
- Analysis of disproportionate effects and environmental integrity
- Cumulative effects
- Economic valuation of interventions and health impacts

This HIA will likely employ many of these procedures and build upon existing health information cataloged by state and local health jurisdictions and the impacts results developed through the EIS for resource-related studies, as outlined in Table 5. The following sections summarize the linear progression of the assessment process steps, beginning with baseline data, shifting to effects evaluation and then characterization of the effects.

### 4.1 Baseline data collection and synthesis

Establishing the baseline provides an initial understanding of a community's constituency and health. For the HECs and their associated health determinants identified during the scoping step, baseline

conditions will be determined. The potential impacts of the proposals will be assessed in relation to these established baseline conditions. Establishing the baseline includes the following steps:

1. Validate HECs identified in scoping.
2. Identify health-based baseline conditions related to each HEC using existing literature, community expertise, available Washington state health surveys and data, established regulatory criteria and established neighborhood assessment tools.
3. Disaggregate the baseline according to proximity to impact area and other demographic factors based on available data (refer to Table 6).
4. Identify measurable indicators of HECs that both evaluate and validate identified health hypotheses (see Table 4).

## ***4.2 Effect evaluation***

Review literature and available statistics for completion of the qualitative analysis. This step will provide information on the relationship between development of the proposals, the HECs and the health hypotheses.

1. Determine whether there is direct causality between development of the proposals and health outcomes.
2. Apply data that relate to HECs. Preliminarily, these data sources will include the following:
  - a. GIS layers from local, state and federal public sources to complete geospatial analysis
  - b. Technical analyses completed for the EIS for the proposals, including the following:
    - I. Geology
    - II. Air quality
    - III. Energy/greenhouse gas
    - IV. Water resources, including surface and subsurface hydrology and stormwater quality
    - V. Wetlands
    - VI. Aquatic resources, including fish, essential fish habitat and invertebrates
    - VII. Noise and vibration
    - VIII. Hazards and risks, including hazardous materials, reliability and safety and oil spill fate/transport
    - IX. Land use, shoreline and recreation
    - X. Indian fishing rights and fishing treaty rights
    - XI. Cultural, historical and archaeological resources
    - XII. Transportation, including rail and vehicle
    - XIII. Marine transportation
    - XIV. Social resources
    - XV. Economics
    - XVI. Visual resources
    - XVII. Public services and utilities

3. Conduct stakeholder workshops and focus group interviews in affected communities as per the developed stakeholder participation plan (see table 6). Consider stakeholder-provided information as evidence in validating effects determinants.
4. Identify data gaps and whether enough data have been gathered to estimate effects quantitatively; if so, identify suitable prediction model(s).
5. Compute health effects estimates based on prediction model(s), baseline conditions, applied data, and expected changes in risk factors. The culminating result will prove or disprove the preliminary health hypotheses (see Table 4).

### 4.3 Characterization

Characterizing the likelihood, severity, magnitude and distribution of health effects requires the HIA team to use judgment to rank cause and effect relationships, the importance of individual health effects, and how effects may change. This process is used to evaluate overall health impact significance. The HIA team will refine the preliminary definitions of likelihood, severity, magnitude and distribution using the ranks and reasons described in the following enumerated list. Table 7 identifies the rating categories to be used to rank the significance for each proven health hypothesis.

Table 7.  
Preliminary health impact rating factors (likelihood, severity, magnitude, distribution) for each HEC or health determinant.

Likelihood	Severity	Magnitude	Distribution
Unlikely/Implausible	Low	Limited	Disproportionate benefits
Possible/Likely	Medium	Moderate	Restorative equity effects
Very Likely / Certain	High	Substantial	Disproportionate harms

#### 4.3.1 Refine preliminary definitions

1. Likelihood: Certainty that development of the proposals will affect HECs and associated health outcomes
  - a. Unlikely/implausible: Logically implausible effect; substantial evidence against mechanism of effect
  - b. Possible/likely: Logically plausible effect with limited or uncertain supporting evidence
  - c. Very likely/certain: Adequate evidence for a causal and generalized effect
2. Severity: Importance of health effect in relation to human function, wellbeing or longevity, considering the affected community's current ability to manage health effects
  - a. Low: Acute, short-term effects with limited and reversible impacts on function, wellbeing or livelihood that are tolerable or entirely manageable within the capacity of the community health system
  - b. Medium: Acute, chronic or permanent effects that substantially affect function, wellbeing or livelihood but are largely manageable within the capacity of the community health system; or acute, short-term effects on function, wellbeing or livelihood that are not manageable within the capacity of the community health system

- c. High: Acute, chronic or permanent effects that are potentially disabling or life-threatening, regardless of community health system manageability; or effects that impair the development of children or harm future generations
3. Magnitude: Change in population frequency of symptoms, disease, illness, injury, disability or mortality as a result of the decision
  - a. Limited: A change of less than 0.1% in the population frequency of a health endpoint
  - b. Moderate: A change of between 0.1% and 1% in the population frequency of a health endpoint
  - c. Substantial: A change of greater than 1% in the population frequency of a health endpoint
4. Distribution: Effects, whether adverse or beneficial, across populations, and the possibility that the decision to allow development of the proposal would reverse baseline or historical inequities
  - a. Disproportionate benefits: A disproportionate beneficial effects to populations defined by demographics, culture or geography
  - b. Restorative equity effects: A reversal or undoing of existing or historical inequitable health-relevant conditions or health disparities
  - c. Disproportionate harms: A disproportionate adverse effects to populations defined by demographics, culture, or geography

#### 4.3.2 Judge confidence in effect characterization

Once characterization of health effects is complete, the HIA team will judge the confidence of the health effects significance levels that were developed using the scale presented in Table 7. This step will include an exploration of the validity of judgments, focusing on the possibility of unequal negative impacts. The HIA team will explore the potential for data gaps in epidemiological, baseline health data, scientific evidence or basic HIA assumptions; analyze the overall effects; and describe the potential for variation. This step may include discussion with stakeholders of characterization and judgment.

## 5. Recommendations

In the final step of the HIA report, the HIA team will provide recommendations, including mitigation strategies that could improve health or protect health through avoidance. These mitigation and avoidance strategies could include alternative ways to design the proposals; changing its location or timing to benefit health; implementing public health management strategies to reduce anticipated adverse health effects; or monitoring, reassessment and adaptations to help manage uncertainties. Recommendations will be based on findings of the assessment step of HIA, as well as on feasibility, efficiency, cost-effectiveness and political acceptability. The following criteria will be defined and used in developing recommendations:

- Responsiveness to predicted impacts
- Specific and actionable
- Experience-based and effective
- Enforceable
- Can be monitored
- Technically feasible
- Politically feasible
- Economically efficient
- Does not introduce additional negative consequences

Once the HIA team develops preliminary recommendations that satisfy the criteria listed above, processes outlined in the GPT Public Involvement Plan can be used to communicate with stakeholders to gauge potential buy-in or feasibility of the recommendations. This stakeholder input will lead to refinement of recommendations that are locally relevant to potentially affected populations. These recommendations would then be presented to the HIA steering committee. Ultimately, the steering committee will determine the final recommendations to conform within the legal framework relevant to the proposals.

## 6. Reporting

The primary objective of the reporting step is to provide a transparent account of the HIA process and formally communicate findings and recommendations in a succinct manner that addresses the needs of all audiences (Bhatia, 2011). The HIA Report will clearly describe the following:

- The proposals and the relationship of the proposals to relevant health issues: This section of the HIA report will describe aspects of the proposals in relation to the potentially affected communities.
- The stakeholders consulted during the HIA process, including the public, steering committees, experts and other participants: This section of the report will describe roles of the Co-Lead Agencies, HIA steering committee, stakeholders and HIA team.
- The HIA process and findings of each phase: This section will describe the screening and scoping steps, including questions and issues that arose and how they were resolved; discuss the available scientific evidence used in the HIA analysis; describe how existing conditions were profiled; and document and describe analytic methods and results.
- Conclusions and recommendations: This section will describe the characterization of the health impacts and their significance for each HEC or issue analyzed and provide recommendations, including mitigation measures, for the impacts identified. This section will also prioritize the potential health effects by significance as they relate to real and perceived impacts on vulnerable populations, perceived public concerns or the quality of the evidence.

The HIA Report will offer the Co-Lead Agencies and stakeholders a meaningful opportunity to critically review evidence, methods, findings, conclusions and recommendations. Upon approval by the Co-Lead Agencies, the final HIA Report will be made publicly accessible.

## 7. References and Resources

### HIA Guidance Resources

Bhatia, R. 2010. A Guide for Health Impact Assessment for use by the California Department of Public Health.

Bhatia, R. 2011. *Health Impact Assessment: A Guide for Practice*. Oakland, CA: Human Impact Partners

Bhatia, R., K. Gilhuly, C. Harris, J. Heller, J. Lucky, and L. Farhange. 2011. *A Health Impact Assessment Toolkit: A Handbook to Conducting HIA*. Oakland, CA: Human Impact Partners, 3rd Edition.

Hebert, K.A., A. M. Wendel, S. K. Kennedy, and A. L. Dannenberg. 2012. "Health Impact Assessment: A Comparison of 45 Local, National, and International Guidelines." *Environmental Impact Assessment Review*. 34: 74-82. Elsevier doi: 10.1016/j.eiar.2012.01.003.

Human Impact Partners. 2012. *HIA Tools and Resources: HIA Opportunities for Collaboration*. Available at: <http://www.humanimpact.org/doc-lib/finish/12/12>

National Association of County and City Health Officials and Center for Disease Control and Prevention. 2008. *Protocol for Assessing Community Excellence in Environmental Health (PACE-EH): A Guidebook for Local Health Officials*.

North American HIA Practice Standards Working Group (Bhatia R., J. Branscomb, L. Farhang, M. Lee, M. Orenstein, and M. Richardson). *Minimum Elements and Practice Standards for Health Impact Assessment, Version 2*. Oakland, CA. November 2010.

Stakeholder Participation Working Group of the 2010 HIA in the Americas Workshop. 2011. *Best Practices for Stakeholder Participation in Health Impact Assessment*. Oakland, CA.

State of Alaska HIA Program, Department of Health and Social Services. 2011. *Technical Guidance for Health Impact Assessment (HIA) in Alaska*.

### Health Statistic Resources

Demographics:

<http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>

<http://www.census.gov/econ/census02/>

<http://www.census.gov/hhes/>

Health Statistics:

<http://www.countyhealthrankings.org/our-approach>

<http://www.cdc.gov/nchs/>

<http://www.doh.wa.gov/PublicHealthandHealthcareProviders/PublicHealthSystemResourcesandServices/PublicHealthImprovementPartnershipPHIP/PublicHealthIndicatorsWorkgroup/LPHIWebsite.aspx>

[http://phpartners.org/health\\_stats.html](http://phpartners.org/health_stats.html)

King County: <http://www.kingcounty.gov/healthservices/health/data/chi2009.aspx>  
(Provides comparisons with other Washington counties)

Indicators:

<http://www.healthypeople.gov/2020/default.aspx>

[http://rprogress.org/sustainability\\_indicators/community\\_indicators.htm](http://rprogress.org/sustainability_indicators/community_indicators.htm)

[http://www.urban.org/UploadedPDF/411605\\_administrative\\_data\\_sources.pdf](http://www.urban.org/UploadedPDF/411605_administrative_data_sources.pdf)

<http://www.cdc.gov/nceh/>

Planning Tools:

<http://www.cdc.gov/healthyplaces/>

GIS:

<http://www.census.gov/2010census/>

<http://www.ecy.wa.gov/services/gis/data/data.htm>

<http://www.whatcomcounty.us/pds/gis/>

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