Guidelines for Storm Repair Work under DEC General Permits GP-0-13-006 and GP-2-13-003

General Permit Authorization

Following the storm surges and coastal flooding from Hurricane Sandy, DEC issued general permits (now GP-0-13-006, Storm Repair Work in Coastal Areas on Long Island), and GP-2-13-003, Storm Repair Work in New York City, within Freshwater Wetlands, and on Docks, Catwalks and Floats) to authorize activities for stabilization and repair that normally require Coastal Erosion Management or Tidal Wetlands permits along the coastal areas of Long Island, New York City and the lower Hudson Valley, or Freshwater Wetlands permits in New York City.

General permits GP-0-13-006 and GP-2-12-003 are in effect until October 31, 2014 and authorize specific types of repair and restorative work while waiving normal procedural requirements for the following activities *only*:

1. Stabilization of existing functional storm-damaged dwellings, decks and walkways with temporary bracing and pilings.
2. Construction of a single four-foot-wide walkway to access damaged dwellings.
3. Installation of up to four rows of sandbags or 1 cubic yard sand cubes at the toe of storm-damaged structures or eroded escarpments.
4. Placement of sand and/or material equivalent to existing material at the toe of eroded escarpments.
5. Repair or reconstruction of stairways that were functional before Hurricane Sandy.
6. Regrading of eroded dunes.
7. In-kind/in-place repair or reconstruction of bulkheads and shoreline erosion-control structures that were functional before Hurricane Sandy. No expansion or seaward extension of bulkheads or shoreline structures is authorized by this permit.
8. Repair or reconstruction of existing public roads, bridges, utilities and other public infrastructure.

GP-2-12-003 further authorizes the following within New York City only:

1. Repair or reconstruction of existing fences or installation of new temporary fences in freshwater wetlands or tidal wetlands or wetlands adjacent areas.
2. Removal of debris from waterways and tidal wetlands.
3. Removal of storm debris from certain freshwater wetlands and adjacent areas on Staten Island.
4. In-kind/in-place repair or reconstruction of docks, catwalks and floats that were functional before Hurricane Sandy.

Other activities, including excavating, filling, new construction, reconstruction or repair of substantially damaged dwellings, within the coastal floodplain, Coastal Erosion Hazard Area, and tidal and freshwater wetlands and their adjacent areas, will require additional authorizations. Property owners are strongly encouraged to take temporary measures, as authorized by the general permits, to stabilize storm-damaged dwellings and to prevent further erosion of escarpments. Clean sand that was moved from the dune or beach by the storm may be replaced on the eroded dune, but it is illegal to remove sand from the existing beach by scraping or other means without authorization. While the general permits do authorize repair or reconstruction of stairways, shoreline erosion-control structures and public infrastructure, DEC urges property owners to consider the current and future risk of damage to these structures before investing time and money in their repair or replacement. If, upon consideration of these risks, the property owner decides to proceed, DEC

suggests adoption of measures to enhance the structure’s ability to resist damage during future storms.

Future Risk

Hurricane Sandy is the most recent in a series of storms with devastating effects on life, property and local, state and national economies**.** New York has experienced numerous unusually severe extreme weather events over the past few years, and the odds are that Sandy will not be a once-in-a-lifetime event for many New Yorkers. Warming oceans will lead to more intense storms that maintain their strength as they move north.

In addition, future storm surges will have a higher starting place because of the rise in sea level. Sea level at the Battery in lower Manhattan is 13 inches higher than it was 100 years ago, allowing flood waters to deepen and flow further. Sea level rise will continue for centuries, with rates increasing as the Earth warms. Research reports completed for New York State and New York City indicate that due to sea-level rise alone, by the end of this century, what we now call a "ten-year flood" will occur every one to two years, and the water levels associated with these floods will be one to two feet deeper. A flood that we now expect to occur, on average, every 100 years will likely occur, on average, every 25 years.[1]

The table below provides sea-level rise projections for New York State. Recent analyses suggest actual sea-level rise will more likely be closer to the rapid ice-melt scenario projections below. However, adapting to the threat of future extreme storms is critical to protecting life, property and our natural resources and will make New Yorkers more resilient to current hazards as well.

[1] NYSERDA. Response to Climate Change in New York State. http://www.nyserda.ny.gov/climaid

Projected Sea-level Rise in New York[2]

Lower Hudson Valley & Long Island	**2020s**	**2050s**	**2080s**
Sea-level rise	2 to 5 in	7 to 12 in	12 to 23 in
Sea-level rise with rapid ice-melt scenario	5 to 10 in	19 to 29 in	41 to 55 in
Mid-Hudson Valley & Capital Region	**2020s**	**2050s**	**2080s**
Sea-level rise	1 to 4 in	5 to 9 in	8 to 18 in
Sea-level rise with rapid ice-melt scenario	4 to 9 in	17 to 26 in	37 to 50 in

Strategies to Reduce Risk

Natural Protective Features

Natural protective features include floodplains, wetlands, offshore bars, beaches, dunes and bluffs. They are the first line of defense against storm energy and flood waters. Disturbance of natural features through removal of vegetation and construction of hard structures, like bulkheads and seawalls, can result in increased erosion, flooding, changes in sediment transport and other unexpected adverse effects. Actions authorized by GP-0-13-006, GP-2-12-001 and GP-2-13-003 are stabilization of eroded escarpments with limited amounts of sand, as described in the general permits. All other activities, including removal of vegetation, excavation, and placement of structures, require a Coastal Erosion Hazard Area Permit and may require a tidal or freshwater wetlands permit. See Coastal Management at http://www.dec.ny.gov/permits/6064.html, Tidal Wetlands Permit Program at http://www.dec.ny.gov/permits/6039.html and Freshwater Wetlands Permits at http://www.dec.ny.gov/permits/6058.html.

Shoreline Erosion-control Structures

It may be necessary to immediately repair or reconstruct shoreline erosion-control structures where critical infrastructure or existing development faces immediate threats from erosion. However, erosion-control structures intended to prevent shoreline erosion can destroy valuable habitats, damage ecosystem function and often direct erosive forces elsewhere, rather than minimizing erosion. Erosion-control structures will also prevent tidal wetland vegetation from migrating landward as sea levels rise, resulting in loss of valuable wetland habitats and natural flood protection. In cases where erosion-control

[2] NYSERDA ClimAID Team. 2010. Integrated Assessment for Effective Climate-change Adaptation Strategies in New York State. C. Rosenzweig, W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, P. Grabhorn, Eds. New York State Energy Research and Development Authority, 17 Columbia Circle, Albany, NY 12203.

structures (e.g., stone revetments), are necessary, sloped structures are far preferable to vertical structures. The use of sloped protection reduces the need to excavate an existing slope and minimizes the amount of fill required landward of the structure. Sloped structures are also less prone to scour at the toe. For additional information, see *Design of Coastal Structures and Protection of Wave-based Erosion* at http://www.dec.ny.gov/lands/86534.html.

In areas where development or infrastructure is not at immediate risk of erosion, DEC suggests property owners consider removing erosion-control structures. Situations in which removal would be especially appropriate include the following:

- In areas where structures have sustained extensive damage and will not be rebuilt.
- The erosion-control structure separates aquatic or wetland vegetation from the waterline.
- The erosion-control structure tends to change direction or magnitude of wave energy, adversely affecting nearby properties.
- The erosion-control structure alters flow of sand and other material to nearby properties, increasing erosion and reducing the amount of beach material deposited.
- The erosion-control structure restricts access to the beach or shoreline.

Where feasible, property owners should consider use of techniques designed to provide natural ecosystem benefits while minimizing shoreline erosion, especially where development or infrastructure would be threatened by shoreline erosion. These techniques are often referred to as *ecologically enhanced methods* or *living shorelines*.

Living shoreline techniques are most often used where wave energy is lower than on open beaches, such as embayments and mudflats. They frequently consist of a combination of "soft" measures, such as vegetation to absorb wave energy and "hard" structures, such as rock sill and oyster reefs to provide stability. Living shorelines are not suitable in all locations. Property owners should work with knowledgeable engineers, land managers and local and state agencies to determine the suitability of living shorelines for their sites. Construction of a living shoreline may require several DEC permits, including Coastal Erosion Hazard Area, Tidal Wetlands and Fresh Water Wetlands. Property owners should consider this option before investing in repair of hard structures.

Additional information on living shorelines is available at the sources listed below:

U.S. Environmental Protection Agency (USEPA). 2009. Synthesis of Adaptation Options for Coastal Areas. Climate Ready Estuaries Program. EPA 430-F-08-024. Washington, DC. http://water.epa.gov/type/oceb/cre/upload/CRE_Synthesis_1-09.pdf

National Wildlife Federation. 2011. Practical Guidance for Coastal Climate-Smart Conservation Projects in the Northeast: Case Examples for Coastal Impoundments and Living Shorelines. http://www.nwf.org/~/media/PDFs/Global-Warming/Climate-Smart-Conservation/Final%20coastal%20climate-smart%20guidance%20document.ashx

The Nature Conservancy (TNC). 2011. The Eastern Shore of Virginia: Strategies for Adapting to Climate Change. Report from the Eastern Shore Climate Change Adaptation Strategies Workshop. http://conserveonline.org/workspaces/e-shore-va-cc-adaptation/documents/workshop-ii-adapting-to-climate-change

Virginia Institute for Marine Science Center for Coastal Resources Management Shoreline Decision Tree: A series of decision trees that lead users through questions about shoreline characteristics and result in recommendations of environmentally preferable treatments for that shoreline. http://ccrm.vims.edu/decisiontree/index.html

If removal or replacement of hard shoreline erosion-control structures with living shorelines is not feasible, property owners should take advantage of the provisions of general permits GP-0-13-006, GP-2-12-001 and GP-2-13-003 to improve the ability of the structure to resist damage during future storms. Property owners should work with a qualified engineer to identify the aspects of the original structure (e.g., materials, construction techniques, size) that made it vulnerable, exploring what alternatives could make the structure more resistant to future storms, especially in view of rising sea levels.

Although general permits GP-0-13-006, GP-2-12-001 and GP-2-13-003 authorize only in-kind/in-place repair or reconstruction of erosion structures, minor variations in length, height and materials are permitted to reflect current design standards. In particular, a replacement bulkhead may be built 18 inches higher than the bulkhead existing prior to Hurricane Sandy. It may include new bulkhead returns or extensions of existing returns of up to 10 feet. New bulkhead materials may be any other material that is otherwise legal in the locality or under state law.

Property owners considering repair and replacement of coastal structures are advised to review DEC's guidance on coastal erosion-control design, including the documents *Design of Coastal Structures* and *Protection of Wave-based Erosion* at http://www.dec.ny.gov/lands/86534.html. Property owners should also consult with knowledgeable coastal engineers and contractors and ensure that all necessary local and federal permits are in place before proceeding with repair or reconstruction.

Public Infrastructure

General Permit GP-0-13-006 authorizes repair or reconstruction of existing *public* infrastructure, including public roads, bridges and utilities. The variety of public infrastructure types and the expertise required to assess current damage, analyze costs and benefits of adaptive measures, and design for enhanced resistance to damage preclude specific guidelines. However, public property managers should consider the following questions as they decide whether to invest in repair or in-kind/in-place reconstruction or to remove the current structure and rebuild at a different site:

- Considering sea-level rise projections and more frequent flooding, is it prudent to rebuild this infrastructure in this location?

- Would a different location offer opportunities to reduce overall risk by maximizing the width of vegetated buffers between structures and the waterline and by taking advantage of natural protective features?
- Does the infrastructure include systems that use toxic substances that could be dispersed by flood waters?
- Is this area more suited to be designed to flood and to store flood waters, perhaps providing less intensive uses, such as open space, recreation or agriculture?

If the infrastructure must be repaired or reconstructed at the same site, public property managers should consider the following questions in making the infrastructure more resilient to current and future climate hazards:

- What aspects of the original infrastructure made it vulnerable?
- What construction technologies were used? What are their strengths and weaknesses?
- Would the repaired or reconstructed structure comply with current building codes or design standards?
- Can critical systems or systems that use or contain toxic materials be elevated or otherwise secured in the event of flooding?

Public infrastructure managers in coastal areas should consider elevating structures, although this activity is not authorized by general permits GP-0-13-006, GP-2-12-001 or GP-2-13-003 and may require additional permits. Other options to explore include use of flood damage-resistant materials, flood-proof construction techniques and corrosion-resistant metal construction connectors. The Federal Emergency Management Agency provides technical bulletins on these and other topics related to construction in coastal and flood-prone areas at http://www.fema.gov/national-flood-insurance-program-2/nfip-technical-bulletins.

Sustainable Public Infrastructure

Public entities faced with the need to reconstruct infrastructure should consider sustainable designs that support social, economic and environmental needs. The Institute for Sustainable Infrastructure has released the Envision™ Sustainability Rating System (http://www.sustainableinfrastructure.org/rating/index.cfm). Envision provides tools to assess costs and benefits over the life of a project, evaluate environmental benefits and help achieve higher levels of sustainability.