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.
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!

Basic Brownfields Cleanup Project Framework

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

Complete Alternatives Evaluation (including Resiliency)

Select Recommended Alternative

ADD GSR LANGUAGE within ABCA by either:
   a) Add a new section: “Green and Sustainable Remediation Measures” or
   b) Just add a few sentences discussing plans to make it greener (more sustainable).

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

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

Climate Change Adaptation Requirements and Guidance

**Requirement:**
- Area-Wide Planning (AWP) Grantees starting in FY14.

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

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

Key Messages

1. Heat waves, coastal flooding, and river flooding will pose a growing challenge to the region’s environmental, social, and economic systems. This will increase the vulnerability of the region's residents, especially its most disadvantaged populations.

2. Infrastructure will be increasingly compromised by climate-related hazards, including sea level rise, coastal flooding, and intense precipitation events.

3. Agriculture, fisheries, and ecosystems will be increasingly compromised over the next century by climate change impacts. Farmers can explore new crop options, but these adaptations are not cost- or risk-free. Moreover, adaptive capacity, which varies throughout the region, could be overwhelmed by a changing climate.

4. While a majority of states and a rapidly growing number of municipalities have begun to incorporate the risk of climate change into their planning activities, implementation of adaptation measures is still at early stages.
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
Analysis of Brownfields Cleanup Alternatives (ABCA)

Complete Alternatives Evaluation (including Resiliency)

Select Recommended Alternative

**ADD GSR LANGUAGE within ABCA** by either:

a) Add a new section: “Green and Sustainable Remediation Measures” or

b) Just add a few sentences discussing plans to make it greener (more sustainable).

---

**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
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.

---

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
**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).

**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
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

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
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

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

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

### BMPs within Appendix X3 table

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

Source: FAQs in http://www.epa.gov/oswer/greenercleanups/standard.html
**Appendix X3 BMP Table**

<table>
<thead>
<tr>
<th>Best Management Practice</th>
<th>Energy</th>
<th>Air</th>
<th>Water</th>
<th>Materials and Waste</th>
<th>Land and Ecosystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate system during off-peak hours of electrical demand, without compromising cleanup progress</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use pulsed rather than continuous injections when delivering or extracting air to increase energy efficiency when nearing asymptotic conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use gravity flow where feasible to reduce the number of pumps for water transfer after subsurface extraction</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Install amp meters to evaluate consumption rates on a real-time basis to evaluate options for off-peak energy usage</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use excess plant steam as an energy source to power cleanup activities</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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
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

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)
Appendix X2 form (continued)

<table>
<thead>
<tr>
<th>Cleanup Phase</th>
<th>EMP Evaluation Process</th>
<th>Quantitative Evaluation Process with BMPs</th>
<th>LCA</th>
<th>Results Document</th>
<th>Evaluation</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Assessment</td>
<td>Remedy Selection</td>
<td>Methodology</td>
<td>Operability</td>
<td>Monitoring</td>
<td>Optimization</td>
<td></td>
</tr>
</tbody>
</table>

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

Brownfields
Green Remediation Lead:
Laurie O’Connor
617-918-1605
oconnor.laurie@epa.gov

Brownfields
Sustainability Lead:
Jessica Dominguez
617-918-1627
dominguez.jessica@epa.gov