



Green and Sustainable Remediation



ASTM Greener Cleanups Standard Resiliency Climate Change

2015 EPA States NEWMOA Meeting
May 11, 2015

Goals of this Presentation

- Provide an overview of the **R1 EPA Brownfields Green and Sustainable Remediation (GSR) Framework** that went into place in 2013.
- Review a new requirement for **climate change considerations in the Analysis of Brownfield Cleanup Alternatives (ABCAs)** that is supported by that framework
- Share a tool opportunity with the new **GSR ASTM Standard** and potential uses for the **BMP list**.
- Discuss how GSR, the new ASTM standard and climate change considerations are **affecting state programs and/or contractor work products**.



U.S. Environmental Protection Agency
Office of Solid Waste and Emergency Response

Principles for Greener Cleanups

Protecting Communities and the Environment for a Sustainable Future
As a nation, we value land as a natural, cultural, and economic resource. Cleaning up contaminated land protects human health and the environment and enables communities and other stakeholders to pursue future beneficial use or reuse of resources for economic, environmental, and societal purposes. Prevention and remediation of contamination plays a central role in seeking a sustainable future.



Image source: clu-in.org

Clean and Greener Policy for Contaminated Sites
EPA Region 1
Office of Site Remediation and Restoration
Revised February 2012

A core part of EPA's mission is ensuring that contaminated sites are cleaned up to be protective of human health and the environment. The process of cleaning up and returning these sites to beneficial use generally requires energy, water, materials, and other resources that can create an environmental footprint of its own. An *environmental footprint* considers the broader environmental impacts of an activity, such as the depletion and degradation of natural resources or other potential consequences.

EPA Region 1's Office of Site Remediation and Restoration is committed to using and promoting strategies and practices that reduce the environmental footprint during cleanup and restoration activities, to the extent feasible and consistent with applicable statutes, regulations and guidance. This *Clean and Greener Policy for Contaminated Sites* embraces the following green remediation objectives, where practical and appropriate:

- Minimize total energy use and maximize use of renewable energy;
- Minimize air emissions and greenhouse gas generation;
- Minimize water use and impacts to water resources;
- Reduce, reuse, and recycle materials and wastes; and
- Protect and minimize adverse impacts to land and ecosystems.

Green & Sustainable Remediation in Brownfields

Terms and Conditions (T&C)

T&C's within the grant award document there is GSR language that requires:



- Use of a quarterly report template that includes a section on GSR achievements.
- Including **resilience** risk factors in the evaluation of cleanup alternatives in the ABCA.
- Considering how GSR practices may optimize a selected cleanup alternative to minimize waste and adverse impacts.

GSR in Brownfields - What are we asking grantees

to do?

Identify practical, inexpensive ways to make projects
greener and more sustainable!

- Minimize impacts
- Maximize efficiencies
- Ensure Long-term Benefits

Where does GSR fit in the Brownfields process?

- All Stages
- Plan, Implement, Document

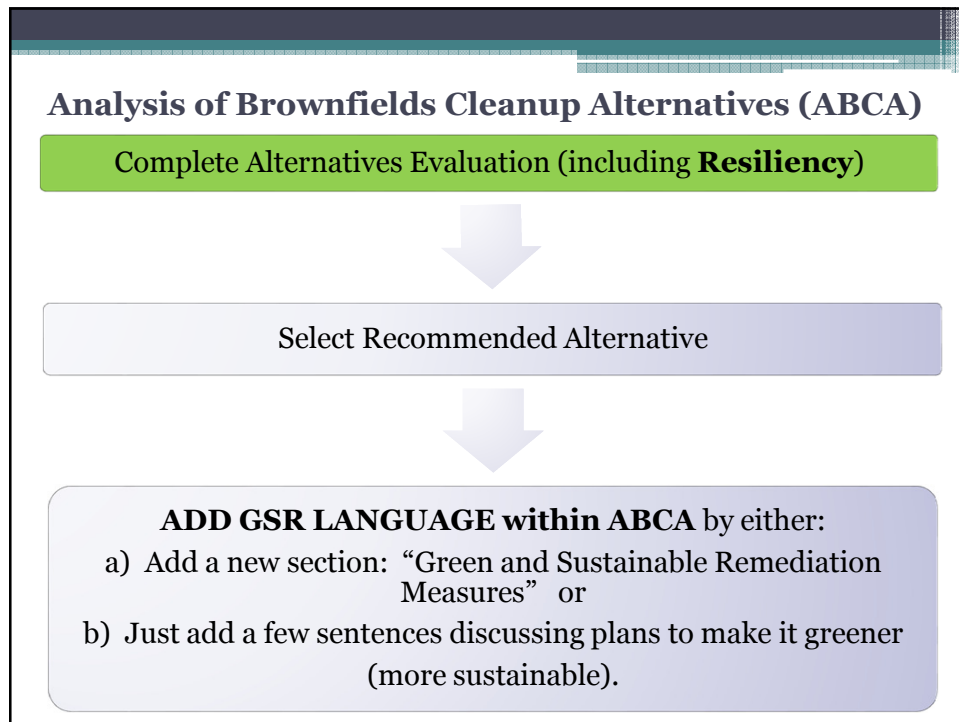


GSR principles apply to Assessment, Cleanup and RLF Grants!

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Basic Brownfields Cleanup Project Framework

- Proposal
- Work Plan
- RFP and Contracting
- **Analysis of Brownfields Cleanup Alternatives (ABCA)**
- Public Engagement
- Quarterly Reporting



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GSR and Climate Change Impacts

- Both Affect the Analysis of Brownfields Cleanup Alternatives (ABCA)

- Included as **part of the effectiveness evaluation** of an ABCA:
 - Climate Change Impacts
- Included **subsequent to the alternatives analysis** to optimize the efficiency and effectiveness of a preferred alternative:
 - ASTM BMP Process and/or EPA GSR Guidance

(both of the above are available through our website)

GSR and Resiliency Resources

Guidance	Standard
• “<i>Suggestions/Ideas for Green Remediation Incorporation into Brownfields Assessments and Cleanups – EPA Region 1</i>” • Green Remediation Best Management Practices (BMPs) – Clu-in website • Climate Change Resiliency Guidance Document and Checklist 	• ASTM’s Standard Guide for Greener Cleanups E2893 (2013) - optional 

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Climate Change Adaptation Requirements and Guidance

Requirement:

- New Term & Condition for Cleanup and RLF Grantees starting in FY13.
- Area-Wide Planning (AWP) Grantees starting in FY14.

Supporting Guidance:

- Two New Guidance Documents (with suggested checklists); one for cleanup programs, one for AWP.

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New Term & Condition for Cleanup and RLF Grantees

T&C First Started with FY13 Grantees

“The evaluation of alternatives must also consider the resilience of the remedial options in light of reasonably foreseeable changing climate conditions (e.g., sea level rise, increased frequency and intensity of flooding and/or extreme weather events, etc.).”

Note: Resilience considerations were not added to the FY13 Assessment T&Cs

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The CHECKLIST: *Just Three Basic Questions*

1. Identify observed and potential changing **climate conditions** for the region
2. Identify the cleanup **site-specific risk factors**
3. Evaluate the **vulnerabilities of each cleanup alternative** to identified climate change risk factors

HOW TO APPLY THE CHECKLIST:

Document the Consideration of each Question in the ABCA

**CHECKLIST:**

How to Address Changing Climate Concerns in
an Analysis of Brownfield Cleanup Alternatives
(ABCA)

Considerations to think about when addressing climate adaptation in the ABCA:

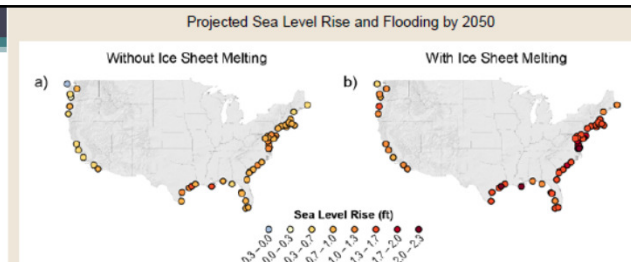
- ☐ Review an authoritative resource (e.g., USGS Web site, state or local resources) to identify observed and potential changing climate conditions for the area in which the cleanup project is located.
- ☐ Given the pertinent climate change concerns, identify the site-specific risk factors, taking into account known conditions (e.g., proximity to the ocean, property affected by a revised FEMA flood plain map, infrastructure vulnerabilities, vulnerability of soil type due to moisture and hydraulic changes, ground and surface drinking water vulnerabilities).
- ☐ Include in your effectiveness evaluation how well each alternative can accommodate the identified climate change risk factors. Remember to consider all stages of the cleanup and long-term reuse of the site.

Note: EPA does not expect grant recipients to generate new site-specific climate change measurements to complete this analysis. Through the ABCA, grant recipients must demonstrate they have reviewed available current and authoritative information for the cleanup analysis. The level of analysis expected depends on the complexity of the project and the degree of risk involved given the feasible remedial options and targeted reuse of the site.

http://www.epa.gov/brownfields/sustain_plts/factsheets/EPA_OBLR_Climate_Adaptation_Checklist.pdf

Example:

Coastal Regions & Northeast



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Example: Remedy/Site Specific Guidance



Office of Superfund Remediation and Technology
EPA 542-F-14-001 May 2014

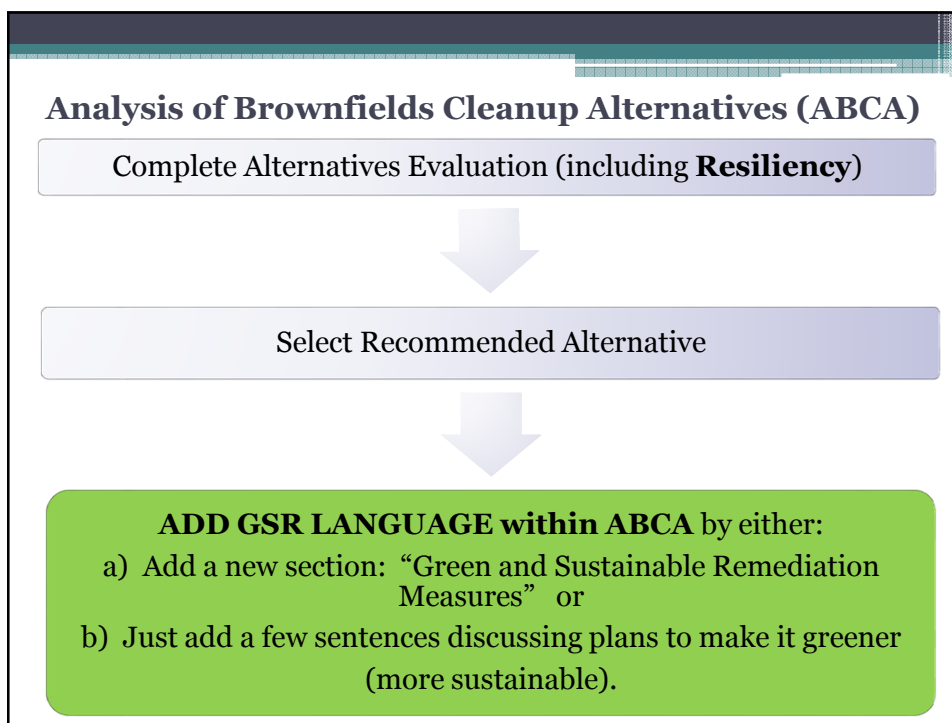
Climate Change Adaptation Technical Fact Sheet: Landfills and Containment as an Element of Site Remediation

In February 2013, the U.S. Environmental Protection Agency (EPA) released the draft *U.S. Environmental Protection Agency Climate Change Adaptation Plan*.¹ The plan examines how EPA programs may be vulnerable to a changing climate and how the Agency can accordingly adapt in order to continue meeting its mission of protecting human health and the environment. Under the Agency's Superfund Program, existing processes for planning and implementing contaminated site cleanup provide a robust structure that allows consideration of climate change impacts. Climate change vulnerability analyses and adaptation planning leading to increased remedy resilience may be integrated throughout the Superfund process, including feasibility studies, remedial designs and remedy performance reviews or the equivalent in other cleanup programs. Due to wide variation in the location and hydrogeologic characteristics of contaminated sites, the nature of remedial actions at those sites, and local or regional climate and weather regimes, the process of considering climate change impacts and potential adaptation measures is most effective through use of a site-specific strategy.

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Resiliency Considerations

- Per the grants T&Cs, Resiliency must be included as part of the Effectiveness evaluation of an ABCA:
 - Climate Change Impacts
 - Resiliency Checklist developed to assist grantees with this requirement
 - Resiliency Checklist itself is NOT a requirement, rather a guidance
- Included subsequent to the alternatives analysis to optimize the efficiency and effectiveness of a preferred alternative:
 - ASTM BMP Process and/or EPA GSR Guidance
 - ASTM Greener Cleanups Standard



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GSR in the ABCA

- Per the grant T&Cs, GSR should be considered as a way to optimize a selected cleanup alternative to minimize waste and adverse impacts:
 - GSR is NOT a requirement, but we ask them to incorporate it
- Ideas for GSR
 - EPA's BMP Fact Sheets (through clu-in.org)
 - EPA Region 1 GSR Guidance
 - ASTM Greener Cleanups Standard
 - Grantees can:
 - Just get ideas from the BMPs
 - Follow the standard (BMP Process) – eligible grant cost

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ASTM's Standard Guide for Greener Cleanups E2893

Describes a process for identifying, evaluating, and incorporating *best management practices (BMPs)* and, when deemed appropriate, for integrating a *quantitative evaluation*** into a cleanup to reduce its environmental footprint.

**In most cases, a quantitative evaluation is probably not justified for the scope, size, budget, and schedule of a Brownfields project

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EPA OSWER 2013 Memo of Encouragement

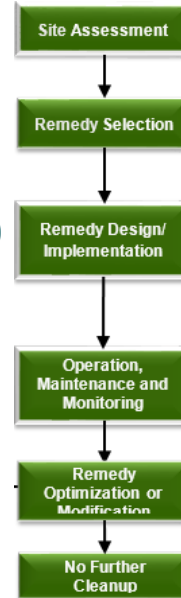
- Reiterates Principles for Greener Cleanups
- Outlines EPA's greener cleanup efforts including ASTM's Standard Guide
- Summarizes EPA's role in Standard Guide development process
- Lists Standard Guide's highlights
- Recommends EPA regions and programs facilitate and encourage its use

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ASTM Suggested Process Implementation

- Guide may be initiated at any time during any cleanup phase:
 - Site assessment
 - Remedy selection (ABCA, Phase III)
 - Remedy design/implementation (Phase IV)
 - Operation, maintenance and monitoring
 - Remedy optimization
- However, it may make more sense for certain cleanup phases

(e.g., for site assessment, environmental footprint reductions may not justify extra time/effort to conduct analysis)



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ASTM Greener Cleanups Standard

Table of Contents

- Section 1: Scope
- Section 2: Referenced Documents
- Section 3: Terminology
- Section 4: Significance and Use
- Section 5: Planning and Scoping
- Section 6: BMP Evaluation Process
- Section 7: Quantitative Evaluation Process
- Section 8: Documentation and Reporting
 - Appendix 1: Resources
 - Appendix 2: Technical Summary Form
 - Appendix 3: BMP Table
 - Appendix 4: Information on Quantitative Evaluation

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ASTM Greener Cleanups Standard

Section 6: BMP Process

➡ **Goal:** To enable the user to identify, prioritize, select, implement, and document the use of BMPs to reduce environmental footprint of cleanup activities

- **Step 1:** Opportunity Assessment
- **Step 2:** BMP Prioritization
- **Step 3:** BMP Selection
- **Step 4:** BMP Implementation
- **Step 5:** BMP Documentation

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Standard Management Practices are NOT Best Management Practices

Standard Management Practices (not included)

- Recycling office waste
- Using compact fluorescent light bulbs
- Minimizing paper use through electronic filing systems

Best Management Practices (BMPs) examples

- When possible, operate system during off-peak hours of electrical demand without compromising cleanup progress
- Use gravity flow where feasible to reduce the number of pumps for water transfer after subsurface extraction

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Step 1: Opportunity Assessment

- A review of BMPs, including those listed in Appendix X3, to determine which BMPs apply to the cleanup phase being evaluated
- Screening level assessment
- All potentially applicable BMPs are retained regardless of cost/other factors
- Other BMPs (than those included in Appendix X3) can be added

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Greener Cleanup BMP Table (Appendix X3)

- Standard Guide includes table with over 160 BMPs
- ASTM provides table in Excel format as an “Adjunct”
- User can sort the table by category, technology or core element
 - 10 Categories (e.g., power & fuel, materials, vehicles...)
 - 11 Technologies (e.g., SVE, P&T, excavation...)
 - 5 Core elements
- User strongly encouraged to add BMPs to the table

BMP Table Filters

BMP Categories (10)	Core Elements (5)	Remedial Technologies (11)
Project Planning and Team	Energy	Soil Vapor Extraction
Sampling and Analysis	Air	Air Sparging
Materials	Water	Pump and Treat
Vehicles and Equipment	Materials and Waste	In-situ Chemical Oxidation
Site Preparation/Land Restoration	Land and Ecosystems	Bioremediation/MNA
Buildings		In-Situ Thermal Treatment
Power and Fuel		Phytotechnology
Surface Water and Storm Water		Subsurface Containment & Treatment Barriers
Residual Solid and Liquid Waste		Excavation and Surface Restoration
Wastewater		Ex-Situ Bio/Chemical Oxidation
		Vapor Intrusion Mitigation

BMPs within Appendix X3 table

Treatment Technology	# (potentially) applicable BMPs
soil vapor extraction	90
air sparging	88
pump and treat	95
in-situ chemical oxidation	88
bioremediation/monitored natural attenuation	90
in-situ thermal treatment	100
phytotechnology	92
subsurface containment & treatment barriers	80
excavation and surface restoration	93
vapor intrusion mitigation	77

Source: FAQs in <http://www.epa.gov/oswer/greenercleanups/standard.html>

Appendix X3 BMP Table

Best Management Practice	Core Element Addressed (at Site Level)				
	Energy	Air	Water	Materials and Waste	Land and Ecosystems
Operate system during off-peak hours of electrical demand, without compromising cleanup progress	X				
Use pulsed rather than continuous injections when delivering or extracting air to increase energy efficiency when nearing asymptotic conditions	X				
Use gravity flow where feasible to reduce the number of pumps for water transfer after subsurface extraction	X			X	
Install amp meters to evaluate consumption rates on a real-time basis to evaluate options for off-peak energy usage	X				
Use on-site generated renewable energy (including but not limited to solar photovoltaic, wind turbines, landfill gas, geothermal, and biomass combustion, etc.) to power cleanup activities	X	X			
Use excess plant steam as an energy source to power cleanup activities	X				

Step 2: BMP Prioritization

- Prioritize BMPs based on their relative ability to reduce environmental footprint
- Assign lower priority to those BMPs unlikely to result in significant reductions
- Prepare prioritized list of BMPs
- Based on professional judgment (of lead environmental professional/project team)

Step 3: BMP Selection

- Select BMPs retained for implementation, based on potential to environmental footprint reductions, relative to other pertinent factors:
 - Implementability
 - Effectiveness
 - Reliability
 - Short-term risks
 - Community concerns
 - Cost
 - Potential for environmental trade-offs

The user should implement BMPs that reduce or have no effect on the project cost

Step 4: BMP Implementation

- Implement the selected BMPs
 - If during implementation, new information or changed circumstances render a selected BMP inapplicable, impractical, cost-prohibitive, or unacceptable to the public, the user may elect not to implement that specific BMP. User should document rationale for not implementing it. ▫

Step 5: BMP Documentation

- Record Step 2 through Step 4 in a table
 - Include prioritized list, identifying those that are implemented and those that were not implemented (with rationale)

Section 7: Quantitative Evaluation

- Qualitative Evaluation is most suited to large-scale or complex sites
- Outlines a seven step process
- Accommodates environmental footprint and Life Cycle Analysis (LCA) approaches
- Describes uses for quantitative evaluation
 - Opportunity Evaluation
 - Technology Evaluation
 - Metrics for BMPs

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Section 8: Documentation and Reporting

Step 1: Document for each phase

- BMP Summary Tables
 - List prioritized BMPs
 - Identify those implemented
 - Include rationale for those not implemented
 - Identify BMPs required by law or regulation
- Quantitative Evaluation Report, if applied

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Section 8: Documentation and Reporting

Step 2: Make publically available

- Technical Summary (Appendix X2 form):
 - Site information
 - Environmental footprint reductions across the core elements (qualitative or quantitative)
- BMP Summary Tables and Quantitative Evaluation Report, if applicable (for each phase)
- Self-Declaration (see next slide)
- Make available in a public location or on a publically available website

Section 8: Documentation and Reporting

Self-Declaration

User should include the following signed and dated statement:

“A greener cleanup evaluation was conducted in conformance with the ASTM E2893 Standard Guide for Greener Cleanups for [site name] located at [insert legal address] by [insert legal name and address of organization that is responsible for the cleanup, if applicable]”

ASTM will post documentation on website. Contact

Kate McClung at: kmcclung@astm.org

Appendix X2 form (Technical Summary)

Instructions: This form is an example template. The user may use this Technical Summary Form or another applicable format that contains the same information. The user can complete this form to summarize the BMPs implemented and quantitative evaluation performed, if appropriate. With the exception of Part 4.0, which is only applicable to users who performed a quantitative evaluation, the user should fill out all sections, or attach sheets, and input “NA” for items that are not applicable. If information is included in a report, the user only needs to reference the report.

X2.1 General Information

X2.1.1 User's name and organization:

X2.1.2 Date:

X2.1.3 Property name:

X2.1.4 Site location (address, city, state):

X2.1.5 Tax parcel ID # or EPA, state, project ID #:

X2.1.6 Cleanup program (for example, RCRA, state voluntary cleanup program):

X2.1.7 Lead oversight agency (for example, EPA, state, other):

X2.2 Site Status Information

X2.2.1 Current cleanup phase:

X2.2.2 Contaminants at the site:

X2.2.3 Current, historical, and reasonably anticipated future use(s) for the site, if known:

X2.2.4 Potential human or ecological receptors of contamination:

X2.2.5 Uses of adjacent properties:

X2.2.6 Stakeholder involvement in the site:

X2.2.7 Past or on-going cleanup activities:

X2.2.8 Technologies or engineering controls implemented:

X2.2.9 Interim or final cleanup goals, if established, and the status in achieving those goals:

X2.2.10 Activity and use limitations:

X2.3 Application of Guide—See Table X2.1.

X2.4 Environmental Footprint Reduction—Describe estimated environmental footprint reductions that resulted from implementing BMPs and a quantitative evaluation, if applicable, across the core elements. The anticipated environmental footprint reductions may be described qualitatively (only the BMP process was applied) or quantitatively (if a quantitative evaluation was conducted, in addition to the BMP process).

X2.5 BMP Process Summary—Provide the following for each cleanup phase in which the guide was implemented.

X2.5.1 Attach tables developed according to 6.6:

X2.5.2 List all BMPs that were required by environmental laws or regulations:

X2.6 Quantitative Evaluation Summary—For each cleanup phase or activity in which a quantitative evaluation was implemented, attach sheet(s) or reference the report(s) which includes the information listed in 7.4.7.

Appendix X2 form (continued)

TABLE X2.1 Application of Guide (check all that apply)

Cleanup Phase	BMP Evaluation Process	Quantitative Evaluation Process with BMPs		Results Document	
		Footprint Analysis	LCA	Evaluation	Implementation
Site Assessment					
Remedy Selection					
Remedy Design/Implementation					
Operation, Maintenance and Monitoring					
Remedy Optimization					

Helpful Links

ASTM Greener Cleanups Standard

www.astm.org/Standards/E2893.htm

EPA Greener Cleanups:

www.epa.gov/oswer/greenercleanups

EPA Greener Cleanup Principles:

www.epa.gov/oswer/greenercleanups/principles.html

EPA Greener Cleanup Standard Initiative:

www.epa.gov/oswer/greenercleanups/standard.html

CLU-IN (Technical resources):

www.clu-in.org/greenremediation

QUESTIONS ?

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