December 2009

Questions and Answers Re. Section 438 Guidance

Q: What is Section 438 of the Energy Independence and Security Act of 2007 (EISA)?

A: In December 2007, Congress enacted the Energy Independence and Security Act of 2007(EISA). Section 438 of that legislation established strict stormwater runoff requirements for federal development and redevelopment projects. The provision reads as follows:

> "Storm water runoff requirements for federal development projects. The sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow."

Section 438 of EISA requires federal agencies to develop and redevelop applicable facilities in a manner that maintains or restores stormwater runoff to the maximum extent technically feasible.

Q: Why did Congress enact Section 438?

A: Stormwater runoff in urban areas is one of the leading sources of water pollution in the United States. Traditional urban areas typically include large areas of impervious surfaces such as roads, sidewalks and buildings. These impervious surfaces prevent rainwater from infiltrating into the ground, and as a result, stormwater runs off the site at rates and volumes that are much higher than would naturally occur. These higher stormwater rates and volumes can cause increased flooding and stream channel erosion, larger pollutant loadings to surface waters, and increased temperature of runoff, among other impacts.

Under Section 438 of EISA, Congress has required federal agencies to provide national leadership to reduce water quality problems from stormwater runoff. EPA has written technical guidance to help federal agencies implement Section 438, which focuses generally on retaining rainfall on site through infiltration, evaporation/transpiration, and re-use to the same extent as occurred prior to development. By reducing stormwater runoff from new development, water quality problems associated with development are reduced.

Q: What is Executive Order 13514?

A: On Oct. 5, 2009, the President signed Executive Order (EO) 13514, "Federal Leadership in Environmental, Energy, and Economic Performance." The EO calls for federal agencies to lead by example in the areas of clean energy and safeguarding the health of our environment. EO 13514 sets as policy that federal agencies shall "…conserve and protect water resources through efficiency, reuse, and stormwater management." The EO also specifically requires EPA to issue guidance on the implementation of Section 438 of EISA by December 5, 2009

Q: Who needs to comply with Section 438?

A: Section 438 applies to the "sponsor of any development or redevelopment project involving a Federal facility . . ." The "sponsor" should generally be regarded as the federal department or agency that owns, operates, occupies or is the primary user of the facility and has initiated the development or redevelopment project. If the federal agency hires another entity to perform activities such as site construction or maintenance, the agency should nonetheless be regarded as the sponsor and be responsible for assuring compliance with the requirements of Section 438.

Q: What practices will be used to implement the guidance?

A: Implementation of Section 438 of the EISA can be achieved through the use of stormwater management practices often referred to as "green infrastructure" or "low impact development" practices which are described in the guidance. The intention of the statute is to maintain or restore the pre-development site hydrology during the development or redevelopment process. More specifically, this requirement is intended to maintain or restore stream flows such that receiving waters are not negatively impacted by changes in runoff temperature, volumes, durations and rates.

Additional information on green infrastructure and low impact development practices may be found at: www.epa.gov/greeninfrastructure and
www.epa.gov/nps/lid/.

Q: What are sponsors of federal development projects subject to Section 438 required to do?

A: Site designers must design, construct, and maintain stormwater management practices to preserve or restore the hydrology of the site during the development or redevelopment process in compliance with Section 438. Site designers have two options to meet this standard:

Option 1 provides site designers with a process to design, construct, and maintain stormwater management practices that manage rainfall on-site, and prevent the off-site discharge of stormwater from all rainfall events less than or equal to the 95^{th} percentile rainfall event.

Option 2 allows the site designers to design, construct, and maintain stormwater management practices using a site-specific hydrologic analysis to determine pre-development runoff conditions instead of using the estimated volume approach of Option 1. Under Option 2, pre-development hydrology would be determined based on site-specific conditions and local meteorology by using continuous simulation modeling techniques, published data, studies, or other established tools.

Option 1 (retaining the 95^{th} percentile rainfall event) is a performance-based, simplified approach that site designers can use to meet Section 438, while Option 2 (site-based hydrologic analysis) allows the site designer to conduct a hydrologic analysis of the site based on site-specific conditions.

Q: What is the maximum extent technically feasible (METF)?

A: Maximum extent technically feasible (METF) is the standard in Section 438 that stormwater management measures must be designed to meet. METF is a process site designers use to determine the types of practices that can be implemented at a site to maintain or restore the hydrologic condition of the site.

Q: What is the 95th percentile rainfall event, and how do I determine it for my area?

A: The 95th percentile rainfall event is the event whose precipitation total is greater than or equal to 95 percent of all storm events over a given period of record. For example, to determine what the 95th percentile storm event is in a specific location, all 24-hour storms that have recorded values over a 30 year period would be tabulated and a 95th percentile storm would be determined from this record (i.e., 5% of the storms would be greater than the number determined to be the 95th percentile storm). Thus the 95th percentile storm would be represented by a number such as 1.5", and this would be the design storm.

Section E of the Technical Guidance on Section 438 contains information on how to calculate the 95th percentile rainfall event for a specific area. A long-term record of daily rainfall amounts (ideally, at least 30 years) is needed to calculate the 95th percentile rainfall.

Q: What is the 95th percentile rainfall event for areas around the country?

The table below includes the 95th percentile storm event for select U.S. cities (adapted from Hirschman and Kosco, 2008)[1]:

City	95th Percentile Event Rainfall Total (in)	City	95th Percentile Event Rainfall Total (in)
Atlanta, GA	1.8	Kansas City, MO	1.7
Baltimore, MD	1.6	Knoxville, TN	1.5
Boston, MA	1.5	Louisville, KY	1.5
Buffalo, NY	1.1	Minneapolis, MN	1.4
Burlington, VT	1.1	New York, NY	1.7
Charleston, WV	1.2	Salt Lake City, UT	0.8
Coeur D'Alene, ID	0.7	Phoenix, AZ	1.0
Cincinnati, OH	1.5	Portland, OR	1.0

[1] Hirschman, David and John Kosco. 2008. *Managing Stormwater in Your Community: A Guide for Building an Effective Post-Construction Program*, Center for Watershed Protection, www.cwp.org/postconstruction.

Columbus, OH	1.3	Seattle, WA	1.6
Concord, NH	1.3	Washington, DC	1.7
Denver, CO	1.1		

Q: Do federal facilities have to meet the 95th percentile storm, or do they have other options?

A: Retaining the 95th percentile rainfall event (Option 1) is a performance based approach that site designers can use as a surrogate for determining pre-development hydrologic conditions. Site designers can also use a site-specific hydrologic analysis that estimates the volume of infiltration, evapotranspiration or onsite stormwater harvesting and use based on site-specific hydrologic conditions (Option 2). The site-specific hydrologic conditions in Option 2 will typically be determined through continuous simulation modeling techniques.

Q: What design options are available to meet section 438?

A: Federal agencies will likely use green infrastructure (GI) or low impact development (LID) management approaches and technologies that would enhance and/or mimic the natural hydrologic cycle processes of infiltration, evapotranspiration, and use. Federal agencies can also use footprint reduction practices (e.g., building up instead of out) to reduce their stormwater impact. Green infrastructure approaches include biological systems and engineered systems. These include but are not necessarily limited to:

- Rain gardens, bioretention, and infiltration planters
- Porous pavements
- Vegetated swales and bioswales
- Green roofs
- Trees and tree boxes
- Pocket wetlands
- Reforestation/revegetation
- Protection and enhancement of riparian buffers and floodplains
- Rainwater harvesting for use (e.g., irrigation, HVAC make-up, non-potable indoor uses).

Q: What if a federal facility cannot control the required stormwater volume on-site?

A: For projects where technical infeasibility exists, the federal agency or department sponsoring the project must document and quantify that stormwater strategies, such as infiltration, evapotranspiration, and harvesting and use have been used to the METF, and that full employment of these types of controls are infeasible due to site constraints. Documentation of technical infeasibility should include, but may not be limited to, engineering calculations, geologic reports, hydrologic analyses, and site maps. A determination that the performance design goals cannot be met on site must include analyses that rule out the use of an adequate combination of infiltration, evapotranspiration, and use measures.

In cases where the facility has a defensible technical infeasibility and can provide adequate documentation of site conditions or other factors that preclude full implementation of the performance design goal, the facility must still install stormwater practices to infiltrate, evapotranspire and/or harvest and use onsite the maximum amount of stormwater technically feasible.

Q: Are there case studies showing how to meet Section 438?

A: Part II of the EISA Section 438 Technical Guidance includes nine case study scenarios that illustrate the types of practices necessary to comply with Section 438. The nine scenarios use practices such as bioretention, porous pavement, cisterns or green roofs to retain on-site the runoff from the 95^{th} percentile rainfall event.

Q: What are the benefits of implementing Section 438?

A: Implementation of these new stormwater performance requirements in EISA Section 438 provides numerous environmental and economic benefits in addition to reducing the volume of stormwater runoff, including the following:

Benefits to Water Resources

- *Cleaner Water.* The use of plants, soils and water harvesting and use practices can reduce stormwater runoff volumes and pollutant loadings and the frequency and magnitude of combined sewer overflows (volume and pollutant loading reductions). These practices are part of a larger set of practices called green infrastructure/low impact development (GI/LID) practices.
- *Clean and Adequate Water Supplies.* GI/LID approaches using soil based vegetated infiltration systems can be used to recharge ground water and maintain stream base flow. By recharging ground water aquifers, aquatic ecosystem health is maintained and base flows are increased which helps ensure more constant flows for drinking water withdrawals. Harvesting and reusing rainwater also reduces the need to use potable water for all uses and can reduce both the infrastructure and energy needed to treat and transport both drinking water and stormwater.
- *Source Water Protection.* GI/LID practices provide pollutant removal benefits, thereby providing some protection for both ground water and surface water sources of drinking water. In addition, GI/LID practices provides ground water recharge benefits.

Other Social and Environmental Benefits:

- *Cleaner Air.* Trees and vegetation improve air quality by filtering many airborne pollutants and can help reduce the amount of respiratory illness (Vingarzan and Taylor, 2003).
- *Reduced Urban Temperatures.* Summer city temperatures can average 10ºF higher than nearby suburban temperatures (Casey Trees, 2007). High temperatures are also linked to higher ground level ozone concentrations. Vegetation creates shade, reduces the amount of heat absorbing materials and emits water vapor – all of which cool hot air (Grant, et al., 2003). Reductions in impervious surface and the use of light colored pervious surfaces (e.g., permeable concrete) also can mitigate urban temperatures.
- *Moderate the Impacts of Climate Change.* Climate change impacts and effects vary regionally, but GI/LID techniques can provide adaptation benefits for a wide array of circumstances. They can be

used to conserve, harvest and use water, to recharge ground waters and to reduce surface water discharges that could contribute to flooding. In addition, there are mitigation benefits such as reduced energy demand and carbon sequestration by vegetation.

- *Increased Energy Efficiency.* Green space helps lower ambient temperatures and, when incorporated on and around buildings, helps shade and insulate buildings from wide temperature swings, decreasing the energy needed for heating and cooling. Diverting stormwater from wastewater collection, conveyance and treatment systems can reduce the amount of energy needed to pump and treat the water. Energy efficiency not only reduces costs, but also reduces generation of greenhouse gases.
- *Community Benefits.* Trees and plants improve urban aesthetics and community livability by providing recreational and wildlife areas. Studies show that property values are higher when trees and other vegetation are present. Increased green space also has public health benefits and has been shown to reduce crime and the associated stresses of urban living.

Q. Where can I find a copy of the Technical Guidance?

A: The Technical Guidance is posted at: http://www.epa.gov/owow/nps/lid/section438

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