

US EPA ARCHIVE DOCUMENT

ENVIRONMENTAL ASPECT/IMPACT RANKING

Background and Exhibits

Module 5 provided a framework for identifying and determining the significance of environmental aspects. This Appendix D provides two additional sets of tools for determining significance of your facility's environmental aspects within the context of *Module 5* procedures. The first tool is based on a combination of environmental and business considerations. The second uses impact ranking and risk management tools. These tools can also be used for prioritizing your list of objectives for environmental performance improvement.

Alternative 1: Determining SEAs Using Environmental and Business Considerations

Exhibit D-1: Significance Determination for Aspects Based on Environmental and Business Considerations is offered here as a tool to guide an alternative significance determination process to that described in *Exhibit 5-5: Procedure for Environmental Aspects, Objectives and Targets, and Programs (EP-003)*. This alternative process would apply to all of those aspects that remain undecided after having applied the significance-determination test of being associated with relevant legal and other requirements or facility policy (i.e., Criterion 1 under Section 7.2.2, Procedure for Determination of Significant Environmental Aspects, in *Exhibit 5-5*). For each of those remaining undecided aspects, you would derive an environmental and business consideration significance score.

Specifically, you would assign a rating value between one, for least significant, to five for most significant, for nine different considerations:

- Four environmental considerations—scale, severity, probability, and duration; and
- Five business considerations—difficulty of changing impact; effect on public image/perception; outcome of change on activities, products, or services; concerns of interested parties; and cost of changing impact.

Either before or after scoring the aspects, you would establish a threshold score above which the aspects will be determined as significant. You would then add the aspects that receive scores greater than this number to the list of aspects associated with legal and other requirements or facility policy. The combination of these two lists becomes the complete set of your facility's SEAs.

You subsequently could refer to the scores of the SEAs, leaving behind those determined not to be significant, for setting environmental performance improvement objectives. For example you might decide to closely examine the top five SEAs as candidates for improvement or at least for a feasibility study aimed at improvement.

Exhibit D-1: Significance Determination for Aspects Based on Environmental and Business Considerations

Person Completing Form:

Area/Process:

Date:

Aspects Not Meeting Regulatory or Facility Policy Criteria	Potential Impacts	Level of Control	Environmental Significance (Scale of 1-5 per Definitions)					Business Significance (Scale of 1-5 per Definitions)					
			Scale	Severity	Probability	Duration	Average Score	Difficulty Changing Impact	Effect on Public Image	Outcome of Change on Process	Concerns of Interested Parties	Costs of Changing Impact	Average Score
INPUTS													
Product Input:													
Energy Usage:													
Water Usage:													
Supplies/Disposables:													
Chemicals:													
NON-PRODUCT OUTPUTS													
Point Source Air Emissions													
Fugitive Air Emissions													
Secondary Air Emissions													
Process Wastewater Discharge:													
Storm Water Discharge:													

Aspects Not Meeting Regulatory or Facility Policy Criteria	Potential Impacts	Level of Control	Environmental Significance (Scale of 1-5 per Definitions)					Business Significance (Scale of 1-5 per Definitions)					
			Scale	Severity	Probability	Duration	Average Score	Difficulty Changing Impact	Effect on Public Image	Outcome of Change on Process	Concerns of Interested Parties	Costs of Changing Impact	Average Score
		High, Medium, or Low											
Groundwater Discharge:													
Hazardous Wastes:													
Non-hazardous Wastes:													
Noise/Odor/Radiation/Traffic/Aesthetic/Land Use/Land Development/Habitats:													
Spillage and Other:													

Exhibit D-1: Significance Determination for Aspects Based on Environmental and Business Considerations (continued)

Definitions to be used in Rating Environmental and Business Considerations

	PARAMETER	RATING CATEGORIES				
		1	2	3	4	5
ENVIRONMENTAL CONSIDERATIONS	SCALE	insignificant volume/quantity	low volume/quantity	medium volume/quantity but sporadic	medium volume/quantity but ongoing	high volume/quantity
	SEVERITY	minimal impact	moderate impact but localized and readily containable	moderate impact over multiple locations	significant impact and/or regional	extreme impact and/or potential for global impact
	PROBABILITY	very unlikely under any operating condition	occurs during abnormal/emergency conditions/probability anticipated and managed	occurs during small-medium new projects or routine maintenance activities	occurs during major new projects or major maintenance activities	occurring during normal operating conditions and artifact of operations
	DURATION	spike situation extremely short-term duration within one day	less than one month	one-six months	less than one year	long-term duration greater than one year or continuous
BUSINESS CONSIDERATIONS	DIFFICULTY OF CHANGING IMPACT	easy to accomplish	minor level of effort required	moderate effort required	major effort required	impact cannot be changed only managed
	EFFECT ON PUBLIC IMAGE/ PERCEPTION	no effect	minor/local scrutiny	moderate public scrutiny manageable	intense local or regional scrutiny requiring more effort	extreme scrutiny : major facility profile impact
	OUTCOME OF CHANGE ON ACT/PROD/SVCS*	no effect	minimal effect	medium effect	large effect	extremely large effect
	CONCERNS OF INTERESTED PARTIES**	no concerns	minor interest at local level limited number of parties	moderate interest/manageable at local/prov. level; limited number of parties	major interest at federal level more widespread, > number of parties	extreme/major impact, e.g., financing/litigation
	COST OF CHANGING IMPACT	extreme: greater than \$5m	major process change: >\$500k but <\$5m	moderate process changes: <\$500k	minor process change: <\$25,000	procedural ~ less than \$1000

*ACT/PROD/SVCS: Activities/Products/Services

**Interested parties could include: employees; community; federal agencies; state agencies; local agencies; shareholders; and special interest groups.

Alternative 2: Determining SEAs Using Environmental Risk Information

Under Section 7.2.2, Procedure for Determination of Significant Environmental Aspects, in *Exhibit 5-5*, if an aspect has not been determined to be significant as a result of regulatory requirements and/or facility policy/goals, community concerns, or pollution prevention potential, then risks associated with environmental impacts (Criterion 4) should be considered. Under this alternative, you can apply your knowledge of chemical and material use at your facility to explore potential impacts to the environment under Criterion 4 and make a significance determination.

Introduction to Environmental Risk Concepts

Risk is composed of two parts: toxicity (or potential effects) and exposure. Toxicity is the ability of a chemical or material to cause harm to the health of humans, wildlife, or vegetation, as well as the type and seriousness of that effect. *Exhibit D-2: Toxicity and Effects Worksheet* will allow you to collect information needed to form a judgment about toxicity and effects for those aspects that have not been determined significant as a result of regulatory requirements and/or facility policy/goals, community concerns, or pollution prevention potential. You will assign a rank based on your judgment of the seriousness of the effects of this chemical or substance.

Exposure is the amount of material with which workers, the community, or the environment comes into contact. The amount is determined by both severity and time of contact. Severity refers to the amount of material that one can come into contact with at any one time. The time of contact depends on the number of times that contact occurs in a given period (the frequency of contact) and the duration of the contact. *Exhibit D-3: Worksheet for Exposure to Chemicals and Materials* will allow you to collect information needed to form a judgment about exposure.

Contact with humans and animal or plant life is characterized as occurring along “pathways.” These pathways describe the routes along which the substance must travel before it enters an animal or plant and how the living organism takes up the substance. Several pathways for human exposure include:

- Breathing the material (inhalation pathway);
- Touching the material (skin or dermal pathway); and
- Ingesting (eating or drinking) the material (oral pathway).

Exhibit D-2: Toxicity and Effects Worksheet

	Aspect*	Information Source	Regulatory Data				Human Health Effects by Pathways Acute and Chronic			Effects on Wildlife or Other Environmental Effects			Safety Concerns	Rank	
			Carcinogen?	OSHA Permissible Exposure Limit (PEL)?	Volatile Organic Compound (VOC)?	Toxic Release Inventory (TRI)?	Inhalation	Dermal	Ingestion	Air	Water	Land		Human	Environment

Contact Person: _____

Date Completed: _____

*For aspects not determined significant by other criteria.

Exhibit D-3: Worksheet for Exposure to Chemicals and Materials

Process	Aspect*	Quantity Used per Time Period	Exposure Time		Personal Protective Equipment (PPE)	Pathway		Rank Exposed Groups		
			Duration	Frequency		Human (inhalation, dermal, oral)	Environ- mental (air, water, land)	Workers	Community	Environ- ment

Contact Person: _____

Date Completed: _____

*For aspects not determined significant by other criteria.

Overview of Risk Ranking Symbols

One way to rank environmental impacts is to use symbols representing a range of high (H) to low (L). Whatever ranking you use (see *Exhibit D-4: Example of Ranking Symbols*), phrase the meaning consistently across all ranking categories. This is most straightforward if you think of “high” as meaning a project you would ultimately like to undertake and “low” as one having lesser priority. Thus, when considering environmental effects, a chemical receiving a “low” rank would be one with low impact or good environmental performance.

Exhibit D-4: Example of Ranking Symbols

Symbol	Meaning	EMS Meaning
H	High	Most environmental impact
Mi-H	Moderately High	More environmental impact
M	Moderate	Medium environmental impact
Mi-L	Moderately Low	Lower environmental impact
L	Low	Lowest environmental impact

Identifying and Ranking Potential Human Health and Environmental Effects

To rank the environmental impacts associated with chemicals and materials used in your business operations, you will need to find information on the human health and environmental effects associated with those chemicals. While there is no single, comprehensive source of information for most chemicals, information is widely available from a number of sources:

- Manufacturer’s Safety Data Sheets (MSDSs). As defined by the Occupational Safety & Health Administration (OSHA) (29 CFR 1910.1200), an MSDS is written or printed material concerning a hazardous material, which is supplied by the manufacturer. You should receive an MSDS with any chemicals you purchase. Keep these MSDSs in a location that is available for review. *Exhibit D-5: Information Required to be on an MSDS* lists the kinds of information that must be included on these data sheets.
- Your suppliers. Ask them for hazard and exposure information on any products you purchase. Ask them to supply the environmental information that is not on the MSDS.
- Your trade association.
- EPA or state environmental agency.
- Online sources in various Web sites. For example, EPA’s Design for the Environment (DfE) Program Web site contains a Risk Guide with additional information.

Exhibit D-5: Information Required to be on an MSDS

- The identity of the hazardous material (except as provided for materials that are trade secrets).
- The physical and chemical characteristics of the hazardous chemical (such as vapor pressure, flash point).
- The physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity.
- The health hazards of the hazardous chemical, including signs and symptoms of exposure and any medical conditions that are generally recognized as being aggravated by exposure to the chemical.
- The primary route(s) of entry.
- The OSHA PEL (Permissible Exposure Level), the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value, and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the MSDS, where available.
- Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Annual Report on Carcinogens (latest edition) or has been identified as a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions) or by OSHA.
- Any generally applicable precautions for safe handling and use that are known to the chemical manufacturer, importer, or employer preparing the MSDS, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for cleanup of spills and leaks.
- Any generally applicable control measures that are known to the chemical manufacturer, importer, or employer preparing the MSDS, such as appropriate engineering controls, work practices, or personal protective equipment.
- Emergency and first aid procedures.
- The date of preparation of the MSDS or the last change to it.
- The name, address, and telephone number of the chemical manufacturer, importer, employer, or other responsible party preparing or distributing the MSDS who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

Organize the information you have into a format that will enable you to make comparisons among aspects. You may find that sometimes there exists very little information for a particular chemical. That discovery in itself is useful. By using this format and showing where information gaps occur, you will know that whatever decision you make now about using a specific chemical may change if information becomes available at a later date.

Exhibits D-2: Toxicity and Effects Worksheet and ***D-3: Worksheet for Exposure to Chemicals and Materials*** will help you organize your information on the chemicals you use in your business activities. The column headings list the categories and specific information needed. The

final column asks for your judgment about the ranking of the environmental concerns associated with the chemical or material under consideration.

Considering Exposure in Ranking Significant Environmental Aspects

Now you will put the effects information together with the exposure information in completing *Exhibit D-6: Worksheet for Impact Ranking*.

- Chemical and Material Risk. In *Exhibit D-6: Worksheet for Impact Ranking*, Chemical and Material Risk has three subheadings: worker effects/exposure; community exposure; and environment effects/exposure. Place both the ranking for effects from *Exhibit D-2: Toxicity and Effects Worksheet* and the ranking for exposure from *Exhibit D-3: Worksheet for Exposure to Chemicals and Materials* in the appropriate columns. The *Exhibit D-2: Toxicity and Effects Worksheet* effects rank for humans would be placed in both the worker effects/exposure and community exposure subheadings in *Exhibit D-6: Worksheet for Impact Ranking*.
- Worker Safety. Look at the exposure and personal protective equipment (PPE) information in *Exhibit D-3: Worksheet for Exposure to Chemicals and Materials* under worker safety and apply a judgment of ranking. Enter this rank in the worker safety column of *Exhibit D-6: Worksheet for Impact Ranking*.
- Impact Ranking and Determination of Significance. Review the columns for the aspect and make a judgment as to whether it should be determined H, Hi-M, M, Mi-L, or L in rank. This can be done in two ways.
 - Look across the columns and assign a total that, in your judgment, best reflects the individual ranks in each column.
 - Assign a number from 1-5 to each rank such that H = 5 and L = 1. To get an average rank for a particular row, add the ranks across the columns and then divide by the number of columns. For example, if the total of the ranks were 20, and you have 6 individual effects and exposure rankings, then the average rank is 3.33. This corresponds approximately to a Mi-H ranking overall. Thus, place “Mi-H” in the total column and “Yes” (Y) in the significance column.

Integrating Impact Ranking into Significant Aspect Determination

If you choose to include impact ranking as part of your significant aspect determination procedure, then you can substitute *Exhibit D-7: Identification and Significance Determination of Environmental Aspects That Includes Impact Ranking* in place of Form EF-003.01, Identification and Significance Determination of Environmental Aspects provided in *Exhibit 5-6: Procedure for Environmental Aspects, Objectives and Targets, and Programs (EP-003)*.

Similar to what was suggested for Alternative 1: Determining SEAs Using Environmental and Business Considerations, you subsequently could refer to the scores of the SEAs derived from impact ranking, leaving behind those determined not to be significant, for setting environmental performance improvement objectives. For example you might decide to closely examine the top five SEAs as candidates for improvement or at least for a feasibility study aimed at improvement.

Exhibit D-6: Worksheet for Impact Ranking

Process	Aspect *	Chemical and Material Risk			Worker Safety	Impact Ranking	Significant? Y/N
		Worker Effects/ Exposure	Community Exposure	Environment Effects/ Exposure			

Contact Person: _____

Date Completed: _____

*For aspects not determined significant by other criteria.

Exhibit D-7: Identification and Significance Determination of Environmental Aspects That Includes Impact Ranking

Person Completing Form:

Area/Process:

Date:

ASPECT IDENTIFICATION		SIGNIFICANCE DETERMINATION				
Category/Aspect	Legal Requirements/ Voluntary Commitments, Company Policy	Community Concern	Pollution Prevention Potential	Impact Ranking	N or S	Rationale for Significance (S) or Non-significance (N)
INPUTS						
Product Input						
Energy Usage (e.g., electricity, gas, oil, diesel):						
Water Usage:						
Supplies/Disposables:						
Chemicals:						
NON-PRODUCT OUTPUTS						
Point Source Air Emissions:						
Acid Mist						
CO						
CO2						
Dust						
H2S						
Known Contamination						
NH3						
NOX						
Odiferous Compounds						
Other Nuisance Emissions						
Particulate Matter (PM10)						
PBT chemicals						
SO2						
SO3						
VOC						

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ASPECT IDENTIFICATION		SIGNIFICANCE DETERMINATION				
Category/Aspect	Legal Requirements/ Voluntary Commitments, Company Policy	Community Concern	Pollution Prevention Potential	Impact Ranking	N or S	Rationale for Significance (S) or Non-significance (N)
Water Vapor						
Other (Specify)						
Fugitive Air Emissions:						
Acid Mist						
CO						
CO2						
Dust						
H2S						
Known Contamination						
NH3						
NOX						
Odiferous Compounds						
Other Nuisance Emissions						
Particulate Matter (PM10)						
PBT chemicals						
SO2						
SO3						
VOC						
Water Vapor						
Other (Specify)						
Secondary Air Emissions:						
Ozone						
Sulfates						
Nitrates						
Particulate Matter (PM10)						
Other (Specify)						
Process Wastewater Discharge:						
Bio-Toxicity						
BOD						
COD						
Flow						
Known Contamination						
Metals						
Oil & Grease						

SPECIALTY-BATCH CHEMICAL MANUFACTURING INDUSTRY — EMS IMPLEMENTATION GUIDE

ASPECT IDENTIFICATION		SIGNIFICANCE DETERMINATION				
Category/Aspect	Legal Requirements/ Voluntary Commitments, Company Policy	Community Concern	Pollution Prevention Potential	Impact Ranking	N or S	Rationale for Significance (S) or Non-significance (N)
Other Nuisance Compounds						
P & N2						
PBT Chemicals						
Pesticides						
pH						
Priority Pollutants						
TOC						
Total Suspended Solids						
NH3						
Other (Specify)						
Storm Water Discharge:						
Bio-Toxicity						
BOD						
COD						
Flow						
Known Contamination						
Metals						
Oil & Grease						
Other Nuisance Compounds						
P & N2						
PBT Chemicals						
Pesticides						
pH						
Priority Pollutants						
TOC						
Total Suspended Solids						
NH3						
Other (Specify)						
Discharge to Groundwater:						
See Process Wastewater Discharge for examples						
Hazardous Wastes:						
Asbestos						
Bleach						
Catalyst						

SPECIALTY-BATCH CHEMICAL MANUFACTURING INDUSTRY — EMS IMPLEMENTATION GUIDE

ASPECT IDENTIFICATION		SIGNIFICANCE DETERMINATION				
Category/Aspect	Legal Requirements/ Voluntary Commitments, Company Policy	Community Concern	Pollution Prevention Potential	Impact Ranking	N or S	Rationale for Significance (S) or Non-significance (N)
Caustic Soda						
Characteristic Waste						
Construction Debris						
Filtrate						
Inorganic Compounds (e.g., WWT Solids, Ash)						
Lab Waste						
Metals						
Off-Spec product						
Organic Compounds (Used Solvents)						
Contaminated PPE						
PBT Chemicals						
Plant Trash						
Product Shelf Life						
Sulfur						
Sulfuric Acid						
Tank Sludge						
Tower Packing/Acid Brick						
Used Oil						
Other (Specify)						
Non-hazardous Wastes:						
See Hazardous Waste for examples						
Noise/Odor/Radiation/Traffic/Aesthetic/Land Use/Land Development/Habitats:						
Image Presentation						
Machine Operations						
Siting Restrictions						
Truck/Railcars						
Urban vs Rural						
Use Sensitivity						
Wastewater Treatment/Landfills						
Other (Specify)						
Spillage and Other:						

Examples

The following example shows you how to use environmental risk information (i.e., Alternative 2) to rank impacts of your environmental aspects. This is a hypothetical example that pertains to new construction indoor painting.

Assume that a number of aspects have already been determined to be significant, because they were the subject of regulatory requirements and/or facility policy/goals, were significant community concerns, and had high pollution prevention potential. However, at least one of the aspects, “Non-abated emissions of VOCs and HAPs from overspray (solvents and dry paint particles) and equipment cleaning solvents” did not meet these criteria. Therefore, you decided to do an environmental impact ranking to determine significance.

Examples of assessments of exposure, effects, and worker safety risks associated with “Non-abated emissions of VOCs and HAPs from overspray (solvents and dry paint particles) and equipment cleaning solvents” are provided in *Example D-1: Toxicity and Effects Worksheet–VOC and HAP Particle Emission* and *Example D-2: Worksheet for Exposure to Chemicals and Materials–VOC and HAP Particle Emissions*, which mirror *Exhibit D-2: Toxicity and Effects Worksheet* and *Exhibit D-3: Worksheet for Exposure to Chemicals and Materials*. The decisions that were made using these worksheets were then transferred to *Example D-3: Worksheet for Impact Ranking–VOC and HAP Particle Emissions*, which mirrors *Exhibit D-6: Worksheet for Impact Ranking*.

How to Obtain Overall Rank

Overall rank can be obtained in the following two ways:

- Look across the columns and assign a total that in your judgment best reflects the individual ranks in each column; or
- Assign a number from 1-5 to each rank such that H = 5 and L = 1. Sum these across the columns and then divide by the number of columns used to get an average rank for that row. For VOC and HAP non-abated emissions the total would be 20. Divide by 6 (the number of individual ranks). The average rank would be 3.33, which corresponds with Mi-H. Place “Mi-H” in the total column.

Meaning of Rank

The total for ranking the environmental impact of non-abated VOC and HAPs emissions was Mi-H and therefore should be considered significant. This would mean that this aspect would then become the focus of an improvement objective and an associated target. Consequently an environmental management program (EMP) describing who would be doing what, and by when, to achieve the target would also be drafted and monitored for progress.

Example D-1: Toxicity and Effects Worksheet — VOC and HAP Particle Emission

Process	Aspect	Information Source	Regulatory Data				Human Health Effects by Pathways Acute and Chronic			Effects on Wildlife or Other Environmental Effects			Safety Concerns	Rank	
			Carcinogen?	OSHA Permissible Exposure Limit (PEL)?	Volatile Organic Compound (VOC)?	Toxic Release Inventory (TRI)?	Inhalation	Dermal	Ingestion	Air	Water	Land		Human	Environment
Pressurized Reactor Operation	Non-abated emissions of VOCs and HAP particles)	MS DS	No	100 ppm	Yes	Yes	Acute and chronic	Acute	Low toxicity	Ozone degradation	NA	NA	Flammable	H	L

Contact Person: _____

Date Completed: _____

Example D-2: Worksheet for Exposure to Chemicals and Materials—VOC and HAP Particle Emissions

Process	Aspect	Quantity Used per Time Period	Exposure Time		Personal Protective Equipment (PPE)	Pathway		Rank Exposed Groups		
			Duration	Frequency		Human (inhalation, dermal, oral)	Environ- mental (air, water, land)	Workers	Community	Environ- ment
Pressurized Reactor Operation	Non- abated emissions of VOCs and HAP particles)	50 ppm	Entire shift	Continuous	Respirator	Inhalation, dermal	Air	H w/o PPE	L	M-L

Contact Person: _____

Date Completed: _____

Example D-3: Worksheet for Impact Ranking—VOC and HAP Particle Emissions

Process	Aspect *	Chemical and Material Risk			Worker Safety	Impact Ranking	Significant? Y/N
		Worker Effects/ Exposure	Community Exposure	Environment Effects/Exposure			
Pressurized Reactor Operation	Non-abated emissions of VOCs and HAP particles)	H/H	L	M/M	M	Mi-H	Yes

Contact Person: _____

Date Completed: _____

Ranking Notes:

Safety might include reference to a flammable chemical, hence the rank of M.

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