VRP GREEN AND SUSTAINABLE REMEDIATION BEST MANAGEMENT PRACTICES

1.0 - INTRODUCTION

"Green and Sustainable Remediation" (GSR) takes into consideration the environmental impacts of site cleanups and implements measures to mitigate these environmental impacts and increase the overall sustainability of site remedies. Per the Wyoming Department of Environmental Quality (WDEQ), Voluntary Remediation Program (VRP), Green and Sustainable Remediation Policy, issued May 7, 2012, the VRP requests that WDEQ project managers, responsible parties, consultants and contractors consider GSR during all phases of cleanup at contaminated sites. As part of this effort, the VRP asks that all parties consider and implement GSR best management practices (BMPs) to reduce the environmental impact of, and increase the sustainability of, remediation projects in Wyoming. Specific GSR BMPs are provided in Section 2.0 and related GSR references and tools are provided in Section 3.0.

2.0 - GSR BEST MANAGEMENT PRACTICES

GSR BMPs are practices that, when implemented as standard protocol during the site cleanup process, help to mitigate the potential negative environmental impacts of site investigation and remedy implementation activities and increase the overall sustainability of the cleanup project. GSR BMPs achieve these goals by:

- Reducing the quantity of energy and non-renewable resources required to implement site remedies;
- Reducing the quantity of emissions and waste generated as remedy by-products; and
- Improving community relations (and realizing other social benefits) during the site cleanup process.

The WDEQ recommends that VRP Project Managers, responsible parties, consultants and contractors consider and implement (where appropriate) the GSR BMPs provided in Sections 2.1 and 2.2 at contaminated sites in Wyoming. The GSR BMPs provided in Section 2.1 may be considered at all stages of the site cleanup process, including assessment, investigation, remedy evaluation, remedy selection, remedy implementation and design, operation and maintenance, and site closure. The GSR BMPs provided in Section 2.2 are specific to the remedy evaluation, selection, design and implementation stages of the cleanup process. Please be advised that some of the GSR BMPs listed in Section 2.1 and 2.2 may require permits or authorization through programs outside of the VRP.

Please provide methods for implementing applicable GSR BMPs in site work plans and document GSR efforts in project reports.

2.1 - GSR BMPS TO CONSIDER DURING ALL PHASES OF SITE CLEANUP:

GSR BMPS to reduce air impacts:
Reduce direct and indirect green-house gas and other emissions (e.g., CO, CO_2, CH_4, N_2O, O_3, VOCs, ozone depleting substances, NO_X, SO_X and particulates) by reducing vehicle idling (e.g., shut off vehicles when not in use for more than 5 minutes), and minimizing truck travel and the use of heavy equipment; properly maintain vehicles and equipment and attempt to use appropriately-sized equipment for site-work.

Use Ultra Low Sulfur Diesel (ULSD) and/or retrofit machinery with clean diesel technologies (e.g., diesel particulate filters).
GSR BMPS to reduce energy demand:
If possible, use renewable energy to power treatment systems and alternative fuels to operate machinery and vehicles.
Design field work to minimize travel to the site; consider using local contractors and staff to decrease travel.
When possible, use locally manufactured materials and local disposal facilities.
GSR BMPS to reduce water impacts:
When appropriate and effective, use steam and non-phosphate detergent instead of toxic cleaning fluids to decontaminate field equipment.
Conserve fresh water; institute stormwater runoff controls and ensure all stormwater permitting requirements are met.
Design stormwater management systems to capture and infiltrate uncontaminated runoff; minimize creation of impermeable surfaces.
Reclaim treated water for re-use.
Prevent long-term erosion and impacts to off-site resources (e.g., water bodies and habitat).
GSR BMPS to reduce soil and habitat impacts:
Create efficient traffic patterns to reduce soil compaction.
Screen and stockpile clean, excavated soil for potential reuse on-site; consider segregation of topsoil.
Minimize habitat disturbance; consider sensitive or threatened wildlife and environmental regulations protecting them.
GSR BMPS to address waste:
Reduce waste; recycle and reuse materials that would otherwise be treated as waste (e.g., metals, concrete, lumber and other construction and demolition materials).
Where possible and effective, identify methods to reduce the generation of investigation-derived waste (e.g., direct push drill rigs (instead of rotary rigs), passive water samplers and/or low-flow sampling).
GSR BMPS to increase social sustainability:
Consider using local contractors and staff to generate local job opportunities.
Minimize health and safety risks.
Control and mitigate dust, odors, noise and light disturbances.
Solicit public participation in order to increase community awareness of and comment on planned activities and restrictions (if applicable) at the site; engage key internal and external stakeholders during the life of the project.
Document any community “lessons learned” for application to future projects.
GSR BMPS for project management:
Develop a conceptual site model (CSM) early in the project life; re-evaluate and refine the CSM as necessary to supply data for good decision making, to support the selection of green remediation technologies and to potentially accelerate the progression of site closure.

2.2 – GSR BMPS TO CONSIDER DURING REMEDY EVALUATION, SELECTION, DESIGN AND IMPLEMENTATION:

GSR BMPS to consider during remedy evaluation and selection:
Consider the environmental impacts of treatment methods when evaluating/selecting site remedies.
Identify and implement technologies that use less energy and water and generate fewer emissions than alternatives.
Evaluate ways to increase energy efficiency and reduce the demand for non-renewable energy by considering the use of alternative, renewable energy supplies to power active treatment systems and/or, if appropriate, considering remedies that require a minimal power supply for long-term operation (e.g., bioremediation, phytoremediation, soil amendments, engineered wetlands, permeable reactive barriers, etc.).
Evaluate remedies that permanently destroy contamination and/or aggressively treat sources in order to determine if these remedies will result in lower environmental impacts than remedies necessitating long-term site management and/or the operation and maintenance of treatment or containment systems.
Evaluate on-site and in-situ treatment and containment technologies to determine if these methods will result in lower environmental impacts than off-site transport and disposal of contaminated media.
Evaluate passive energy technologies, such as MNA or phytoremediation, as final steps at sites currently utilizing active treatment technologies.
If appropriate, conduct energy use and emissions calculations to compare remedial alternatives[1].
Where feasible, integrate remedies with the proposed end use and support green and sustainable re-development.
Encourage green and healthy communities and working landscapes; maintain or improve public access to open space.
GSR BMPS to consider during remedy design:
Design functional cover systems (e.g., habitat, recreation, renewable energy generation, etc.).
Use native species requiring little or no irrigation for re-vegetation.
Increase habitat value and establish new habitat when feasible.
Incorporate green building design and consider reuse of existing slabs, foundations and buildings.
Design active treatment systems to allow for the use of reduced energy supplies (e.g., for air sparge and/or soil vapor extraction systems, consider using variable frequency drives on equipment and designing the systems to cycle through legs in order to reduce blower sizes); design active treatment systems so that portions or legs may be decommissioned as the contaminant plume decreases in size.
GSR BMPS to consider during remedy implementation:
Evaluate the effectiveness of using intermittent, reduced and/or alternative energy supplies to power existing active remediation systems; optimize systems to reduce energy demand and time to site closure (e.g., decommission portions of the system as the contaminant plume decreases in size); shut down unnecessary equipment.
Conduct pilot studies to confirm remedy/technology effectiveness before instituting full-scale projects; verify that active systems are functioning properly.
Increase the reliability of remediation systems to minimize the frequency of O&M site visits; if applicable and appropriate, incorporate remote monitoring features into long-term treatment systems.

[1] Please consult the WDEQ project manager for more information on energy use and emissions calculations.

Consider sustainability during periodic reviews and conduct periodic optimization of active treatment systems; review historical data to determine if reduced sampling frequencies and/or quantities are warranted at the site.
Re-evaluate and refine the CSM as necessary to supply data for good decision making and to potentially accelerate the progression of site closure.
Periodically review emerging green technologies and evaluate the potential of these new technologies to improve the effectiveness or efficiency of the current site remedy.
Verify that environmental receptors do not change over time.

3.0 - REFERENCES

3.1 - GSR BMP REFERENCES:

The WDEQ compiled the list of GSR BMPs from the following federal and state resources:

EPA. National Clean Diesel Campaign (NCDC). http://www.epa.gov/diesel/

EPA. Green Remediation Focus. http://cluin.org/greenremediation/.

EPA, Office of Solid Waste and Emergency Response. Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites. EPA 542-R-08-002. April 2008. Available at http://www.clu-in.org/greenremediation/docs/Green-Remediation-Primer.pdf.

Illinois Environmental Protection Agency. Greener Cleanups: How to Maximize the Environmental Benefits of Site Remediation. February 2008. Available at http://www.epa.state.il.us/land/greener-cleanups/matrix.pdf.

Interstate Technology & Regulatory Council (ITRC). Green and Sustainable Remediation: State of the Science and Practice. GSR-1. Washington, D.C.: Interstate Technology & Regulatory Council, Green and Sustainable Remediation Team. May 2011. Available at http://www.itrcweb.org/Documents/GSR-1.pdf.

Interstate Technology & Regulatory Council (ITRC). Green and Sustainable Remediation: A Practical Framework. GSR-2. Washington, D.C.: Interstate Technology & Regulatory Council, Green and Sustainable Remediation Team. November 2011. Available at http://www.itrcweb.org/Documents/GSR-2.pdf.

New York State Department of Environmental Conservation. DER-31/Green Remediation. Issued August 11, 2010. Revised January 20, 2011. Available at http://www.dec.ny.gov/docs/remediation_hudson_pdf/der31.pdf

U.S. Sustainable Remediation Forum. Sustainable Remediation White Paper – Integrating Sustainable Principles, Practices, and Metrics into Remediation Projects. Remediation. Vol. 19. Iss. 3. p. 5-114. Wiley Interscience. June 12, 2009. Available at http://www.sustainableremediation.org/library/issue-papers/.

3.2 - ADDITIONAL GSR REFERENCES/RESOURCES AVAILABLE TO THE PUBLIC:

In addition to the GSR BMP references, further information on GSR (including links to various GSR tools for conducting energy use and emissions calculations) can be found at:

Websites:

Association of State and Territorial Solid Waste Management Officials (ASTSWMO). Green Cleanups Information Resources. http://www.astswmo.org/Pages/Policies_and_Publications/Sustainability/Greener_Cleanups.html

Department of the Navy. Naval Facilities Engineering Comman (NAVFAC), Green and Sustainable Remediation. http://www.ert2.org/t2gsrportal/default.aspx

EPA. Green Remediation Focus. http://cluin.org/greenremediation/.
This website provides links to additional EPA resources for GSR.

Interstate Technology and Regulatory Council (ITRC). Green and Sustainable Remediation. http://www.itrcweb.org/teampublic_GSR.asp

Sustainable Remediation Forum (SURF). http://www.sustainableremediation.org/

GSR Tools:

A comprehensive list of tools applicable to GSR evaluations is provided in Appendix A of the May 2011, ITRC GSR guidance document, "Green and Sustainable Remediation: State of the Science and Practice." This document is available for free download at:http://www.itrcweb.org/Documents/GSR-1.pdf.

The following tools are a subset of the list provided in the ITRC guidance document. These tools represent a small portion of available tools, and their use and application is dependent on site-specific circumstances and current WDEQ rules and policies. These tools are currently available to the public, are free to download and are used to qualitatively and/or quantitatively compare remedial alternatives for use in GSR evaluations. Please contact a WDEQ project manager for more information on how to use these tools.

Greener Cleanups Matrix: How to Maximize the Environmental Benefits of Site Remediation. Available at: http://www.epa.state.il.us/land/greener-cleanups/matrix.pdf.
Provided by the Illinois Environmental Protection Agency. The matrix is a simple tool used for qualitative comparisons of technologies and practices.

Green Remediation Evaluation Matrix (GREM). Available at: http://www.dtsc.ca.gov/omf/grn_remediation.cfm
Provided by the California Department of Toxic Substances. The GREM is a matrix used for qualitative comparisons of treatment technologies.

SiteWise™. Available at: http://www.ert2.org/t2gsrportal/sitewise.aspx.
Provided by Battelle, the U.S. Navy and the U.S. Army Corps. SiteWise™ estimates energy use, water use, emissions, and accident risk for remedial alternatives.

Sustainable Remediation Tool (SRT™). Available at:
http://www.afcee.af.mil/resources/technologytransfer/programsandinitiatives/sustainableremediation/srt/index.asp. Provided by the U.S. Air Force Center for Engineering and the Environment (AFCEE). SRT™ estimates energy use, water use, emissions, accident risk and technology costs for remedial alternatives.