

# Sustainability and the Nine NCP Criteria as Applied to Remedy Evaluation



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## ABSTRACT

At large, complex sediment sites, remedy selection is guided by several considerations. These considerations have their foundation in the nine remedy selection criteria defined by the National Contingency Plan (NCP; 40 CFR 300 et. seq.) that covers sites being remediated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund), or comparable state programs. These criteria include: (1) overall protection of human health and the environment; (2) compliance with applicable or relevant and appropriate requirements (ARARs); (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state acceptance; and (9) community acceptance. In recent years, Responsible Parties (RPs) have started to conduct Sustainability analyses to assess how environmental, economic and social metrics are affected by different remedial alternatives. The selection of a more sustainable remedy can provide added benefits for the community and environment and should be part of the overall remedy selection process. The U.S. Environmental Protection Agency (USEPA), however, has stated for select sediment sites that sustainability is not one of the nine NCP criteria, and should only be considered during remedy implementation. The objective of this presentation is to demonstrate how sustainability metrics are consistent with the nine NCP criteria and support more effective remedies.

## INTRODUCTION

Green and Sustainable Remediation (GSR) evaluations are being conducted to evaluate the remedy selection process performed during the remedial action selection phase of remedial projects, consistent with the National Environmental Policy Act (NEPA, 1969) and the NCP. This evaluation provides site decision makers with an opportunity to develop and select the most sustainable remedy that is protective of human health and the environment. As the U.S. Navy (2012) has noted:

“Assessment of remedial alternatives with respect to sustainability should not be considered a unique criterion within the [feasibility study] FS; rather the GSR metrics fit easily within the nine existing CERCLA criteria. Considering GSR metrics associated with site remediation in the purview of the existing regulatory framework provides the Navy with the ability to choose more sustainable options overall, and not just green options.”

USEPA has continued to expand their support of GSR over time:

- 2009 – Sustainable Remediation White Paper (SURF)
- 2010 – Superfund Green Remediation Strategy
- 2012 - Guidance on Green and Sustainable Remediation
- 2013 – Sustainability Analytics: Assessment Tools & Approaches
- 2014 - 2014-2018 EPA Strategic Plan
- 2016 – Consideration of Greener Cleanup Activities in Superfund Cleanup Process

USEPA’s 2016 guidance notes that “regions may find opportunities to consider or implement greener cleanup activities during various cleanup process phases, including site characterization, engineering evaluation/cost analysis (EE/CA), NTCRA, remedial investigation and feasibility study (RI/FS), remedy selection, remedy implementation (e.g., remedial design, construction), and operation and maintenance (O&M).” Under CERCLA, remedy selection is guided by evaluating proposed remedies using the nine NCP criteria. In 2016, USEPA states that “greener cleanup activities should not be treated as a new criterion under the NCP”, however, it is clear that many of the aspects of a sustainability evaluation are components of the nine criteria and should be considered as part of remedy selection.

## APPROACH

The historical and regulatory context of the NCP criteria (e.g., the National Environmental Policy Act) were reviewed through a sustainability lens to assess how different sustainability metrics can be mapped to each of the nine NCP criteria. USEPA guidance on sustainability and sediment management also were reviewed to document their relationship to the NCP criteria. In addition, other sediment management guidance documents (e.g., U.S. Army and Navy, National Research Council, Interstate Technology and Regulatory Council) that further support incorporating sustainability into the decision-making process were identified.

## NCP CRITERIA

Threshold Criteria	1. Overall protection of human health and the environment 2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
Balancing Criteria	1. Long-term effectiveness and permanence 2. Reduction of toxicity, mobility, or volume 3. Short-term effectiveness 4. Implementability 5. Cost
Modifying Criteria	1. State Acceptance 2. Community Acceptance

## GSR METRIC MAPPING

GSR Metrics	Threshold Criteria		Balancing Criteria					Modifying Criteria	
	Protection of human health and the environment	Compliance with ARARs	Long-term Effectiveness	Reduction in Toxicity, Mobility, or Volume	Short-Term Effectiveness	Implementability	Cost	State Acceptance	Community Acceptance
Community Impacts & Cohesiveness	X	X	X		X	X		X	X
Cost of Remedy							X		X
Criteria Pollutant Emissions	X	X	X		X			X	X
Ecological Impacts	X	X	X	X	X	X	X	X	X
Economic Impacts						X	X	X	X
Ecosystem Functions and Services	X	X	X		X	X		X	X
Energy Consumption					X		X	X	X
Environmental Justice								X	X
GHG Emissions			X		X			X	X
Human Health Risks	X	X	X	X	X	X		X	X
Noise Impacts					X			X	X
Public Safety	X	X			X	X		X	X
Recreational Impacts			X		X			X	X
Resource and Material Consumption			X		X		X	X	X
Traffic					X			X	X
Waste Generation and Management			X	X	X	X	X	X	X
Water Impacts/Use			X	X	X		X	X	X
Worker Safety	X	X			X		X	X	X

Based on and expanded from US Navy (2012).

## KEY FINDINGS

**Overall protection of human health and the environment** – Remedies are required to be protective of human health and the environment. Risk related to contamination, however, should be balanced appropriately with risk associated with selection and implementation of a remedy.

- Risk assessment results used as the basis for a remedial decision, background contributions, target risk ranges, and overall risk management should be considered.
- Impacts to the community and environment can be associated with remedies that exceed the cleanup required to protect human health and remedies that contain overly aggressive cleanup goals, that have target cleanup objectives that are below background contamination, increase the potential risks to the community and environment without an incremental risk benefit.
- Similar risk-based remedial goals can be attained using different remedial actions (e.g., dredging, capping, monitored natural recovery).

**Compliance with applicable or relevant and appropriate requirements (ARARs)** - Compliance with ARARs is a threshold criterion and must be met in order for a remediation alternative to be eligible for selection. There are circumstances where ARARs can be waived, including when “compliance with the requirement will result in greater risk to human health and the environment than other alternatives [40 CFR 200.430(f)(1)(ii)(C)(2)].”

- Compliance with specific ARARs can result in adverse impacts to several sustainability metrics (i.e., community impacts and cohesiveness, exposure to criteria pollutant emissions, ecological impacts, impacts to ecosystem functions and services, human health risks, public safety and worker safety) with limited overall remedial benefit.

## LINKING TO THE CRITERIA

**Long-term effectiveness** – This criterion focuses on the residual risk following remediation and the reliability of controls (e.g., containment, institutional controls, etc.) implemented to manage risk.

- Metrics such as community impact and cohesiveness, criteria pollutant emissions, ecological impacts, ecosystem functions and services, GHG emissions, human health risks, recreational impacts, resource material and consumption, waste generation, and water impacts/use, are relevant metrics to consider.

**Example:** Data on cap implementation to contain contaminated sediment can be used to support an option that is identified as more sustainable than dredging.

**Reduction in Toxicity, Mobility, or Volume** – Different treatment alternatives of contaminated media can have substantially different energy uses, air emissions, noise, and other GSR metrics.

- These metrics should be considered and compared across potential alternatives so that the remedial alternatives evaluation favors sustainable alternatives that employ recycling or treatment that reduces toxicity, mobility, or volume.

**Short-term Effectiveness** – This criterion evaluates potential risks that may be posed to the community during implementation of an alternative.

- GSR metrics include impacts on the community, vehicular safety, environmental impacts from remedy implementation associated with air emissions and resource consumption, as well as impacts to ecological resources.

**Implementability** – These considerations relate to ease or difficulty of implementing the alternatives.

- Considerations include: technical feasibility (construction and operation of a technology, including monitoring effectiveness), administrative feasibility (permits and approvals), availability of services and materials (including treatment and disposal options), and manpower required (level of safety risk of work activities involved, man-hours).
- Sustainability metrics may include: community impacts (e.g., access restrictions, traffic), criteria pollutant emissions, economic impacts (traffic, infrastructure disruptions), and environmental impacts (ecological impacts, impacts to ecosystem functions and services, restoration and mitigation of sensitive environments, etc.).

**Cost** – The cost of a remedial alternative can be affected by several GSR metrics.

- GSR metrics may increase and/or reduce costs, and the impact of each metric varies on a case-by-case basis.
- Lower costs - reduced lower energy consumption, reduced water use and reduced material consumption
- Increased costs - limited work hours to limit social impacts on local residents or creation of an ecologically advanced treatment remedy (e.g. constructed wetland).

**State Acceptance** - All GSR metrics can be evaluated as part of the state acceptance criterion, as these sustainability issues are of concern to the regulatory agencies which oversee the remediation projects (in fact some states have guideline or regulations in support of sustainability).

**Community Acceptance** – This criterion relates to determining which components of the alternatives the community support, have reservations about, and oppose. Evaluation and discussion of all GSR metrics can elucidate many of the social and economic impacts that the proposed alternatives will have and the balances necessary to achieve different remedial outcomes.

## SUMMARY

GSR evaluations are tools that can enhance the decision-making process for remediation sites and result in more sustainable remedies without compromising compliance with the NCP threshold criteria. There is substantial benefit to incorporating GSR metrics as part of the remedy selection process during the Feasibility Study phase of a project. As the U.S. Navy has stated [U.S. Navy, 2012b]:

“Remedy selection provides the greatest opportunity to lower the overall remedy footprint. While it is possible to minimize the footprint during later stages of the project, the greatest benefit can be achieved by selecting the remedy that generates the smallest footprint at the start.”

In the CERCLA process (and similar regulations), remedy selection is guided by the nine NCP criteria (see Table 1). GSR metrics should be developed and incorporated into the decision-making for remedy selection. If the metrics are incorporated, the remedy selection will satisfy the NCP, will be consistent with USEPA goals for increasing sustainability throughout their programs such as the “FY 2014-2018 EPA Strategic Plan” [U.S. EPA, 2014] and will better balance potential benefits and impacts for key stakeholders.