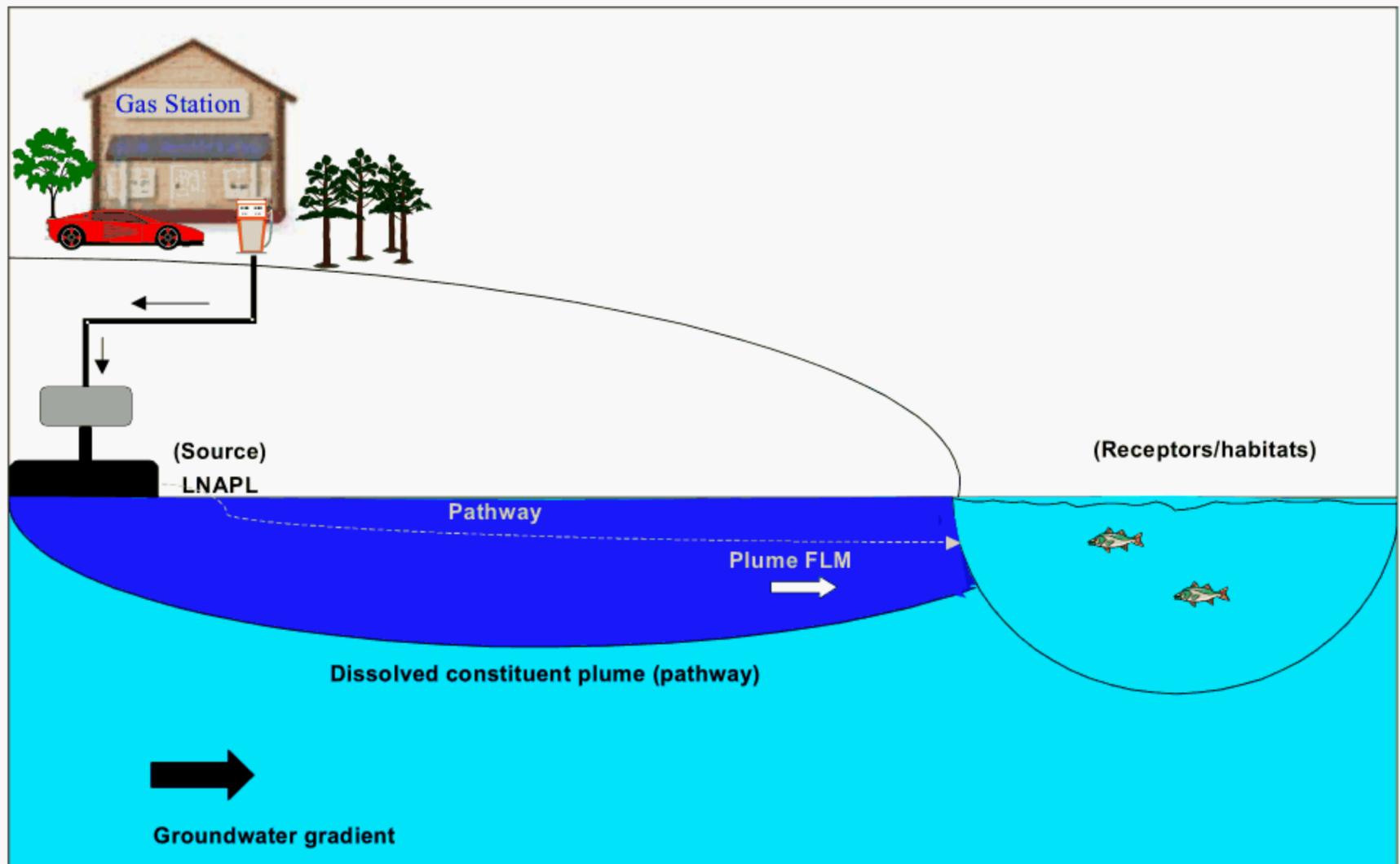


PRIMER FOR EVALUATING ECOLOGICAL RISK AT PETROLEUM RELEASE SITES

API Publication 4700



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PREFACE

To assist site or facility managers, this primer provides brief, simplified guidance for “screening” petroleum release sites for ecological risk to local plants, animals, and/or natural habitats. This project was undertaken to provide an elementary companion to the human health component of the *Decision Support System for Exposure and Risk Assessment* (DSS software program, API, 1999). The DSS model estimates site-specific human health risks, assists in determining the need for site remediation, and evaluates the uncertainties of model input parameters.

This document focuses on “downstream” facilities (refining and marketing, including retail gas stations) and on petroleum products (versus crude oil), although the concepts in this primer could be modified and usefully applied to other petroleum industry sites. In this primer, the goal of the screening process presented is a documented determination of the likelihood of adverse ecological effects. A low probability of adverse effects indicates that no further ecological assessment is warranted; whereas a high probability of adverse effects—or analytical uncertainty—indicates that more detailed analyses may be appropriate.

Every effort has been made to focus on a few critical ecological risk assessment elements, use existing information/data, and simplify instructions for a preliminary evaluation of ecological risk. When relevant information is unavailable, or when the site investigator is uncertain in an evaluation, an expert should be consulted. Internal company environmental staff, or subject-area consultants with relevant experience, should be able to complete and document the evaluation process presented in this primer in less than one work week, even for complicated sites with documented soil/groundwater impacts. For sites where impacts are localized and limited to surface/subsurface soils, the analysis should require less than one work week.

This document does not address petroleum “spills” that may require immediate, emergency response activities.

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This document is intended to facilitate the decision-making process. Under no circumstances does this guidance contradict the spill reporting and response requirements under various Federal and state statutes and regulations. The user should consult with the appropriate regulatory agency and follow regulatory requirements.

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INTRODUCTION

Evaluating ecological risk is increasingly important when making environmental risk management decisions.

The purpose of this document is to help site or facility managers acting as site investigators decide how and to what degree they should address ecological risks that may result from a petroleum products release. This primer focuses on “downstream” operations related to the transportation, distribution, and marketing of petroleum products. Evaluation of ecological risk is becoming an increasingly important input when making environmental risk management decisions. Human health risk, cost, availability and effectiveness of remedial technology, and stakeholder concerns (e.g., property owners, property users, and local community members) are examples of other elements that must be considered. To assist in evaluating ecological risk at petroleum release sites, this primer:

- Briefly describes the ecological risk assessment process
- Provides guidance on a tiered process’s initial steps—preliminary evaluation—that identify the nature and extent of ecological risk at a release site.

Spills or hydrocarbon releases may occur during downstream operations, as shown in **Table 1**.

**TABLE 1.
SOME POTENTIAL DOWNSTREAM SOURCES OF PETROLEUM RELEASES.**

CATEGORY	SOURCES
Transportation	Pipelines (pressure, products) Pump stations ASTs USTs Road/rail transport
Refining (retail/marketing)	Pipelines Tank farms Terminals Bulk/distribution plants Distribution pipelines ASTs (aboveground storage tanks) USTs (underground storage tanks)

This primer complements the DSS software program.

Under no circumstances does this guidance contradict the spill reporting and response requirements under various Federal and state statutes and regulations.

Various regulatory and voluntary industry programs govern the assessment and remediation of petroleum releases from these downstream operations. Increasingly, these programs use risk-based approaches for guiding actions associated with spills or petroleum product releases. The American Petroleum Institute's (API's) *Decision Support System for Exposure and Risk Assessment* (DSS software program, API, 1999) is an example of a risk-based approach that was developed with human health concerns in mind. The DSS software program estimates site-specific risks to human health, identifies the need for site remediation, develops site-specific cleanup levels for subsurface soil and groundwater, and evaluates the uncertainty associated with human health risk estimates.

Protecting human health, however, will not necessarily protect ecosystems sufficiently. Providing the initial steps to evaluate ecological risk, this primer complements the DSS software program by explaining:

- How to identify conditions that may require attention to mitigate imminent ecological risk
- How to decide if tiered ecological risk assessment is necessary at a petroleum release site
- How to use preliminary evaluation results to develop a site conceptual model that can guide further tiered assessment.

While the primer is intended for site or facility managers acting as site investigators, experts in risk assessment and environmental monitoring may be needed if more thorough or sophisticated analyses are indicated. Internal company environmental staff, or consultants with relevant experience, should be consulted when making decisions at petroleum release sites.

WHAT IS ECOLOGICAL RISK ASSESSMENT?

Ecological risk assessment is an analytical tool for determining the likelihood of adverse environmental effects resulting from human activities.

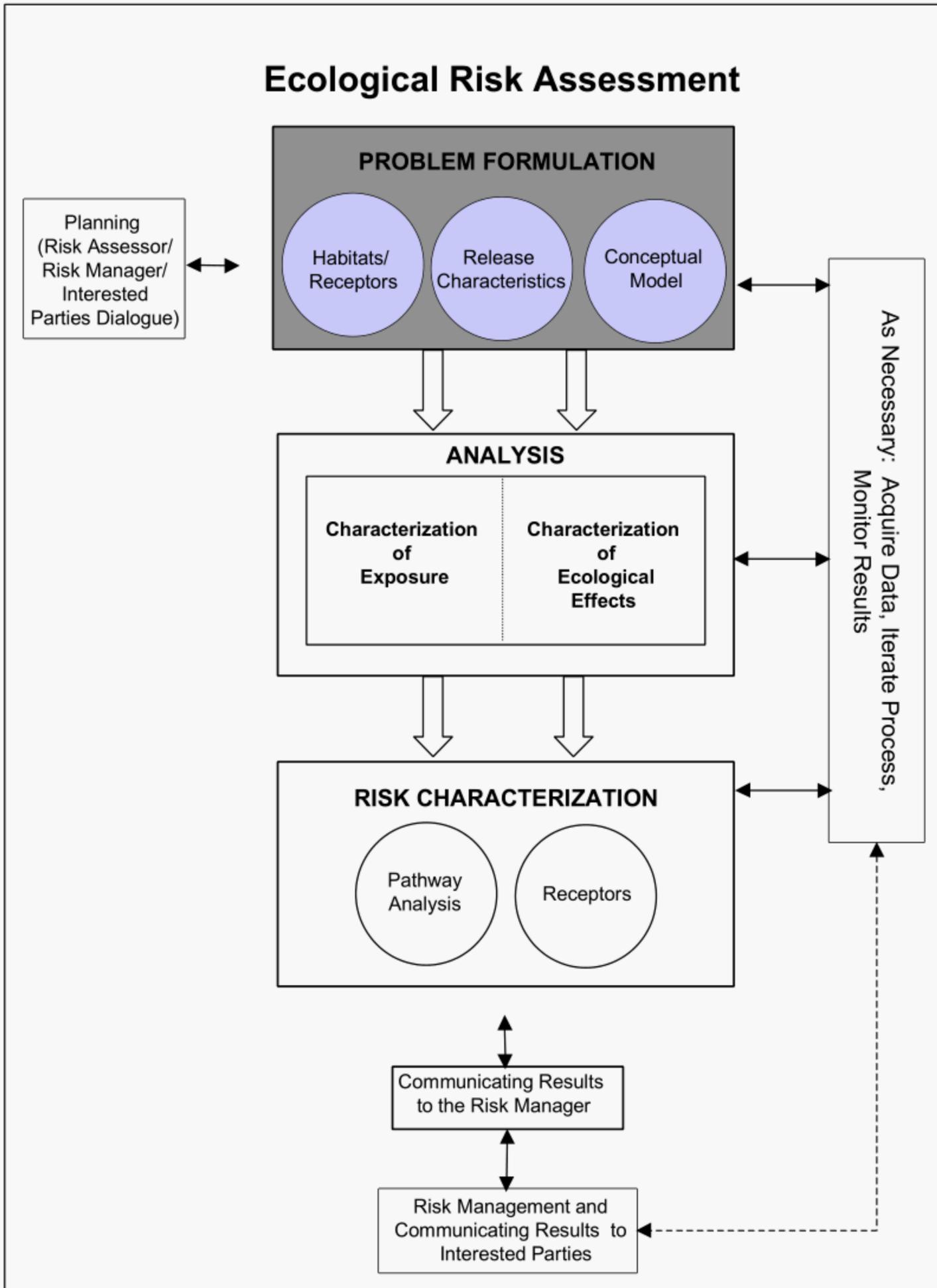
As defined by the U.S. Environmental Protection Agency (EPA, 1998), ecological risk assessment is a systematic “process for organizing and analyzing data, information, assumptions, and uncertainties to evaluate the likelihood of adverse ecological effects” to ecological receptors. Ecological risks associated with petroleum or petroleum product releases may occur:

- When relevant ecological receptors are in the vicinity of the release
- When these receptors have potential exposure to the released products or their constituents
- When potentially harmful effects are associated with the released products or their constituents.

Ecological risk assessment is used to assess the likelihood of adverse effects on the environment and to facilitate environmental risk management decision making.

The EPA has designed a general framework for conducting ecological risk assessment. An adaptation of this framework is illustrated in **Figure 1**. Many Federal, state, and industry-based groups have adopted this framework as a starting point for addressing ecological risk. This primer is consistent with the EPA ecological risk assessment framework, but is written specifically for the assessment of downstream petroleum release sites. With respect to **Figure 1**, this primer provides guidance related to “problem formulation” for site investigators to decide whether a potential problem exists.

**FIGURE 1.
THE FRAMEWORK FOR ECOLOGICAL RISK ASSESSMENT.**



The shading in the figure represents this primer's focus—guidance related to problem formulation—in relation to the framework for ecological risk assessment. Modified from EPA (1992).

WHAT ARE RELEVANT ECOLOGICAL RECEPTORS AND HABITATS?

Identifying relevant receptors and habitats is integral to ecological risk assessment.

Guided by the American Society for Testing and Materials definition of relevant receptors and habitats (ASTM, 2000), this primer defines relevant ecological receptors and habitats as ecological resources requiring protection. At a site, identifying relevant resources from all resources is difficult, but integral to the problem formulation phase of the ecological risk assessment framework. Some relevant ecological resources include communities with threatened or endangered species, recreationally or commercially important species, regionally or nationally rare habitats, or habitats with high-aesthetic quality or special protection afforded by law or regulation.

This definition is consistent with guidance provided by the EPA (1997) and many states. For example, guidance on what is important to protect—which may be difficult to determine because of varying viewpoints—can be found in various Federal and state regulations governing ecological resources. The EPA (1997) states that the process of selecting what to protect often includes ecological resources that are:

- Protected by law
- Critical resources
- Key components of the ecological system.

The EPA notes that identifying valued ecological resources is central to ecological risk assessment.

Various state resource management and environmental regulatory documents provide guidance on which receptors commonly are considered valued ecological entities, and often list receptors and habitats that are to be protected by environmental regulations. Protected receptors usually include:

- Rare, threatened, or endangered species
- Ecologically important species
- Recreationally or commercially important species.

Protected habitats usually include:

- Wetlands
- Aquatic habitats, such as streams, rivers, lakes, and estuaries
- Forests and other ecologically important terrestrial habitats
- Habitats designated as sensitive or of special interest.

Certain site-specific receptors and habitats typically are not included in an ecological risk assessment.

Based on guidelines being developed by the EPA and some states, certain receptors and habitats typically are not included in an ecological risk assessment. Some receptors include animals that may inhabit urban or industrial areas (e.g., rats and pigeons), domestic animals, and livestock. It is possible, however, that such species might be included in a food chain evaluation of human health impact, where relevant.

Areas committed to industrial or commercial use generally are not considered valuable resources for ecological risk assessment. For example, the following areas usually are not considered:

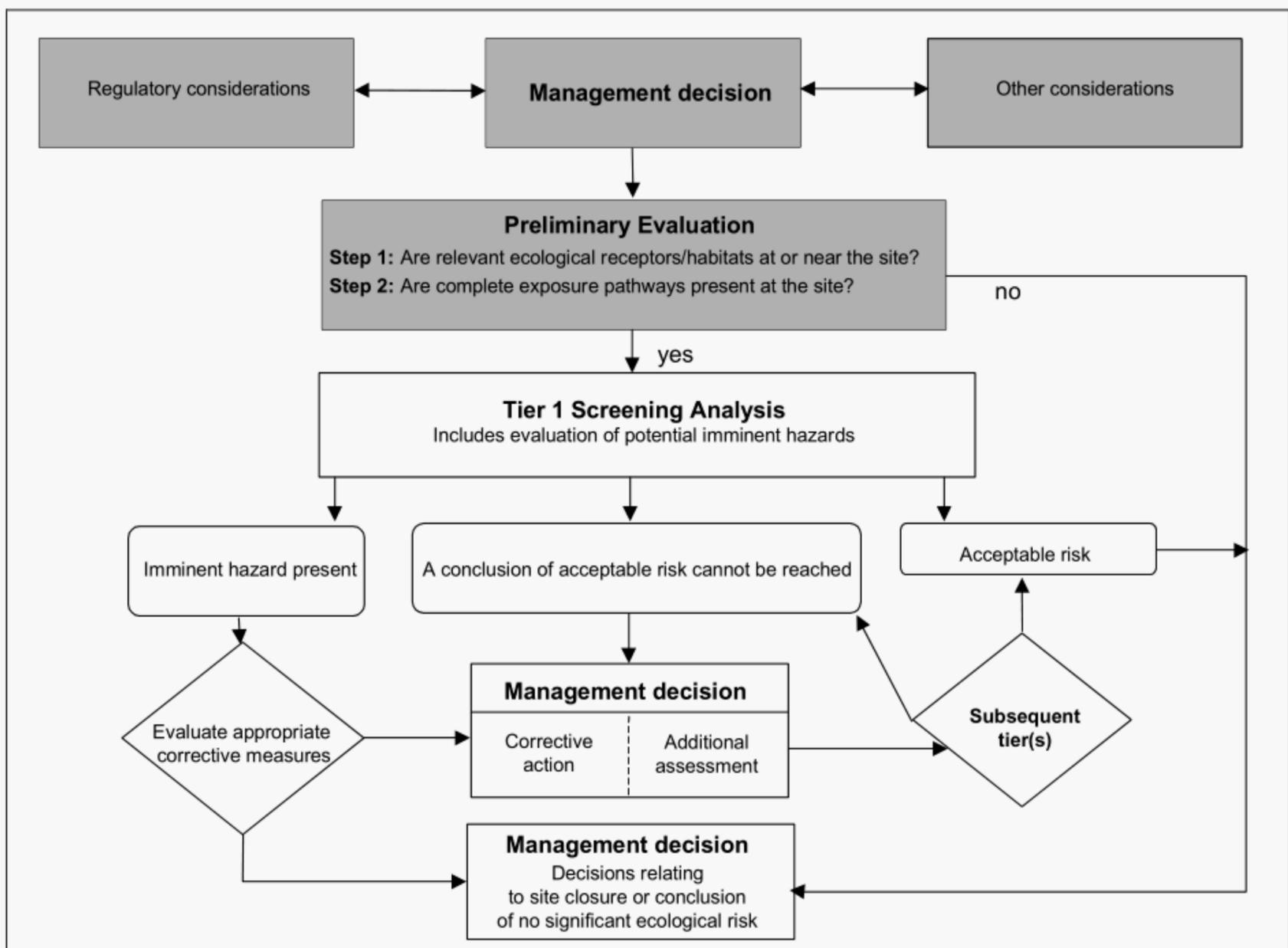
- Paved areas (e.g., parking lots, roads, storage areas)
- Areas in active industrial or commercial use
- Median strips and other small isolated areas (which may be vegetated)
- Sumps and other water collection systems used for industrial purposes.

HOW DO I EVALUATE ECOLOGICAL RISK?

Many Federal, state, and industry-related agencies emphasize a tiered approach to ecological risk assessment.

A tiered approach for ecological risk assessment is presented in **Figure 2** and is consistent with the process described in the ASTM Risk-Based Corrective Action process (ASTM, 2000). This primer describes the initial steps to this tiered approach—a preliminary evaluation. Several state regulatory agencies (California, Massachusetts, Pennsylvania, Texas, and Washington) have adopted some tiered approach form, which has the flexibility to assess risk at various detail levels. In some cases, a simple preliminary evaluation suffices, while other cases warrant more-detailed ecological risk assessment.

FIGURE 2.
TIERED ECOLOGICAL ASSESSMENT PROCESS.



The figure's shading represents this primer's focus—the preliminary evaluation and the steps preceding it.

The tiered approach allows the site investigator to focus only on those chemicals and pathways that potentially pose risk to relevant ecological receptors and habitats. Chemicals and/or pathways that do not pose a substantial risk are eliminated early from consideration. Likewise, if it is apparent that significant ecological impacts already are occurring or likely to occur at the petroleum release site, then the site or facility manager can consider appropriate initial response actions.

HOW DO I BEGIN THE ECOLOGICAL RISK ASSESSMENT PROCESS?

The first step in evaluating ecological risk is identifying applicable regulatory considerations.

The first step in evaluating ecological risk is to locate applicable Federal, state, or local guidance and regulations (“regulatory considerations” in **Figure 2**). Some spill or release conditions may be covered by existing regulations, and this primer’s users should be aware of how these regulatory considerations apply to specific situations. This primer is based, in part, on a review of guidance developed by several states; however, in some cases, this primer may conflict with state or Federal guidance. Site investigators should consider consulting with relevant regulatory agencies to determine appropriate action. The recommended reading/sources of information section at the end of this primer lists Federal resources that can be used to research regulations and ecological risk approaches that apply at a specific site.

Several factors that may affect an ecological risk assessment must be considered at a petroleum release site.

At a petroleum release site, the site investigator typically considers several factors that may affect an ecological risk assessment. These factors also may be used to determine the need for and appropriateness of various remedial technologies. Factors to be considered include the assessment of human health risk, cost, benefits and risks of remediation, availability of remedial technology, stakeholders’ interests, local concerns, and possibly political issues.

The site investigator judges whether a preliminary evaluation is warranted after considering the following:

- Performance criteria—developed by regulatory agencies to explicitly protect relevant ecological receptors and habitats—may stipulate site closure, obviating the need for an ecological risk assessment.
- A risk management decision to remediate a site below ecological risk threshold levels is made immediately, with no further ecological assessment warranted.
- Further investigation of site conditions is warranted because the site is not covered by performance criteria, the extent of contamination is not known, and/or the released material has potential to reach relevant ecological receptors and habitats.

HOW DO I CONDUCT A PRELIMINARY EVALUATION?

The preliminary evaluation helps the site investigator:

- Identify conditions that may warrant an initial or immediate response action
- Decide whether ecological risks must be evaluated or addressed at the petroleum release site
- Identify relevant ecological receptors and habitats, chemicals of concern, media of concern, and pathways of concern—which will guide subsequent assessment tiers, if necessary.

The preliminary evaluation (“preliminary evaluation” and “tier 1 screening analysis” in **Figure 2**) evaluates the presence of two primary conditions:

- Relevant ecological receptors and habitats at or near the site
- Potentially complete exposure pathways for chemicals of concern.

The preliminary evaluation determines if the following are present: relevant ecological receptors and habitats, and potentially complete exposure pathways.

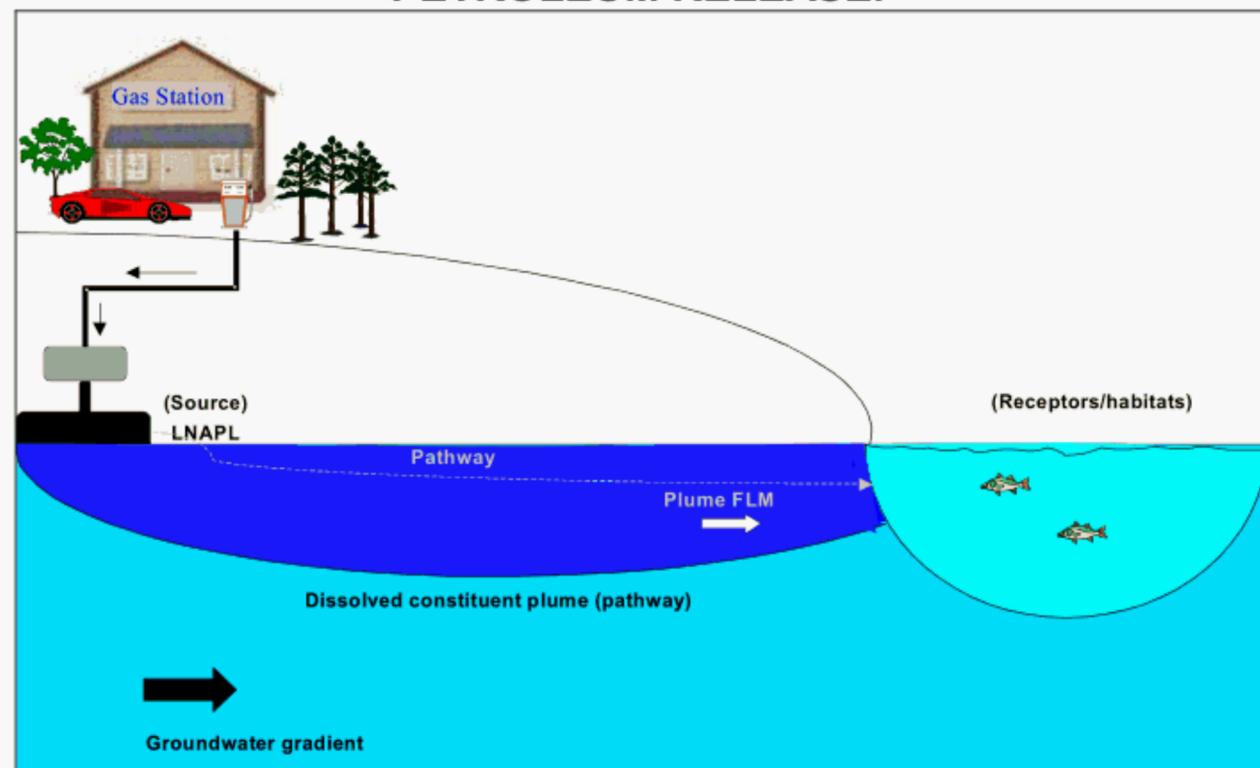
A complete exposure pathway usually consists of a chemical source and migration pathway by which the chemical constituent may reach a receptor or habitat. *Both* conditions must exist now or potentially exist in the future for an ecological risk to be present. Otherwise, the site investigator should conclude that there is no ecological exposure and, therefore, no ecological risk. If such a conclusion can be documented, no further ecological assessment is warranted (see **Figure 2**).

Conceptual models visually depict the relationships among sources, pathways, and receptors/habitats at a petroleum release site.

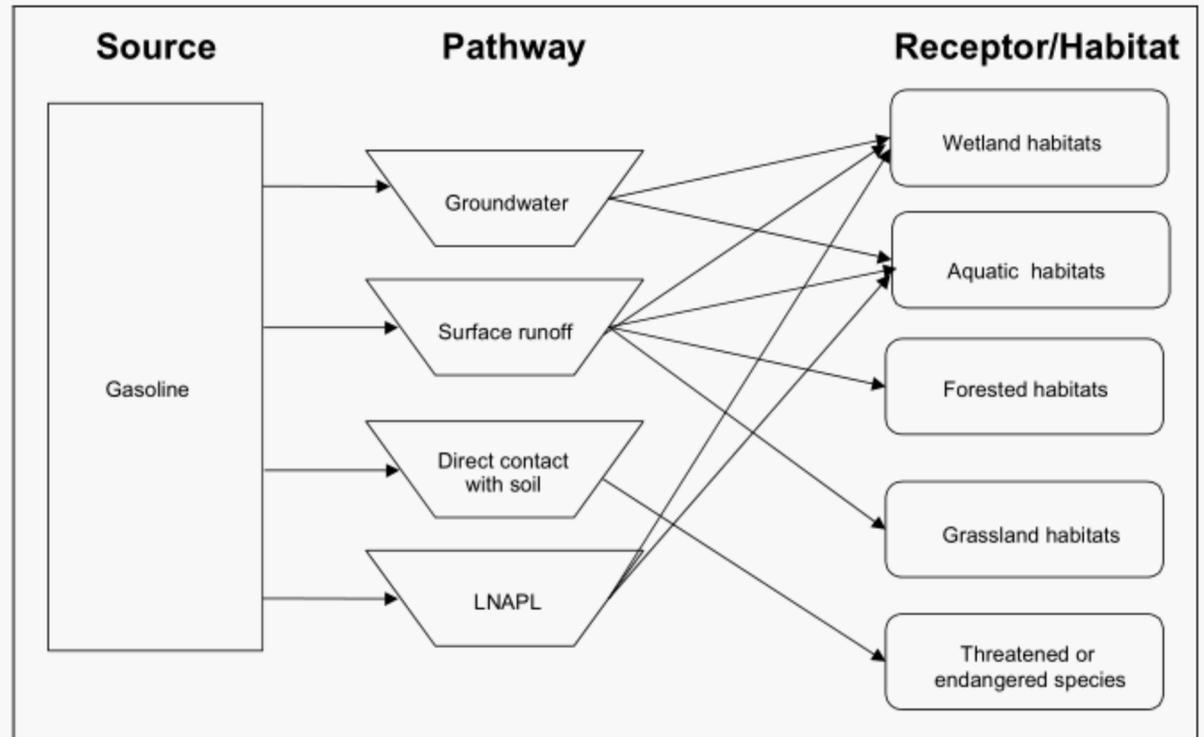
It is helpful to view the two primary conditions previously described as parts of a site conceptual model. Conceptual models are visual depictions of the relationships among chemical sources, exposure pathways, and receptors/habitats at a petroleum release site. These models may be simple or complex, depending on the possible relationships being conveyed. The most useful conceptual models are either drawings that show where released material might move through environmental media (**Figure 3**) or box diagrams (**Figures 4 and 5**). These models communicate information on predominant transport mechanisms and pathways, and also are useful to indicate the presence of complete pathways.

Figure 3 shows a pathway relationship between the source and the receptors. This is a subsurface petroleum release into a marine environment. The source is a gas station and the pollutant is gasoline and light oil (light non-aqueous phase liquid—LNAPL). The figure shows how LNAPL saturates the ground, creating a dissolved constituent plume. This plume then finds a pathway and leaches into the water/marine environment. Living in this environment are the receptors/habitats such as fish and bottom-dwelling animals. **Figures 4 and 5** depict a pathway relationship using boxes. The model in **Figure 3** aids in understanding the problem while **Figures 4 and 5** aid in analyzing and evaluating the problem.

FIGURE 3.
SITE CONCEPTUAL MODEL—DRAWING OF A SUBSURFACE PETROLEUM RELEASE.

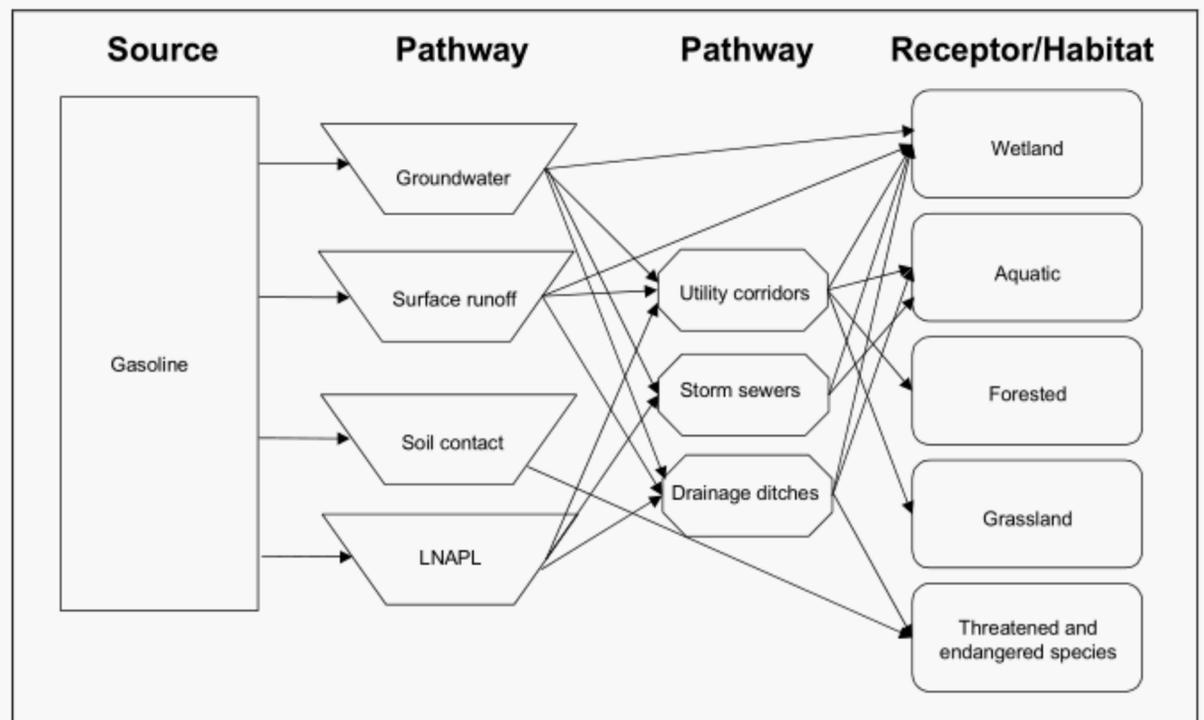


**FIGURE 4.
SITE CONCEPTUAL MODEL—BOX DIAGRAM OF A SUBSURFACE
GASOLINE
RELEASE IN A RURAL AREA.**



Exposure to ecological receptors may occur via groundwater transport or surface runoff from contaminated soils into natural habitats. (LNAPL=light non-aqueous phase liquid)

**FIGURE 5.
SITE CONCEPTUAL MODEL—BOX DIAGRAM OF A SUBSURFACE
GASOLINE
RELEASE IN AN URBAN/SUBURBAN AREA.**



Potential pathways and pathway modifications imposed by man-made structures and conveyances.

Physical characterizations of and chemical concentrations in environmental media also can be used to determine if pathways are potentially complete. When using physicochemical site data, the site investigator must consider the chemical's or product's potential mobility at the site. Pathways that appear incomplete under prevailing conditions may be complete in the future if the phase-separated product or dissolved constituent migrates.

The type of site may influence the scale of the release and the nature of exposure.

When conducting a preliminary evaluation, it is important to consider the scale of the release and the nature of exposure at the site. Two examples of site release scenarios are presented below:

1. Petroleum product release volume at service stations often is small to medium, with direct impact on soil and groundwater (LNAPL) limited to the site boundaries. Some potential release scenarios include tank overfilling, tank failure, pipeway failure, and customer driveoff (pump damage). Petroleum products and/or dissolved constituent (e.g., BTEX) plumes, however, may migrate beyond site boundaries.
2. At distribution facilities (e.g., terminals, bulk plants), release volumes may range from small to large, with a somewhat greater potential for offsite impact for large releases. Possible exposure pathways range from overland flow of petroleum-containing stormwater to LNAPL migration and/or dissolved constituent plumes to surface waters.

The size or scale of a release influences assessment needs and decision making at the petroleum release site. For example, a larger release may require more assessment resources and perhaps more complex site management considerations. The release magnitude, therefore, may be more important than the facility type at which a petroleum release has occurred.

Step 1 of the Preliminary Evaluation: Are Relevant Ecological Receptors and Habitats at or Near the Site?

Site investigators may use checklists, identifying relevant ecological receptors and habitats that are appropriate for a particular state or region. Federal, state, and local agencies routinely identify the ecosystems requiring protection. During the higher tiers (later stages) of an ecological risk assessment, detailed information about these ecosystems may be required. For a preliminary evaluation, though, a shorter list of ecosystem types provides a more manageable starting point for an evaluation of potential ecological risks.

Fewer relevant ecological receptors and habitats will be identified for the preliminary evaluation than for the higher tiers of an ecological risk assessment.

Figure 6 is a sample checklist of receptor groups and habitat types that can identify prevalent ecological receptors or habitats (if any) at or near a petroleum release site. This list includes the most common categories of receptors and habitats but could be modified to be more state- or region-specific. If sufficient information is available and the boxes in the sample (or modified) checklist are all checked *No*, then relevant ecological receptors/habitats are not considered present, and no further ecological assessment is warranted. The results should be documented in the company's site investigation report. If any of the boxes are checked *Yes* or *Uncertain*, then a Step 2 "pathway analysis" is performed for each checked receptor or habitat.

**FIGURE 6.
CHECKLIST FOR POTENTIAL RECEPTORS AND HABITATS:
STEP 1 OF THE PRELIMINARY EVALUATION.**

	YES	NO	UNCERTAIN
Are freshwater or marine wetlands present ¹ (e.g., marshes, swamps, bogs, tidal flats)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are aquatic habitats present ¹ (e.g., lakes, ponds, rivers, streams, creeks)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are forested habitats present ² ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are grassland habitats present ² ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are there one or more sensitive environments, such as critical habitat for endangered or threatened species, a national or state wildlife refuge present?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are there on-site habitats, such as pooled water, impoundments or lagoons, which could attract wildlife species to the site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are there federal or state rare, threatened, or endangered species present?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

¹At or within approximately ¼ mile.
²At or within approximately 500 feet.

If one or more questions are answered YES or UNCERTAIN, proceed to Step 2 of the Preliminary Evaluation (pathway evaluation).

If all questions are answered NO, exit the ecological assessment process.

Note: This checklist is included with this document, printed on stock suitable for lamination.

The site investigator determines how “at or near” a petroleum release site is using a state- or region-specific definition.

“At” means the release site is coincident with the receptors’ habitat. “Near” is defined in various ways; some states have specified distances, while others define proximity based on site, chemical, and transport characteristics. Experience from within the petroleum industry with groundwater plumes and surface runoff of releases indicates that the following distances generally will be adequate for a preliminary evaluation:

<u>Situation</u>	<u>Distances</u>
Releases of petroleum products to groundwater	1,300 feet (~1/4 mile) from surface water or wetlands
Releases of petroleum products to surface soils	500 feet from receptors or habitats

These distances should be modified in some cases. For example, if the released material enters a storm drain or surface conduit, the material may flow in a concentrated form to locations beyond the above-specified distances. In such cases, the site investigator should consider the receptors' or habitats' proximity to the discharge locations of surface or subsurface drainage systems. Also, dissolved constituent plumes in groundwater may exceed 1/4 mile where aquifer permeability and hydraulic gradients are high. Site aquifer and groundwater quality data will be needed to identify such locations.

The absence or presence of relevant ecological receptors and habitats may be obvious. If the petroleum release site is located adjacent to a recreational lake, then the site is located near relevant receptors and habitats. If, on the other hand, the site is located in an urban area surrounded by concrete or asphalt and is at distance from a waterway, then it most likely is *not* located near relevant receptors and habitats.

Relevant ecological receptors and habitats may be identified using direct observations, or additional research may be necessary.

The site investigator may be unsure of the surrounding environment or unfamiliar with environmental resource designations. In such cases, the site investigator should obtain a U.S. Geological Survey (USGS) topographic site map and contact the local Conservation Commission or relevant natural resource agency personnel to identify areas designated as wetlands, special habitats, or habitats where threatened or endangered species may live. Natural resource agency information about receptors and habitats is necessary because some habitats and species have been afforded special status or protection by Federal and state agencies (see **Table 2** for Federal agencies responsible for specific environmental resources).

During an inspection of a petroleum release site, the site investigator should look for the source(s) of petroleum release, the pathways by which the product may be transported, and the receptors/habitats that may be exposed to the petroleum product or constituent chemicals. The conceptual models shown in **Figures 4 and 5** exemplify receptor and pathway types that should be assessed. When conducting a site inspection, the checklist provided in the **Appendix** as "Card 2, sides 1 and 2" and is a useful aid for onsite assessment at petroleum release sites/facilities.

**TABLE 2.
FEDERAL AGENCIES RESPONSIBLE FOR SPECIFIC ENVIRONMENTAL RESOURCES.**

AREA	RESPONSIBLE FEDERAL AGENCY
Wetlands, as defined in 40 CFR Part 230.3	EPA, COE, DOI/FWS, BLM, NPS, USDA/FS
Critical habitat for designated or proposed endangered/threatened species	DOI/FWS, BLM, NPS, NOAA/NMFS, USDA/FS
Habitat used by designated or proposed endangered/threatened species or marine mammals	DOI/FWS, BLM, NPS, NOAA/NMFS, USDA/FS
National marine sanctuaries	NOAA/NPS
National parks	DOI/NPS
Federal wilderness areas	DOI/FWS, BLM, NPS, USDA/FS
National estuary program areas	EPA
Near coastal waters program areas	EPA
Clean lakes program critical area	EPA
National monuments	DOI/NPS, USDA/FS
National recreational areas	DOI/NPS, USDA/FS
National preserves	DOI/NPS
National wildlife refuges	DOI/FWS
Coastal barrier resource system	DOI/FWS, NPS
National river reach designated as recreational	EPA, DOI/BLM
Federal- or state-designated wild and scenic rivers	DOI/BLM, NPS, USDA/FS
National conservation areas	DOI/BLM, USDA/FS
Hatcheries	DOI/FWS, NOAA/NMFS
Waterfowl management areas	DOI/FWS
Cultural resources	DOI/NPS, BLM, USDA/FS
Areas of critical environmental concern	DOI/BLM
National forest system	USDA/FS

NOTE: BLM, Bureau of Land Management; COE, Army Corps of Engineers; DOI, Department of the Interior; EPA, Environmental Protection Agency; FS, Forest Service; FWS, Fish and Wildlife Service; NMFS, National Marine Fisheries Service; NOAA, National Oceanic and Atmospheric Administration; NPS, National Park Service; USDA, U.S. Department of Agriculture.

Step 2 of the Preliminary Evaluation: Are Complete Exposure Pathways Present at the Site?

A complete exposure pathway usually consists of a source of contaminant release and a migration pathway by which the contaminant reaches a receptor or habitat.

In the preliminary evaluation, the site investigator must determine if a complete exposure pathway exists now, or potentially in the future, so that a further tiered approach can be employed, if necessary.

The investigator should proceed with Step 2 if receptors or habitats were identified in Step 1. Potential exposure pathways are identified from soil, sediment, groundwater, and/or surface water measurements; from a knowledge of transport processes; and from information gathered during a site inspection. There is exposure potential only if a complete exposure pathway is present. If incomplete exposure pathways exist now or potentially in the future, then the site investigator concludes that further investigation is not warranted and documents this judgment in the preliminary evaluation report.

In Step 2, the checklist in **Figure 7** helps identify exposure pathways for each receptor or habitat identified in Step 1 (using the checklist in **Figure 6**). **Note:** This checklist is in the back of this document, printed on cardstock as “Card 1, side 2.” If complete exposure pathways exist, then the site investigator documents the nature of these pathways by specifying the location and nature of released material, pathway(s), and habitats. If one or more complete pathways are present, then the site investigator either proceeds with a further tiered investigation in consultation with risk assessment experts, or considers remedial action.

In some cases, the evaluation of transport and exposure pathways is straightforward. In other cases, the site investigator must rely on individuals with expertise in groundwater hydrology, geology, non-aqueous phase liquids, and non-point surface runoff.

How Do I Evaluate the Need for an Initial Response Action?

While conducting a site inspection or during subsequent evaluation, the site investigator also should identify conditions that warrant an initial response action. ASTM (2000) defines an initial response action as “the course of action to mitigate hazards to human health and the environment, including immediate or short-term abatement or containment measures to prevent a chemical release spread.” For petroleum products, many states use the presence of visible contamination (sheen, or visibly contaminated soil or sediment) to indicate conditions that warrant initial response actions. Under no circumstances should this guidance be interpreted to prevent or delay appropriate emergency response actions.

Preliminary evaluation results (Step 1 + Step 2) are used to develop a site conceptual model.

How Do I Develop a Site Conceptual Model?

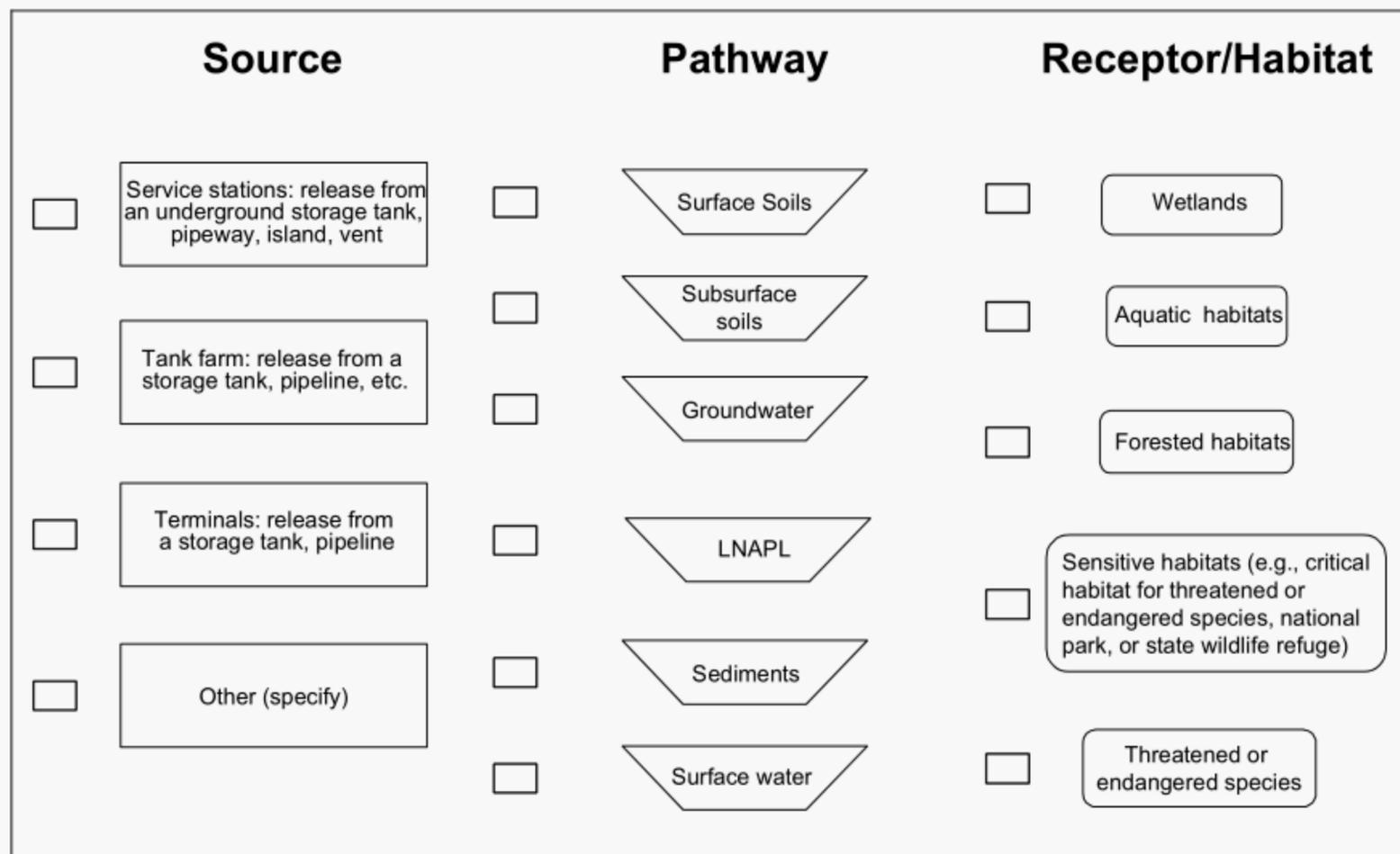
By identifying major categories of receptors/habitats and pathways, the preliminary evaluation provides a foundation for conducting a tiered ecological risk assessment. If no receptors/habitats are present, or no pathways are present, then the process ends with the preliminary evaluation. If receptors/habitats and pathways exist, then the assessment may proceed (see “Tier 1 screening analysis” in **Figure 2**). Selecting receptors/habitats and pathways is part of establishing a site conceptual model. Using preliminary evaluation results, **Figure 8** may be used to develop a conceptual model for any petroleum release site type. (See **Figures 4 and 5** for examples of site conceptual models constructed from Steps 1 and 2, results of the preliminary evaluation.)

**FIGURE 7.
CHECKLIST OF EXPOSURE PATHWAYS:
STEP 2 OF THE PRELIMINARY EVALUATION.**

	YES	NO	UNCERTAIN
A.			
1. Can contaminants leach into groundwater, or are contaminants already present in groundwater?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Are contaminants mobile in groundwater?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Could groundwater discharge to surface water near site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Could contaminants reach receptors or habitats via groundwater? (Check YES if Questions 1, 2, and 3 are all answered YES or UNCERTAIN.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B.			
4. Is LNAPL present at the site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Is LNAPL migrating toward receptors or habitats?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Could LNAPL discharge to surface water near the site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Could contaminants reach receptors or habitat via migration of non-aqueous phase liquid (LNAPL)? (Check YES if Questions 4 and 5 are answered YES or UNCERTAIN, or if Questions 4 and 6 are answered YES or UNCERTAIN.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C.			
7. Are contaminants present in surface soils?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Can contaminants be leached from or eroded with surface soils?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Are there relevant receptors or habitats located downgradient of the eroded surface soils?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Could contaminants reach receptors or habitats via surface runoff? (Check YES if Questions 7, 8, and 9 are all answered YES or UNCERTAIN.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D.			
10. Are one or more receptors inhabiting or using the area where contamination exists?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Is the location of the contamination such that one or more receptors could contact it currently or in the future?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Could contaminants reach receptors or habitats via direct contact? (Check YES if Question 10 or 11 is answered YES or UNCERTAIN.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>If Questions A, B, C, or D are answered YES or UNCERTAIN, proceed to Tier 1 assessment. Otherwise, exit the ecological assessment process.</p>			

Note: This checklist is included with this document, printed on stock suitable for lamination.

**FIGURE 8.
SAMPLE CHECKOFF DIAGRAM FOR A SITE CONCEPTUAL MODEL.**



Preliminary evaluation results are used to checkoff the source(s), pathway(s), and receptor(s)/habitat(s) applicable at the petroleum release site. All the checked boxes are connected with arrows to construct a site conceptual model. Sources of petroleum release represent some possible release scenarios. Sources are not limited to the scenarios presented here. Adapted from ASTM (1995).

How Do I Report the Results of a Preliminary Evaluation?

Preliminary evaluation results typically are included as part of a site investigation report. If the preliminary evaluation reveals either *no receptors/habitats* or *no complete exposure pathways*, then further ecological assessment is not warranted. If the preliminary evaluation reveals potentially complete exposure pathways (now or in the future) to receptors/habitats, then further tiered assessment or appropriate remedial measures should be considered. **Table 3** is a sample format for reporting the preliminary evaluation results.

**TABLE 3.
SAMPLE SECTIONS OF A PRELIMINARY EVALUATION REPORT.**

1. Introduction	A brief description of the assessment including the nature of the petroleum release (e.g., product, composition, volume, concentration, site, and water quality data)
2. Identification of receptors and habitats A. Report Step 1 results. B. Reference information sources, such as site inspections, contacts with resource agencies, and published materials. C. Identify which receptors or habitats are located at or near the release. (Note: It can include narrative form, and graphical presentations.)	
3. Identification of exposure pathways A. Report Step 2 results. B. Reference information sources. C. Identify which pathways are potentially complete. (Note: The pathways analysis should indicate line diagrams or pictures relating the receptors or habitats to release locations via various transport and exposure media. This diagram can serve as a conceptual model for the site.)	
4. Summary of potentially exposed receptors or habitats It is helpful to organize the information by potentially exposed receptor or habitat as follows:	<ul style="list-style-type: none"> • Receptor or habitat • Pathways to that receptor or habitat • Nature of released material reaching receptor or habitat via specified pathways • Estimated area or size of exposed habitat • Estimated duration of exposure (past, present, future) associated with the release(s)
5. Preliminary evaluation conclusions and summary	
6. Initial response actions If site conditions warrant initial response actions, this can be documented within the Preliminary Evaluation report.	

Because the preliminary evaluation is based on limited information, many specific characteristics of the exposure will be unknown at this stage. The site investigator, however, will find it helpful to begin estimating some characteristics. The preliminary evaluation provides a basis for proceeding with tiered assessments or for making informed site management decisions.

Preliminary Evaluation Decisions and Summary

At the conclusion of the preliminary evaluation, the site investigator and management may reach one of the following decisions:

The preliminary evaluation results in one of four basic decisions.

1. There is no need for further ecological risk assessment because no receptors/habitats are present.
2. There is no need for further ecological risk assessment because incomplete exposure pathways are present.
3. There are receptors/habitats and potential complete exposure pathways, and further ecological risk assessment is appropriate. The site investigator—in consultation with risk assessment experts—may conduct a further tiered investigation or proceed with further tiers (**Figure 2**).
4. Remedial action to eliminate or minimize exposure may be considered.

WHEN DO I PROCEED WITH FURTHER TIERED INVESTIGATIONS?

As indicated in **Figure 2**, the site investigator—in consultation with risk assessment experts—can proceed with further tiered investigations if relevant receptors and habitats are present and if there is potential for complete exposure pathways. There is some debate over what screening-level methods should be used in a Tier 1 Screening Analysis for the Tiered Ecological Assessment Process. One possibility is to compare chemical levels in the environmental media of concern to ecological benchmarks, which are intended to be used as screening-level tools, not as cleanup levels. One method or a combination of other qualitative or quantitative requirements may be used. These methods are available at the Federal or state level to compare local biological and environmental conditions and to consider exposed habitat areas for ecological assessments.

ASTM (2000) uses the term “relevant ecological screening criteria” to refer to comparisons that may be made during a Tier 1 ecological risk assessment. Relevant ecological screening criteria are “generic, non-site-specific ecological criteria or guidelines that are determined to be applicable to relevant ecological receptors and habitats, exposure pathways, and site conditions utilized during the Tier 1 evaluation” (ASTM, 2000).

Further tiered ecological risk assessments require more qualitative and quantitative methods than the preliminary evaluation requires.

Higher tiers typically use more site-specific and/or quantitative methods to evaluate ecological risk. These methods may include fate and transport modeling, biological studies, and toxicity measurements. Such information on exposure and effects can be organized into a weight-of-evidence approach. These more sophisticated techniques require trained personnel with experience in ecological risk assessment. Further, an assessment’s acceptability depends to some degree on the regulatory setting, and is most successful when regulators have been brought into the assessment at an early phase. These early discussions are an important part of problem formulation in the EPA framework (**Figure 1**).

CONCLUSIONS

The preliminary evaluation is part of a tiered approach to ecological risk assessment.

Preliminary evaluation results are factored with other considerations in making environmental risk management decisions.

Environmental management decisions are based on several factors, including the evaluation of ecological risk. To conduct an ecological risk assessment, a tiered approach may be used. The site investigator begins by characterizing the petroleum release site as well as the nature and extent of subsequent petroleum contamination. Then, relevant receptors/habitats at or near the site are identified. Next, the investigator must determine if there are actual or potential complete exposure pathways of receptors or habitats to the source of petroleum contamination. Finally, the investigator reports the preliminary evaluation results, including a site conceptual model, to guide further tiered investigation or to facilitate site management decisions. Upon completion of the preliminary evaluation, management decisions can be made, based on the collected information about ecological risk plus other regulatory, financial, and political considerations.

REFERENCES

- API (American Petroleum Institute). 1999. *Decision Support System for Exposure and Risk Assessment*, Version 2. Publication Number 4685. American Petroleum Institute, Health and Environmental Sciences Department, Washington, DC.
- ASTM (American Society for Testing and Materials). 1995. *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*. E 1739. American Society for Testing and Materials, Philadelphia, PA.
- . 2000. *Standard Guide for Risk-Based Corrective Action*. Subcommittee E50.04, Regulatory Programs, Voluntary Cleanup Task Group. E208100. American Society for Testing and Materials, Philadelphia, PA.
- EPA (U.S. Environmental Protection Agency). 1992. *Framework for Ecological Risk Assessment*. EPA/630/R-92/001. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC.
- . 1997. *Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments*. EPA/540-R-97-006. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC.
- . 1998. *Guidelines for Ecological Risk Assessment*. Federal Register, 63(93):26846-26924. EPA/630/R-95/002F. /630/R-92/001. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC.

RECOMMENDED READING/SOURCES OF INFORMATION

- EPA (U.S. Environmental Protection Agency). 1989. *Risk Assessment Guidance for Superfund, Volume II: Environmental Evaluation Manual*. Interim Final. EPA/540/1-89/001. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC.
- . 1991. *Ecological Assessment of Superfund Sites: An Overview*. Office of Solid Waste and Emergency Response. ECO Update Publication 9345.0-051.
- . 1991. *Peer Review Workshop Report on a Framework for Ecological Risk Assessment*. EPA/625/3-91/022.
- . 1992. *Briefing the BTAG: Initial Description of Setting, History, and Ecology of a Site*. Office of Solid Waste and Emergency Response. ECO Update Publication 9345.0-051.
- . 1992. *Developing a Scope of Work for Ecological Assessments*. Office of Solid Waste and Emergency Response. ECO Update Publication 9345.0-051.
- . 1992. *Framework for Ecological Risk Assessment*. U.S. EPA Risk Assessment Forum. EPA/630/R-92/001.
- . 1992. *Guidance for Data Usability in Risk Assessment*. Office of Emergency and Remedial Response, Office of Solid Waste and Emergency Response, Directive No. 9285.7-09A and B.
- . 1992. *Report on the Ecological Risk Assessment Guidelines Strategic Planning Workshop*. EPA/630/R-92/002.
- . 1992. *The Role of Natural Resource Trustees in the Superfund Process*. Office of Solid Waste and Emergency Response. ECO Update Publication 9345.0-051.
- . 1993. *A Review of Ecological Assessment Case Studies from a Risk Assessment Perspective*. Risk Assessment Forum. EPA/630/R-92/005.
- . 1993. *Guidelines for Deriving Site-Specific Sediment Quality Criteria for the Protection of Benthic Organisms*. EPA/822/R-93/017.
- . 1993. *Technical Basis for Deriving Sediment Quality Criteria for the Protection of Benthic Organisms by Using Equilibrium Partitioning*. EPA/822/R-93/0112.
- . 1993. *Wildlife Exposure Factors Handbook, Volume I*. EPA/600/R-93/187a.
- . 1993. *Wildlife Exposure Factors Handbook, Volume II: Appendices*. EPA/600/R-93/187b.
-

- . 1995. *Ecological Risk: A Primer for Risk Managers*. Office of Prevention, Pesticides and Toxic Substances. EPA/734-R95-001.
- . 1996. *Ecological Significance and Selection of Candidate Assessment Endpoints*. Office of Solid Waste and Emergency Response. EPA/540/F-95/037. ECO Update Publication 9345.0-011FSI.
- . 1996. *Ecotox Thresholds*. Office of Solid Waste and Emergency Response. EPA 540/F-95/038. ECO Update Publication 9345.0-12FSI
- . 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*. Office of Solid Waste and Emergency Response. EPA/540-R-97-006.
- . 1998. *Guidelines for Ecological Risk Assessment*. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, D.C. Federal Register 63(93):26846-26924. EPA/630/R-95/002F.
- SETAC (Society of Environmental Toxicology and Chemistry). 1997. *Ecological Risk Assessment*. Technical paper. Pensacola, FL.

GLOSSARY

Assessment endpoint	An explicit expression of the environmental value that is to be protected and is operationally defined by one or more attributes of an ecological component. An example of an assessment endpoint is sustainability of warm water fish species in Lake Z, typical of those found in other recreational lakes. In this example, the attribute is sustainability (e.g., growth, development, and reproduction), and the ecological component is warm water fish species in Lake Z.
Benchmark	An ecological benchmark in a specific medium is the contaminant concentration considered protective of specified receptors and habitats. Benchmark levels are considered to be protective exposure levels, not cleanup levels.
BTEX	Benzene, toluene, ethylbenzene, and isomers of xylene. Other than ethers/alcohols, these are among the most soluble constituents of petroleum products.
Chemical(s) of concern	Specific constituents—or chemical “stressors”—that are identified for evaluation in the risk assessment process. They are identified based on historical and current site use, detected concentrations in environmental media, and the toxicity, persistence, and mobility of the constituents and their breakdown products in the environment.
Conceptual model	A visual representation of the source of a petroleum release and the pathways through which either the petroleum or its constituents may reach a receptor or habitat. Conceptual models should summarize information about a site, including relevant receptors and habitats, predominant transport processes and pathways, and potentially complete exposure pathways.
Ecological receptor	Ecological receptors can include individual organisms (e.g., endangered species), populations, communities, habitats, and ecosystems that may be exposed to stressors.
Ecological risk assessment	A process for organizing and analyzing data, information, assumptions, and uncertainties to evaluate the likelihood of adverse ecological effects resulting from exposure to stressors.
Ecosystem	The biotic community (animals, plants, microbes) and abiotic (non-

living) environment within a specified location in space and time.

Environmental media

Air, soil, surface water, groundwater, sediment, or plant or animal tissue.

**Exposure pathway
("pathway")**

The course a chemical or physical agent takes from a source to an exposed organism, population, community, or ecosystem. A simple example of an exposure pathway is discharge of petroleum from a source to a surface waterbody.

Habitat

Place where a plant or animal lives, often characterized by a dominant plant form and physical characteristics (e.g., pine forest, salt marsh, pond).

Initial response action

The immediate course of action to mitigate hazards to human health and the environment, including immediate or short-term abatement or containment measures to prevent the spread of a chemical release (ASTM, 2000).

LNAPL

Light, non-aqueous phase liquid. An immiscible liquid, such as most petroleum fuels, that will "float" on groundwater or surface water.

Measurement endpoint

A measurable response to a chemical stressor that corresponds to a specific assessment endpoint. Examples of measurement endpoints related to the assessment endpoint "sustainability of warm water fish" are comparison of water concentrations to ambient water quality criteria, growth rate of fish in Lake Z compared with fish in other recreational lakes, and fish larvae survival in sediment toxicity tests in the laboratory.

Risk

The expected frequency or probability of adverse effects resulting from exposure to stressors.

**Relevant ecological
screening criteria**

Generic, non-site-specific ecological criteria or guidelines determined applicable to relevant ecological receptors and habitats, exposure pathways, and site conditions (ASTM, 2000).

**Relevant receptors and
habitats**

Defined in the *Provisional Standard Guide for Risk-Based Corrective Action* (ASTM, 2000) as "the ecological resources that are to be protected at a site. Because of the variety of ecological resources that may be present, focus upon those [ecological resources] relevant to a site is an important part of the problem formulation phase of ecological risk assessment. Examples of ecological resources include: communities with threatened or endangered species, recreationally or commercially important communities, regionally or nationally rare communities; communities with high aesthetic quality; communities afforded special protection by law or regulation; and habitats that support these

communities.”

***Weight-of-evidence
approach***

A risk characterization method in which each assessment endpoint (e.g., an attribute of a relevant receptor or habitat) selected for the ecological risk assessment has multiple lines of evidence (measurement endpoints) that are used to determine whether there is potential risk.

APPENDIX
CHECKLIST FOR ONSITE ASSESSMENT
AT PETROLEUM RELEASE SITES/FACILITIES:
SITE SUMMARY REPORT FORM

1. Site Description

Site/Facility Name: _____

Location: _____ (use map reference)

County: _____ City: _____ State: _____

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? (indicate units, dimensions): _____

4. Is this the first site visit? yes no (If no, locate any reports of previous site visits.)

Date(s) of previous visit(s): _____

5(a). The present land use on the site is:
(check all that apply)

- Urban
- Rural
- Residential
- Industrial (light heavy)
- Agricultural (crops: _____)
- Recreational
- Undisturbed
- Other (describe: _____)

5(b). The area surrounding the site is:
(check all that apply)

- Urban
- Rural
- Residential
- Industrial (light heavy)
- Agricultural (crops: _____)
- Recreational
- Undisturbed
- Other (describe: _____)

6. The past land use on the site was:
(check all that apply)

- Urban
- Rural
- Residential
- Industrial (light heavy)
- Agricultural (crops: _____)
- Recreational
- Undisturbed
- Other (describe: _____)

7. Do any potentially sensitive environmental areas exist adjacent to or in proximity of the site?
(check all that apply)

- Waterbody
- Federal and state parks
- Grassland habitats
- Forested habitats
- Prairie potholes
- Critical habitats for threatened or endangered species
- Other, including on-site habitats that could attract wildlife species
(describe: _____)

Please provide the source(s) of information used to identify the sensitive areas in Question 7, indicating their general location on a site map, and specify their distance (in feet) from the release site.

- | | |
|---|--|
| <p>8. What is the source of the petroleum release—
dates, types, and volumes?
(check all that apply)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Pipelines <input type="checkbox"/> Underground storage tank <input type="checkbox"/> Aboveground storage tank <input type="checkbox"/> Pump stations <input type="checkbox"/> Tank farm <input type="checkbox"/> Other (specify discovery method: _____) | <p>9. What is/are the suspected petroleum product(s)
of concern?
(check all that apply)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Fuel oil <input type="checkbox"/> Kerosene <input type="checkbox"/> Gasoline <input type="checkbox"/> Jet fuel <input type="checkbox"/> Diesel <input type="checkbox"/> Other (specify: _____) |
|---|--|

Attach additional sheets with the contaminants of concern at the site and the maximum concentration levels, if available.

- 10(a). Is there any product visible on the site? yes no
- 10(b). Is there LNAPL on the site? yes no
11. Check any potential routes of offsite migration of contaminants observed at the site:
 Swales Storm drains Overland Runoff Other (specify): _____
12. If known, what is the approximate depth to the water table? _____
13. Is the direction of surface runoff apparent from site observations? yes no
 If yes, to which of the following does surface water runoff discharge? (indicate all that apply)
 Surface water Groundwater Sewer Collection impoundment
14. Is there a navigable waterbody or tributary to a navigable waterbody? yes no
 If yes, indicate distance and direction: _____
15. Is there a waterbody (potential aquatic habitat) on or in the vicinity of the site? yes no
 If yes, specify the distance (in feet and direction) from the release site: _____
16. Is there evidence of flooding? yes no
 If yes, a wetland may be present. Specify the distance in feet from the release site: _____
17. Is there evidence of petroleum in a waterbody or wetland? yes no

Summary of observations and site setting (attach field sketch[optional]):

Completed by: _____ Affiliation: _____
 Job Title: _____ Date: _____

This checklist is adapted from the *Ecological Risk Assessment Guidance for Superfund*, EPA (1997).

**CHECKLIST OF EXPOSURE PATHWAYS:
STEP 2 OF THE PRELIMINARY EVALUATION.**

	YES	NO	UNCERTAIN
A.			
1. Can contaminants leach into groundwater, or are contaminants already present in groundwater?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Are contaminants mobile in groundwater?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Could groundwater discharge to surface water near site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Could contaminants reach receptors or habitats via groundwater? (Check YES if Questions 1, 2, and 3 are all answered YES or UNCERTAIN.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B.			
4. Is LNAPL present at the site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Is LNAPL migrating toward receptors or habitats?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Could LNAPL discharge to surface water near the site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Could contaminants reach receptors or habitat via migration of non-aqueous phase liquid (LNAPL)? (Check YES if Questions 4 and 5 are answered YES or UNCERTAIN, or if Questions 4 and 6 are answered YES or UNCERTAIN.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C.			
7. Are contaminants present in surface soils?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Can contaminants be leached from or eroded with surface soils?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Are there relevant receptors or habitats located downgradient of the eroded surface soils?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Could contaminants reach receptors or habitats via surface runoff? (Check YES if Questions 7, 8, and 9 are all answered YES or UNCERTAIN.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D.			
10. Are one or more receptors inhabiting or using the area where contamination exists?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Is the location of the contamination such that one or more receptors could contact it currently or in the future?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Could contaminants reach receptors or habitats via direct contact? (Check YES if Question 10 or 11 is answered YES or UNCERTAIN.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If Questions A, B, C, or D are answered YES or UNCERTAIN, proceed to Tier 1 assessment. Otherwise, exit the ecological assessment process.			

**CHECKLIST FOR POTENTIAL RECEPTORS AND HABITATS:
STEP 1 OF THE PRELIMINARY EVALUATION.**

	YES	NO	UNCERTAIN
Are freshwater or marine wetlands present ¹ (e.g., marshes, swamps, bogs, tidal flats)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are aquatic habitats present ¹ (e.g., lakes, ponds, rivers, streams, creeks)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are forested habitats present ² ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are grassland habitats present ² ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are there one or more sensitive environments, such as critical habitat for endangered or threatened species, a national or state wildlife refuge present?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are there on-site habitats, such as pooled water, impoundments or lagoons, which could attract wildlife species to the site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are there federal or state rare, threatened, or endangered species present?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

¹At or within approximately ¼ mile.
²At or within approximately 500 feet.

If one or more questions are answered YES or UNCERTAIN, proceed to Step 2 of the Preliminary Evaluation (pathway evaluation).

If all questions are answered NO, exit the ecological assessment process.

CHECKLIST FOR ONSITE ASSESSMENT AT PETROLEUM RELEASE SITES/FACILITIES: SITE SUMMARY REPORT FORM

1. Site Description

Site/Facility Name: _____

Location: _____ (use map reference)

County: _____ City: _____ State: _____

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? (indicate units, dimensions): _____

4. Is this the first site visit? yes no (If no, locate any reports of previous site visits.)

Date(s) of previous visit(s): _____

5(a). The present land use on the site is:
(check all that apply)

- Urban
- Rural
- Residential
- Industrial (light heavy)
- Agricultural (crops: _____)
- Recreational
- Undisturbed
- Other (describe: _____)

5(b). The area surrounding the site is:
(check all that apply)

- Urban
- Rural
- Residential
- Industrial (light heavy)
- Agricultural (crops: _____)
- Recreational
- Undisturbed
- Other (describe: _____)

6. The past land use on the site was:
(check all that apply)

- Urban
- Rural
- Residential
- Industrial (light heavy)
- Agricultural (crops: _____)
- Recreational
- Undisturbed
- Other (describe: _____)

7. Do any potentially sensitive environmental areas
exist adjacent to or in proximity of the site?
(check all that apply)

- Waterbody
- Federal and state parks
- Grassland habitats
- Forested habitats
- Prairie potholes
- Critical habitats for threatened or endangered species
- Other, including on-site habitats that could attract wildlife species
(describe: _____)

Please provide the source(s) of information used to identify the sensitive areas in Question 7, indicating their general location on a site map, and specify their distance (in feet) from the release site.

8. What is the source of the petroleum release—
dates, types, and volumes?
(check all that apply)
- Pipelines
 - Underground storage tank
 - Aboveground storage tank
 - Pump stations
 - Tank farm
 - Other (specify discovery method: _____)
9. What is/are the suspected petroleum product(s)
of concern?
(check all that apply)
- Fuel oil
 - Kerosene
 - Gasoline
 - Jet fuel
 - Diesel
 - Other (specify: _____)

Attach additional sheets with the contaminants of concern at the site and the maximum concentration levels, if available.

- 10(a). Is there any product visible on the site? yes no
- 10(b). Is there LNAPL on the site? yes no
11. Check any potential routes of offsite migration of contaminants observed at the site:
 Swales Storm drains Overland Runoff Other (specify): _____
12. If known, what is the approximate depth to the water table? _____
13. Is the direction of surface runoff apparent from site observations? yes no
If yes, to which of the following does surface water runoff discharge? (indicate all that apply)
 Surface water Groundwater Sewer Collection impoundment
14. Is there a navigable waterbody or tributary to a navigable waterbody? yes no
If yes, indicate distance and direction: _____
15. Is there a waterbody (potential aquatic habitat) on or in the vicinity of the site? yes no
If yes, specify the distance (in feet and direction) from the release site: _____
16. Is there evidence of flooding? yes no
If yes, a wetland may be present. Specify the distance in feet from the release site: _____
17. Is there evidence of petroleum in a waterbody or wetland? yes no

Summary of observations and site setting (attach field sketch[optional]):

Completed by: _____ Affiliation: _____
Job Title: _____ Date: _____

This checklist is adapted from the *Ecological Risk Assessment Guidance for Superfund*, EPA (1997).

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