

Section 2

Environmental Considerations for Port Development and Operations

The purpose of this section is to identify port development and operation activities that may affect environmental quality. For each activity, the potential pathways for environmental impacts are also evaluated.

2.1 Port Activities

Activities and operations vary widely among ports depending on the types and volume of materials shipped. However, there are many common activities, such as vehicle maintenance or bulk materials handling that occur at nearly every port, and impacts to the environment from these activities may occur. For example, fuel spills of varying amounts that occur during routine on- or off-loading activities can be carried by stormwater into a water body, and can have serious effects on water quality, waterfowl, and sediments.

However, a port can play a significant role in protecting and enhancing the environment through careful initial planning and implementation of appropriate measures. The degree to which a particular activity may impact the environment is dependent on:

- Proximity to sensitive natural resources
- Open pathways between the activity and these resources
- Extent of the activity
- Controls in place to prevent or reduce impacts
- Opportunities to enhance the environment

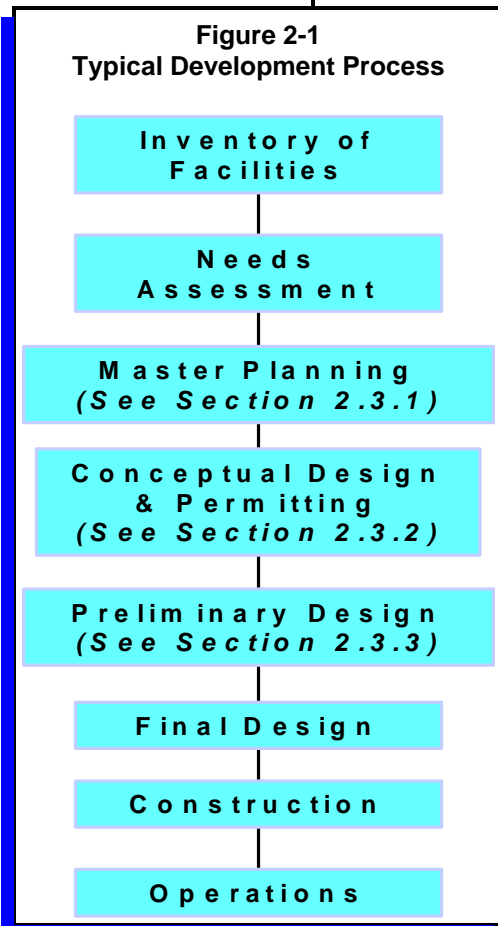
This section presents a list of key port activities that have potential to affect environmental quality, divided into two main categories:

- Development-related activities
- Operations-related activities

For the purpose of this document, development-related activities include construction, and operations-related activities include maintenance. The following section presents activities in each major heading. Activities that are both development and operations-related are discussed in the most appropriate section.

2.1.1 Development-Related Activities

Figure 2-1 shows a typical development process, starting with an inventory of current facilities and needs assessment, followed by master planning, several stages of design, construction, and finally into startup and operations. While environmental impacts are most



likely to occur during construction and operations, environmental concerns may arise at any step of the development process, and are best addressed during the earliest possible stages. In particular, environmental issues and concerns are often identified during the needs assessment, and addressed (i.e., potential solutions are found) during the master planning step.

Table 2-1 presents a list of the key construction activities that may be of greatest concern for port development. Section 3 presents a variety of environmental management practices (EMPs) designed to reduce or eliminate the impacts from these activities.

Table 2-1
Development Related Activities

- Building Demolition
- Building Renovation
- Bulkhead Renovation & Installation
- Remediation
- Dredge Material Placement
- Dredging
- Landfilling
- New Building Construction
- Pier Construction / Rehabilitation
- Pavement Installation
- Pavement Removal
- Site Cleaning
- Utility Construction

2.1.2 Operation-Related Activities

Table 2-2
Operations Related Activities

- Automobile Transport
- Building/Grounds Maintenance
- Cargo Handling
- Chemical Storage and Handling
- Fueling
- Painting
- Paint Stripping
- Public Access & Recreation
- Rail Maintenance
- Ship Liquid Discharges
- Ship Air Emissions
- Ship Breaking
- Vehicle & Equipment Maintenance
- Vessel Repair & Maintenance

Table 2-2 presents a list of operational activities that are common to most port facilities. This list was developed through discussions with the HN&E Committee and a series of site visits to ports throughout the US. Section 3 also presents EMPs designed to reduce impacts associated with operational activities.

2.2 Potential Environmental Impacts and Pathways

In general, impacts to the environment occur through four media — air, surface water, soils, and groundwater. For many port activities, there is more than one pathway leading to an environmental impact and each should be reduced or eliminated. For example, for dry bulk storage of coal products, dusts may be created and carried by wind currents offsite to nearby residences. Stormwater may fall on the product and carry fine particles and other contaminants to nearby surface waters, or the stormwater may dissolve contaminants and carry those contaminants into the soils and eventually into groundwater.

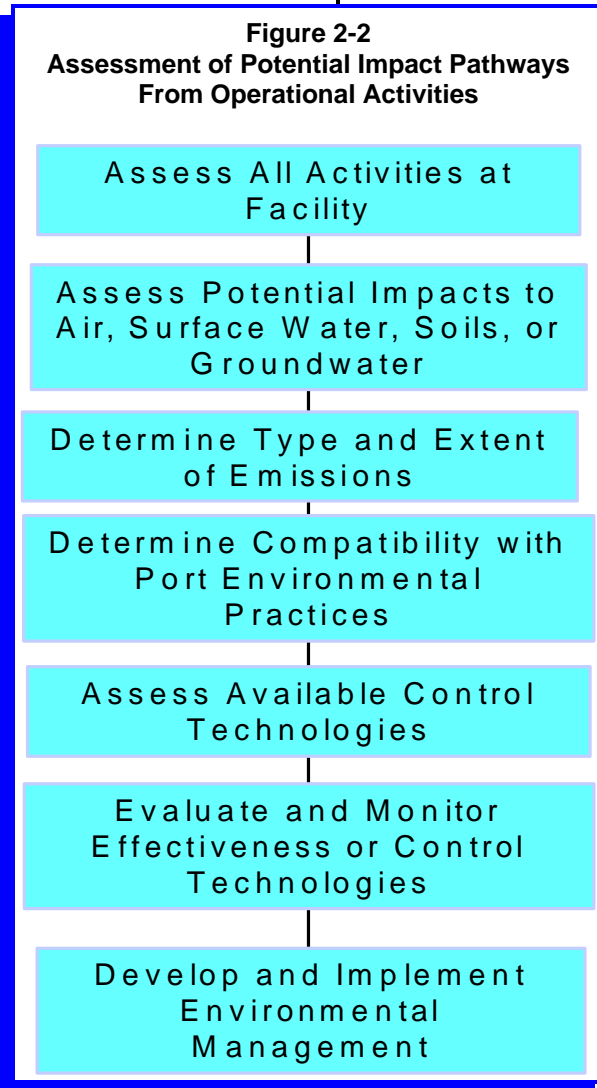
Each activity performed by a port and its tenants should be evaluated to determine the potential pathways for contaminants to reach the environment. An understanding of both the contaminants and potential pathways provides a basis to start or change environmental management practices to help eliminate those pathways, which is the focus of Section 3.

2.3 Environmental Concerns for Port Development

Each step of the typical development project — for a port or for any other industry — requires careful consideration of numerous environmental factors including those shown in **Table 2-3**. Three critical steps in the development process shown in **Figure 2-1** are discussed in the following sections.

2.3.1 Master Planning

During the master planning stage, a port must determine the type and extent of activities that will occur at the new facility. It is important to understand all of the processes and procedures used at a facility, not only the final product or service that will be provided. Then the port, working with its tenants if applicable, would develop a plan to protect and enhance the environment, as demonstrated in **Figure 2-2**.



**Table 2-3
Typical Environmental Considerations For Port Development Projects**

- Underground Storage Tanks/ Above Ground Storage Tanks (USTs/ASTs)
- Chemical Storage
- Spills & Leaks
- Solid Waste
- Water Resources
- Wetlands
- Cultural Resources
- Air Emissions
- Wastewater Discharges
- Storm Water Discharges
- Construction Impacts
- Fisheries
- Traffic
- Noise
- Endangered Species
- Public Outreach/Access
- Mitigation
- Hazardous Wastes
- Sediment & Erosion Control

Community and regulatory agency outreach is necessary during this stage to assess community concerns, and develop a strategy to address them. This strategy may involve project modifications, such as limits on the size of the project; additions of new project features, such as public awareness opportunities; or voluntary environmental management programs, including energy efficiency initiatives. In addition, this strategy should be developed in conjunction with other elements of the port's management team (e.g., marketing, engineering, financial, legal) to ensure that any project meets the port's mission.

2.3.2 Conceptual Design & Permitting

Once the master plan is complete, conceptual design and permitting efforts are conducted. Permitting is one of the most critical steps in any development project with the extent and number of permits dictated by the county or region involved. In the US, permitting is strongly dependent on the state in which the project occurs. For example, some states have their own NEPA-like programs (e.g., California (CEQA) and Massachusetts (MEPA),) wetlands programs, as well as special programs related

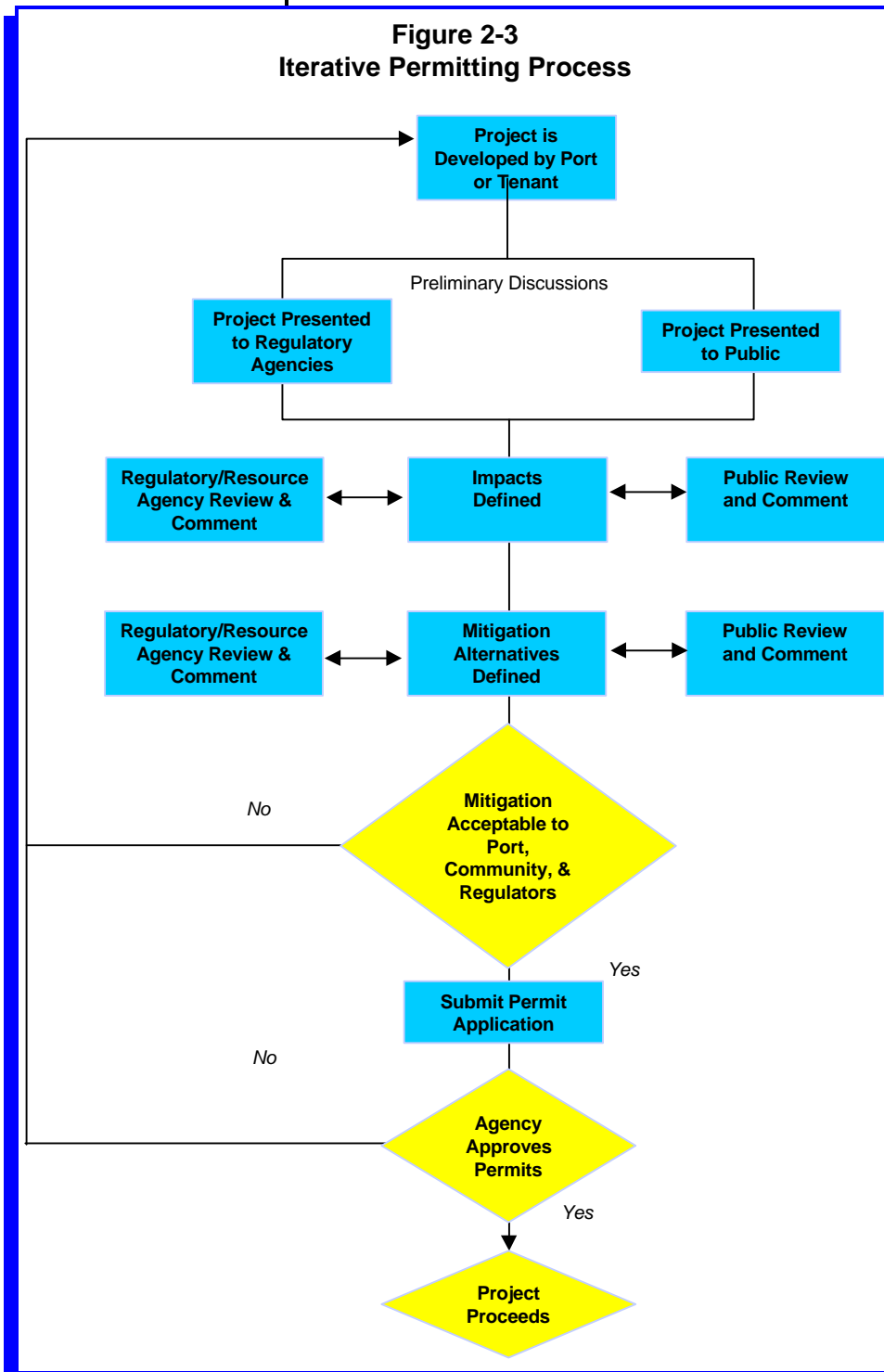
to construction in waterways of the state. In addition, Federal air, water and waste regulations are managed/enforced at the State level.

A typical permitting program, as shown in **Figure 2-3** is an iterative process involving extensive negotiations with local, state, and federal regulatory and resource agencies. There are an extensive number of factors that are weighed by the regulatory agencies during a review of impacts and potential mitigation alternatives, not the least of which are community concerns regarding the project. Many ports prefer to consult with regulatory agencies and the public while projects are still in the conceptual stages to identify potential environmental concerns before costly design plans have been completed. For example, because the permitting process often results in conditions placed on a project's design, the Port of Everett uses a five-step process involving:

- Step 1 - Project Definition
- Step 2 - Preliminary Engineering and Environmental Review
- Step 3 - Permits
- Step 4 - Final Design
- Step 5 - Construction.

In Step 2, a project is brought only to the 30 % complete stage and the Port gathers agency and public comments. In Step 3, permit applications are submitted, and approvals that include conditions on the design and received before final design is started in Step 4.

Figure 2-3
Iterative Permitting Process



When agency and public concerns are not well understood, community outreach and involvement programs become essential elements of the project. Section 5 presents a guide for development of community outreach programs and a series of case studies of successful efforts.

2.3.3 Preliminary and Final Design & Construction

Once a plan to minimize the impacts of a development project has been developed, the port/tenant should design the most cost-effective method to eliminate/reduce potential pathways. During the design, the port should also develop plans to minimize the impacts of construction activities — from demolition of existing facilities through construction of new ones. **Table 2-4** presents an overview of the basic development activities of concern and potential pathways and environmental impacts for each activity. Included in the table is a

subjective assessment of the types of impacts — short-term or long-term — to the four media and freshwater and marine biota. This assessment is strongly dependent on the location of the activity and the levels of controls used to protect the environment. However, for the most part, construction-related impacts tend to be more localized, acute in nature (i.e., they occur over a short period of time during construction) and dissipate rapidly at the completion of the project.

	Air Quality		Surface Water Quality		Soils/Sediment		Ground Water Quality		Fresh Water biota		Marine Biota	
	ST	LT	ST	LT	ST	LT	ST	LT	ST	LT	ST	LT
Building Demolition	H	L	H	L	L	L	L	L	M	L	M	L
Building Renovation	M	L	M	L	L	L	L	L	M	L	M	L
Bulkhead Installation	M	L	H	L	L	M	L	L	M	M	M	M
Contamination Remediation	M	L	H	L	L	L	L	L	M	L	M	L
Dredge Material Disposal	M	L	H	M	L	M	L	L	H	M	H	M
Dredging	M	L	M	L	L	M	L	L	H	M	H	M
Landfilling	M	L	M	L	L	L	L	L	M	L	M	L
New Building Construction	M	L	M	L	L	L	L	L	M	L	M	L
Pavement Installation	M	L	L	L	L	L	L	L	M	L	M	L
Pavement Removal	M	L	M	L	L	L	L	L	M	L	M	L
Pier Construction/Rehabilitation	M	L	M	L	L	M	L	L	M	L	M	L
Site Clearing	M	L	M	L	L	L	L	L	M	L	M	L
Utility Construction	M	L	M	L	L	L	L	L	M	L	M	L

¹ The type and magnitude of impact is dependent on the extent to which an activity occurs, its proximity to sensitive receptors, and the controls employed by the port or its tenants

² ST - Short Term; LT - Long-Term; L-Low impact; M - Moderate impact; H -High impact

2.4 Environmental Concerns for Port Operations

Port operations and activities, by their nature, have the potential to impact one or more environmental media. The port and its tenants should evaluate their operations, determine which pathways and media can be affected and develop plans to eliminate or minimize potential impacts. Environmental compliance audits are generally used to assess port and

Table 2-5
Potential Impacts from Operational Activities^{1, 2}

Activity	Air Quality		Surface Water Quality		Soils/Sediment		Ground Water Quality		Fresh Water Biota		Marine Biota	
	ST	LT	ST	LT	ST	LT	ST	LT	ST	LT	ST	LT
	Automobile Transport											
Off-Loading	H	M	M	L	L	L	L	L	M	L	M	L
Storage	M	L	M	L	L	L	L	L	M	L	M	L
Building Grounds Maintenance/												
	L	L	M	M	M	M	M	M	M	M	M	M
Cargo Handling												
Dry Bulk	H	M	H	L	M	L	L	L	M	M	M	M
Liquid Bulk	M	M	M	L	M	M	M	M	M	M	M	M
General Cargo	L	L	M	L	L	L	L	L	L	L	L	L
Containers	L	L	L	L	L	L	L	L	L	L	L	L
Break Bulk	M	L	M	L	L	L	L	L	M	M	M	M
Chemical Storage and Handling												
	M	M	M	L	M	L	M	L	M	L	M	L
Fueling												
On-Loading	H	M	M	L	M	L	M	L	M	M	M	M
Storage	M	M	M	L	M	M	M	M	L	L	L	L
Off-Loading	M	M	M	L	M	L	M	L	M	M	M	M
Painting												
Building	H	L	L	L	L	L	L	L	L	L	L	L
Anti-Fouling	H	L	M	L	L	L	L	L	M	M	M	M
Service Vehicles	H	L	L	L	L	L	L	L	L	L	L	L
Paint Stripping												
	H	L	M	L	L	L	L	L	M	L	M	L
Public Access & Recreation												
Cruise Lines	M	M	L	L	L	L	L	L	M	L	M	L
Fishing Piers	L	L	M	L	L	L	L	L	L	L	L	L
Moorings/Slips	L	L	M	M	L	L	L	L	M	L	M	L
Public Recreational Access	M	M	M	M	L	L	L	L	M	L	M	L
Rail Maintenance												
	L	L	M	L	M	L	L	L	M	L	M	L
Ship Liquid Discharges												
Ballast Water	L	L	H	L	L	L	L	L	M	M	M	M
Tank Cleaning	M	L	H	L	L	L	L	L	M	L	M	L
Bilge Water	L	L	H	L	L	L	L	L	M	L	M	L
Sewage	L	L	M	L	L	L	L	L	M	L	M	L
Solid Waste												
Ship-Generated	L	L	M	L	L	L	L	L	M	L	M	L
Shore-Generated	L	L	M	L	L	L	L	L	M	L	M	L
Vehicle and Equipment Maintenance												
	H	L	M	L	M	L	M	L	M	L	M	L
Vessel Repair and Maintenance												
	M	M	M	L	M	L	M	L	M	L	M	L
Ship Breaking												
	M	L	M	L	M	L	L	L	M	L	M	L
Ship Air Emissions												
	M	M	L	L	L	L	L	L	L	L	L	L

¹ The type and magnitude of impact is dependent on the extent to which an activity occurs, its proximity to sensitive receptors, and the controls employed by the port or its tenants

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tenant operations and determine which pathways require attention. An audit carefully examines the processes used at a facility, determines the actual or potential impact pathways, and identifies current control methods. From the audit, the port or its tenants can then select appropriate methods to manage the activity more effectively. The audit process is described in greater detail in Section 4.

Table 2-5 presents a summary of major port activities and a subjective assessment of potential impacts from each operation. As discussed previously, this assessment is dependent on:

- **Location.** For example, application of ship paints over land or in a drydock is likely to cause less impact than painting over water (assuming that materials falling in the dry dock are swept up and not discharged.)
- **Sensitivity of Species of Concern.** In areas where highly sensitive species exist, more severe, chronic, and/or acute impacts may occur as compared to an area where less sensitive species exist.
- **Physical Features.** Physical features such as breakwaters may reduce dilution/flushing rates and may cause greater impact, in localized areas, when compared to areas with higher flushing rates.

It should be noted that the impacts described in both Tables 2-4 and 2-5 are site- and project-specific and could vary substantially depending on the implementation process. In addition, the likelihood of impacts is substantially lower when appropriate environmental management techniques are implemented and maintained properly.

2.5 Regulatory Issues

In most countries, environmental rules and regulations are becoming more stringent and are reaching more broadly into private and public sectors. These environmental regulations generally define the potential risks of port operations and most related businesses. This document is intended to provide general environmental guidance to AAPA member ports, and it would be impossible to define the regulatory programs for each country, state, province, or region. Appendix A provides a guide to retrieving EPA's Section Notebook entitled Profile of the Water Transportation Industry that contains a brief overview of the federal regulatory programs specific to the United States. Readers should refer to their local, regional, state, or federal guidance for the specific interpretation of rules and regulations pertinent to each activity.