New York – New Jersey – Connecticut
Hurricane Sandy Follow-up and Transportation Vulnerability Assessment and Adaptation Analysis

Scope of Work

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Submitted by:

North Jersey Transportation Planning Authority (NJTPA)
New York Metropolitan Transportation Council (NYMTC)
South Western Regional Planning Agency (SWRPA)
Greater Bridgeport Regional Council (GBRC)

In Partnership with:

Connecticut Department of Transportation
New Jersey Department of Transportation
New York State Department of Transportation

New York – New Jersey – Connecticut
Hurricane Sandy Follow-up and Transportation Vulnerability Assessment and Adaptation Analysis

The goal of this project is to assess the impacts of October 2012's Hurricane Sandy, (and to some extent Hurricane Irene, Tropical Storm Lee, and the Halloween Nor'easter in 2011) on the transportation assets within the greater New York- New Jersey - Connecticut metropolitan region and identify adaptation strategies to increase the resilience of those assets to the impacts of extreme weather events and the possible future impacts of climate change The project will also perform a gap analysis for the region, consolidate data sources and information, and identify critical areas and transportation assets generally.

The study area for this project will consist of the planning areas of the partner metropolitan planning organizations (MPOs). The Project Principals Group will consist of representatives from the staff and membership of those MPOs as well as the three state department of transportation that are partnering in the effort. This project will build upon the climate change vulnerability and adaptation efforts developed to date by Federal Highway Administration as well as those of other federal, state and local agencies across the study area.

I. Description of Proposed Effort:

A. Purpose:

The New York-New Jersey-Connecticut metropolitan region (The Region) has experienced a series of extreme weather events over the last few years, including hurricanes, nor'easters/mid, winter storms, and heat waves. The most recent, Hurricane Sandy left a great swath of damage to homes, businesses, the electrical grid and transportation systems across the region. The damage to the transportation infrastructure was in many cases unprecedented, severing links critical to the region's mobility, economy, and way of life. The powerful storm illustrated just how vulnerable the transportation system is to extreme weather events. As the Region works to recover and rebuild from the storm, planning and preparation for more extreme and powerful storms in the future seems imperative, given the potential and probable impacts of a warming planet.

In light of these challenging events, The North Jersey Transportation Planning Authority (NJTPA), New York Metropolitan Transportation Council (NYMTC), South Western Regional Planning Agency (SWRPA), and the Greater Bridgeport Regional Council (GBRC) are joining with the New York, New Jersey and Connecticut departments of transportation to assess the effects of Hurricane Sandy and the 2011 weather events mentioned above, and to analyze adaptation strategies for critical infrastructure. Through this project, a final report will be produced that will highlight the Region's most vulnerable transportation assets and analyze the adaptation measures available given their location and the geomorphology of their surroundings.

The overall proposed scope of this project will be divided into two phases: Phase one will be to collect and analyze available data from specific storm-related damage of the transportation system and document the extent of inundation of flood waters from various tropical and mid-latitude storms. This effort will involve analyzing the existing climate change projections modeled for the region and identifying gaps or discrepancies in their projections. This will allow the region to conduct an integrated vulnerability assessment of the region's transportation systems to several current and future climate stressors in the second phase of the project. A representative set of up to 10 transportation assets shown to be vulnerable to Hurricane Sandy and other recent extreme weather events and that are most critical to the region's mobility and economic vitality will be chosen for additional engineering assessments. Adaptation measures will be identified for each selected asset that could reduce the asset's vulnerability to extreme weather and to improve the region's resiliency.

The second phase of the study will identify critical sub-regions and transportation assets at risk from current and future climate stressors. Updates to the climate projections may be undertaken if necessary and appropriate. Existing or updated climate models will be used to identify additional transportation infrastructure that may be vulnerable to extreme weather. This vulnerability analysis will be conducted on transportation assets across the region. This phase will also include an adaptation analysis for transportation assets in vulnerable sub-areas.

In addition, the Project Steering Committee will host meetings on various climate change-related research topics, including sea level rise, storm surge, and adaptation measures that will serve to inform the project at specific milestones and raise the adaptive capacity of state, region, and local governmental agencies to a changing climate.

The Project Steering Committee will work closely with FHWA and its consultant in conducting this work. A detailed scope of work is described in section three of this Scope of Work.

B. Geographic Focus:

The New York – New Jersey – Connecticut region consists of a diverse geography of coastal and riverine environments, dense population centers surrounded by less dense suburban and exurban development, and natural resources connected together by an extensive, heavily used transportation network. The region is home to major port facilities, three major airports, and other critical infrastructure for the movement of goods and services. Its public transit systems accommodate more passenger trips than anywhere else in the United States, and it's roadway system includes some of the most heavily traveled corridors in the country.

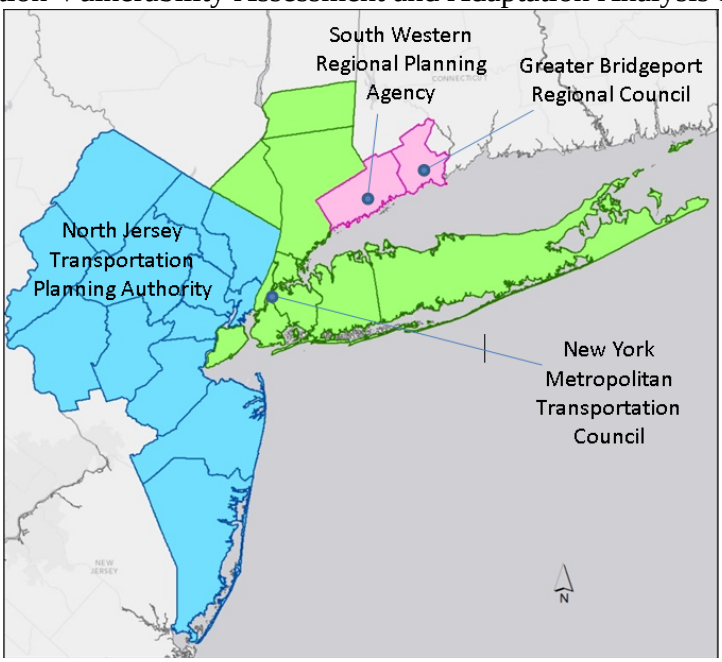
The Region's topography is dominated by water bodies and hundreds of miles of associated shorelines, barrier beaches and coastlines. In The Region's center, three large islands cluster around New York Harbor: Staten Island, Manhattan Island and Long Island, which extends 100 miles to the east. When these islands are taken together with New Jersey's 130 miles of coastline extending to the south and Connecticut's coastline to the east, The Region's topography forms what is known as the New York Bight, where the Atlantic coast makes a nearly right angle bend at the mouth of the Hudson River. This topographical feature has long been of major

concern to scientists studying storm patterns along the east coast, and is one of the primary reasons why the New York – New Jersey - Connecticut metropolitan area is considered a high danger zone for storm generated ocean-water surges. In addition to the extensive coastline, scores of rivers and streams traverse the region and its islands, forming tributary systems which drain into the Atlantic Ocean, Raritan Bay, Newark Bay, New York Harbor, and Long Island Sound.

Because of this complex topography, many important transportation arteries – railroads, parkways and highways – were built in the mostly flat valleys which border the region's various rivers, streams, creeks, and coastal plains. But the physical advantages of constructing these facilities in river valleys are balanced by the vulnerability of these facilities to flooding caused by groundwater or inundation. Thus, extreme weather events can also close these critical arteries that lie in the flood plains of the region's waterways, which also creates a disproportionate impact on the overall transportation network. In addition, a variety of water crossings provided by ferries, bridge landings and tunnel mouths were built to cross the larger rivers in the region, with their access points adjacent to shorelines and river banks. Thus ferry docks, bridge landings and tunnel mouths are all exposed to inundation by rising sea levels and extreme weather events, and this vulnerability can sever vital transportation connections and have a disproportionate impact on the region's mobility.

In sum, The Region's diverse topography exposes the critical transportation facilities to disruption from extreme weather. And since these critical connections are relatively small in number, that disruption can bring the region's transportation system to a virtual halt. It is this transportation network - so critical to the region and the nation's economy – that makes this region an ideal location to focus FHWA's resources in addressing the threat climate change poses on transportation infrastructure.

Transportation Vulnerability Assessment and Adaptation Analysis Study Area



C. Organizational Focus:

The Northern New Jersey Subregion

The 13-County NJTPA region is the fifth largest MPO region in the country, comprising more than 6.7 million people and 3.2 million jobs. The region contains a dense web of transportation assets with thousands of miles of roadways, including over 2,000 miles of freeways/expressways, 6,000 miles of arterial highways and 15,000 miles of county and local roads. The NJTPA region also contains an extensive public transportation system, servicing millions of trips a year. NJ Transit's rail system in the region includes 10 commuter rail lines, two light rail lines, 150 stations and 390 miles of track. The NJTPA region is home to the largest container port on the Atlantic seaboard, which also is the third largest in the U.S. and the 14th largest in the world.

The New York City Subregion

NYMTC's planning area is at the core of New York City's metropolitan region and contains a population of roughly 12 million. The ten county planning area includes the five boroughs of the City of New York and five surrounding suburban counties: Putnam, Rockland and Westchester counties in the lower Hudson Valley and Nassau and Suffolk counties in suburban long Island. The transportation network located within the planning area is extensive. The Metropolitan Transportation Authority's network provides bus and subway services in New York City, and commuter rail services in the lower Hudson Valley and on Long Island. Each of the five suburban counties provide bus transit services within their jurisdictions, as well as connecting services to MTA's commuter rail lines and to surrounding jurisdiction, including New York City. In addition, an extensive network of limited access highways, arterial and collector roadways, and local streets provide vehicular and non-motorized mobility throughout the region. Given the topography of NYMTC's planning area, the transportation system as a whole is reliant on numerous types and sizes of water crossings, including bridges, tunnels, and waterborne conveyances.

The South Western Connecticut Subregion

The South Western Region is part of the New York Metropolitan Area with very strong ties to New York City, neighboring Westchester County, and New Jersey. SWRPA is located in the in the southwest "panhandle" of Connecticut and consists of the eight municipalities of lower Fairfield County, including the cities of Norwalk and Stamford, and the towns of Darien, Greenwich, New Canaan, Weston, Westport and Wilton. SWRPA is located within the coastal slope region of Connecticut, with five communities directly on the Long Island Sound. Generally, the Region is heavily developed and with more than 364,000 people within 225 square miles, is one of the most densely populated areas in the state. The South Western Region is notable for the large percentage of workers who commute by public transit.

The Greater Bridgeport Planning Region is located in Fairfield County, fifty miles east of New York City and 150 miles west of Boston, Massachusetts. Together, the municipalities of Bridgeport, Easton, Fairfield, Monroe, Stratford and Trumbull encompass 145.5 square miles

and are home to approximately 318,000 residents. This population density is the highest of any region in the state. The three most urbanized communities of the Greater Bridgeport Region, Bridgeport, Fairfield and Stratford, lie along the shoreline of Long Island Sound.

The transportation system of the South Western and Greater Bridgeport Region is diverse and offers residents an integrated range of options. Transit facilities include local bus service, MTA Metro North commuter rail service, Amtrak passenger rail service and ferry service to Long Island. The Regions' network of streets and highways includes Interstate 95, the Merritt/Hutchinson River Parkway, and US Routes 1, 7 8 and 25.

D. Climate Change Effects and Impacts:

As the climate warms during the 21st century, the Region is likely to experience a series of climate stressors relating to extreme weather events. According to climate projections, The Region is likely to experience the following climate stressors:

- Intense precipitation and flooding,
- More extreme nor'easters and hurricanes,
- Sea Level Rise
- Extreme heat and heat waves,

These weather phenomena will likely impact the functioning of the transportation system in a variety of ways, including:

- Flooding and washouts on roads and tracks due to intense precipitation Fallen trees and utility wires on tracks due to heavy rain and wind from storms
- Flooding of tunnels (road and rail) and rail stations from heavy rain and storm surges
- Shorted signals due to flooding and saltwater corrosion from storm
- Increased failure of electrical equipment due to more intense, longer lasting heat waves
- Additional wear and stress on equipment and infrastructure, leading to additional service disruptions for emergency repairs
- Service disruption due to power outages and rolling blackouts
- Passenger safety and discomfort on public transit due to extreme heat

The Region is also likely to experience the impacts of sea level rise, which will exacerbate coastal and riverine flooding from nor'easters and hurricanes. This project will review existing climate projections and, where necessary, update climate projections to reflect the latest understanding of future climate changes.

II. Dedicated Staffing and Resources:

The project partners will provide the staffing resources to administer and manage the project and coordinate among the partners, technical advisors, stakeholders and the interested public. Each partner will dedicate staff time to complete the project. Staff resources applied to the project will be financed through the fiscal resources of the partners.

A. Proposed Structure and Partner Roles and Responsibilities:

The project partners will together form a Project Principals Group, comprised of staff and/or membership representatives from the four MPOs and staff representatives of the three state DOTs. The Project Principals Group will be responsible for development of the overall work plan and conducting the study in coordination with FHWA and the Consultant. The Project Principals Group will also convene and interface with the project's technical advisers and other stakeholders, and will work with FHWA and the Consultant to execute the project's work program and complete its deliverables. Finally, the Project Principals Group will rely on the Project Working Group to assist in executing the work program and providing the extensive coordination to complete the project.

Proposed Technical Experts

Assessing the impacts from recent storms and extreme weather events across the study area will require engaging with a great number of agencies. The project will engage an extensive group of "technical experts". The Technical Experts will play a critical role in this study, by providing expertise and information throughout the study. The Technical Experts will provide technical resources and data to support the project, and they will interact cooperatively with the Project Principals Group and the Project Working Group to apply lessons learned from study to additional climate change adaptation efforts to their own planning efforts.

Federal

Federal Highway Administration (FHWA); Federal Transit Administration (FTA);Federal Railroad Administration (FRA); U.S. Department of Homeland Security (USDHS) and Federal Emergency Management Agency (FEMA);U.S. Geological Survey (USGS); U.S. Environmental Protection Agency (USEPA); and National Oceanic and Atmospheric Administration (NOAA).

State

State homeland security, emergency, energy, land use and environmental quality agencies, public transit operators, public utility and/or public service commissions and independent system operators.

Regional/Local

in New York State; partner MPO member agencies and their emergency, energy, environmental quality, public works, transportation and land use agencies; relevant independent public authorities including New Jersey Transit, Metropolitan Transportation Authority, Port Authority of New York and New Jersey, and National Railroad Passenger Corporation (Amtrak); relevant utilities; coastal communities; University Transportation Research Centers and other relevant academic institutions.

	Role / Responsibilities
Project Working Group Staff representatives from NJTPA, NYMTC, GBRC and SWRPA	• Acts as the FHWA point of contact • Prepares progress reports to FHWA on the activities of the project partners • Meets regularly with FHWA and the Consultant (bi-weekly conference calls are anticipated) •
Project Principals Group NJTPA, NYMTC, SWRPA, GBRC, NYSDOT, CTDOT, MTA and NJDOT	• Responsible for the overall development of the Draft and Final Work Plan • Responsible for conducting the study in coordination with FHWA and the Consultant
Technical Experts *Federal agencies:* FTA, FRA, USDHS, FEMA, USGS, USEPA, NOAA, USACE. *State agencies:* State homeland security, emergency, energy, land use and environmental quality agencies, public transit operators, public utility and/or public service commissions and independent system operators. *Regional and local agencies:* NJ TRANSIT, PANYNJ, Amtrak, relevant utilities, coastal communities; and relevant academic institutions.	• Provides information, technical resources and data to support the scope of work • Works cooperatively with the project team to apply lessons learned from study to additional climate change adaptation efforts

NYMTC Staff Effort Detail:
NYMTC will dedicate staff resources to the project as well as contributing a primary project manager. NYMTC's staff contribution will include staff from the Planning and Technical groups of its Central Staff and potential staff from its various member agencies.

NJTPA Staff Effort Detail:
The NJTPA will dedicate staff effort to the project as well contributing a primary project manager. The NJTPA will serve as the primary contact point with FHWA and their consultant, overseeing the scope of work of the consultant. The NJTPA will provide assistance in coordinating the activities of the Project Team.

SWRPA and GBRC Staff Effort Detail
SWRPA and GBRC will dedicate staff resources to the effort and will work closely with the other project team members. The two agencies will work in conjunction with one another to coordinate activities related to the Connecticut portion of the study area.

Consultant Team Effort Detail:
The consultant team will be hired by FHWA and will conduct the scope of work as defined in Section 3 of this proposal. The consultant team will have oversight by FHWA and meet regularly with FHWA and the primary project managers.

III. Draft Contractor Work Plan:

The Contractor shall assist FHWA and the project partners in learning from the experience of Hurricane Sandy and other recent storms and identifying strategies that improve the resiliency of the transportation system to extreme weather and climate change, especially as assets are rebuilt or retrofitted. A subset of up to 10 representative transportation assets impacted by Hurricane Sandy will be identified and an engineering-based assessment and adaptation analysis is anticipated to be performed on these assets. The project will also include a regional vulnerability assessment and the identification of adaptation strategies for critical infrastructure.

Task 1: Kickoff Meeting and Project Plan

The purpose of this task is for the Contractor to conduct an on-site kick-off meeting with FHWA contract and technical representative(s) within two weeks of the effective date of the Task Order award. The kick-off meeting will be held at FHWA headquarters in Washington, DC and will last approximately two hours. The Contractor shall prepare all materials and lead the scheduling of the meeting with the assistance of the FHWA. At a minimum, the Contractor's project manager and lead technical staff shall attend the kick-off meeting.

The scope, tasks, deliverables, and project management process (Task 2.1) shall be discussed during this meeting. The Contractor shall submit a draft project work plan based on the input of FHWA and the minutes of the kick-off meeting. The project work plan shall include scope, task descriptions and deliverables, schedule, management and staffing plan, travel plan (if any), and risks and assumptions. FHWA and the Project Working Group will review the draft Project Work Plan and provide any feedback within two weeks of receipt of the draft and the Contractor shall submit the Final Project Work Plan and Kick-off Meeting Minutes within 1 week of receipt of this feedback.

Deliverables for Task 1:

- Plan and Hold Kick-off Meeting (within 2 weeks of effective date of award)
- Draft Project Work Plan and Kick-off Meeting Minutes for FHWA review (within 4 weeks of effective date of award)
- Final Project Work Plan and Kick-off Meeting Minutes (within 7 weeks of effective date of award)

Task 2: Project Management and Stakeholder Coordination and Collaboration

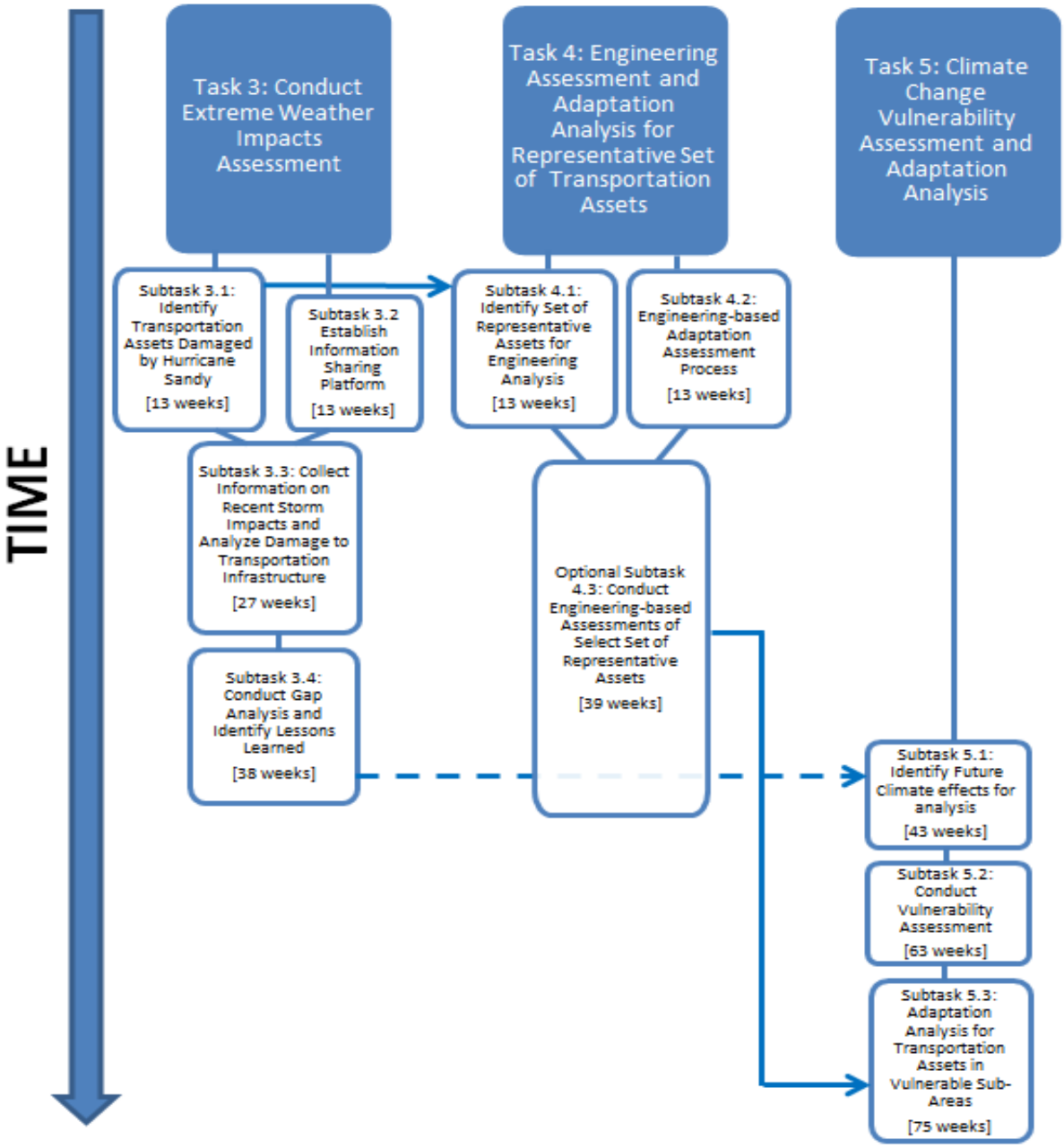
The purpose of this task is to develop and administer a project management process and to facilitate the coordination of the partners involved in the overall project, stakeholders and subject

matter experts, as well as other Hurricane Sandy related projects in the region.

Subtask 2.1 Develop and Administer Project Management Process

The Contractor shall develop and administer a project management process, which shall include a risk management process, to monitor schedule and performance status to ensure the tasks and deliverables delineated in the task order are met in accordance with the task order's terms. This will be an important element of the project given its complexity and the interaction and timing of the various Tasks and Subtasks (see Figure 2).

Figure 1: Relationship of Key Project Analysis Steps



The Contractor shall provide the FHWA project team bi-weekly updates, in writing, via email regarding the overall status of the project. The bi-weekly reports shall include the following: (1) clear account of work performed under each task during the report period; (2) outline of the work to be performed during the next report period; (3) hours worked and costs incurred on the requirement; and (4) description of any problem(s) encountered or anticipated that will affect the completion of any work within the agreed upon time and fiscal constraints, including any recommended solutions, or a statement that no problems were encountered.

The Contractor shall develop a one-page summary brochure or handout describing the purpose and scope of the project. The Contractor shall submit a draft of this summary brochure or handout for review by FHWA and the Project Working Group within 4 weeks of the effective date of award. FHWA and the Project Working Group will review the draft and provide any feedback within two weeks of receipt of the draft and the Contractor shall submit the final summary brochure or handout within 1 week of receipt of this feedback.[Note: This deliverable is subject to the minimum requirements described in Section H.3 of this Task Order]

The Contractor shall also participate in bi-weekly meetings with FHWA and other relevant project personnel (likely to include the Project Working Group) in person or via teleconference. It is anticipated that these meetings will be one hour in duration. The purpose of these meetings shall be to provide the status updates on the tasks accomplished in the previous two weeks, review planned activities for the upcoming weeks, and to discuss any technical issues or concerns that have arisen, including the Contractor's proposed resolution of any issues or concerns, as necessary.

Deliverables for Subtask 2.1:

- Draft Project Management Process (within 4 weeks of effective date of award)
- Final Project Management Process (within 7 weeks of effective date of award)
- Draft one-page summary brochure or handout describing the purpose and scope of the project (within 4 weeks of effective date of award)
- Final one-page summary brochure or handout describing the purpose and scope of the project (within 7 weeks of effective date of award)
- Written bi-weekly project updates
- Biweekly project review meetings
- Unscheduled project updates/meetings, as required.

<u>Subtask 2.2: Facilitate Project Stakeholder Coordination and Collaboration Activities</u>

The Contractor shall facilitate coordination and collaboration activities among and across the diverse groups anticipated to be involved in the project and other post-Hurricane Sandy activities. Figure 3 describes the key project stakeholders anticipated to be involved in the project.

Figure 2: Key Project Stakeholders

Project Working Group - The Project Working Group will include staff representatives from NJTPA, NYMTC, GBRC, and SWRPA. This group will serve as the main FHWA point of contact for the overall project and will prepare progress reports on the activities of the project partners.

NJTPA Staff: The NJTPA will dedicate staff effort to the project as well as contributing a primary project manager. The NJTPA will serve as the primary contact point for the project partners with FHWA and the Contractor for the overall project.

NYMTC Staff: NYMTC will dedicate staff resources to the project as well as contributing a primary project manager. NYMTC's staff contribution will include staff from the Planning and Technical groups of its Central Staff and potential staff from its various member agencies.

SWRPA and GBRC Staff: SWRPA and GBRC will dedicate staff resources to the effort and will work closely with the other project team members. The two agencies will work in conjunction with one another to coordinate activities related to the Connecticut portion of the study area.

Project Principals - The Project Principals will consist of representatives from the staff and membership of the four MPOs and three state departments of transportation that are partnering in project: NJTPA, NYMTC, SWRPA, GBRC, NYSDOT, CTDOT, MTA and NJDOT. These agencies are responsible for the development of the overall project Work Plan and conducting the study in coordination with FHWA and the Contractor.

Technical Experts Group - The project will engage an extensive group of technical experts during the study. This Technical Experts Group will provide technical resources and data to support the project, and will interact cooperatively with the Project Working Group and Project Principals to apply lessons learned from the study to additional climate change adaptation efforts and their own planning efforts. This group will include representatives from Federal, State, Regional and Local agencies.

Federal agencies: Federal Highway Administration (FHWA); Federal Transit Administration (FTA); Federal Railroad Administration (FRA); U.S. Department of Homeland Security (USDHS) and Federal Emergency Management Agency (FEMA);U.S. Geological Survey (USGS); U.S. Environmental Protection Agency (USEPA); National Oceanic and Atmospheric Administration (NOAA); and U.S. Army Corps of Engineers (USACE).

State agencies: State homeland security, emergency, energy, land use and environmental quality agencies, public transit operators, public utility and/or public service commissions and independent system operators.

Regional and local agencies: NJ TRANSIT, PANYNJ, Amtrak, relevant utilities, coastal communities; and relevant academic institutions.

Project Principals Quarterly Meetings

The Contractor shall schedule and organize quarterly meetings or conference calls with FHWA and the Project Principals to keep all participants up to date and informed of the project status. The Contractor shall develop the meeting agendas (including handouts and presentations) and written minutes of the meetings.

Technical Experts Group and Stakeholder Meetings

The Contractor, in collaboration with the Project Principals, will provide technical, organizational, and logistical support for up to three meetings with the Technical Experts Group and other regional stakeholders to address selected project topics. The purpose of these meetings will be to provide updates on the status of the project, gather information and analysis relevant to the project from the participants, and engage the participants in integrating project findings into upcoming decision-making. In addition, these meetings will facilitate the exchange of information and

research among stakeholders in the region in order to ensure a successful project outcome and to develop the connections that will be crucial when implementing adaptation initiatives in the future. The meetings will be held around project milestones as specified by FHWA and the Project Principals. It is anticipated that the first meeting will be held in conjunction with the identification of transportation assets damaged by Hurricane Sandy (Task 3.1) and the selection of up to 10 representative transportation assets for engineering-based assessments (Task 4.1).

These meetings will be one day events and held within the project study area at no-cost Federal, State, or local government facilities. FHWA will secure the meeting location and the Contractor shall coordinate with the point of contact at that location on logistical arrangements. The point of contact at the location will be responsible for room set-up and A/V needs. For each meeting, the Contractor shall work with FHWA and the Project Principals to develop an agenda that meets the meeting objectives and to develop any technical pre-meeting materials for attendees that will help prepare for the meeting discussions. The Contractor shall develop all necessary meeting materials (e.g., nametags, folders with agenda, background materials, and signage) in advance and ensure that the necessary A/V equipment is available from the host location.

The Contractor shall work with FHWA and the Project Principals to identify potential meeting attendees and track their status regarding attendance. The Contractor shall draft the invitation for meeting participants. It is anticipated that each meeting will involve no more than 45 participants and that most participants in these meetings will be local to the region. However, the Contractor shall manage the arrangements for travel and travel reimbursement needs for any non-USDOT participants. Actual travel and hotel reservations may be made by the meeting participants. The Contractor shall work closely with FHWA to provide guidance to participants in advance of the meetings regarding limits on reimbursable expenses and shall follow up with the participants after the event to provide reimbursement.

The Contractor shall provide on-site support to ensure meeting participants have all necessary materials, and that the original meeting goals are met. On-site support also includes identifying potential problems and planning contingencies. The Contractor shall facilitate the meeting, provide staff to check in participants upon arrival, and take detailed notes documenting the discussions that occur during the meeting. After each workshop, the contractor shall produce a technical summary document (not to exceed 10 pages), discussing key findings of the meeting and lessons learned. [Note: This deliverable is subject to the minimum requirements described in Section H.3 of this Task Order]

Coordination with Post-Sandy Recovery Stakeholders

In addition, as necessary, the Contractor shall work with FHWA and the Project Principals in maintaining an open dialogue with stakeholders in Post-Sandy recovery and rebuilding efforts, particularly with respect to the Infrastructure Federal Recovery Support Function (RSF) (http://www.fema.gov/site-page/recovery-support-functions) , which is part of the National Disaster Recovery Framework (www.fema.gov/national-disaster-recovery-framework).

Deliverables for Subtask 2.2:

- Quarterly meetings or conference calls with FHWA and the Project Principals
- Organize and facilitate up to three meetings with the Technical Experts Group and other

stakeholders on selected project topics, including the development of a technical summary document for each meeting (to be held around specific project milestones, TBD)

Task 3: Conduct Extreme Weather Impacts Assessment

The purpose of this task is to identify and analyze Hurricane-Sandy and other storm related damage to transportation infrastructure in the region. A critical component of this effort is the establishment of an Information Sharing Platform where all data collection and mapping will be stored for use in this project. The Contractor shall also collect and analyze climate modeling projections conducted by various agencies within the region and compare those projections with the recent storm events in order to conduct a lessons learned and gap analysis. As a result of this analysis, the Contractor shall also identify if additional climate modeling will need to be conducted as part of Task 5.

Subtask 3.1: Identify Transportation Assets Damaged by Hurricane Sandy

The Contractor shall work with FHWA, the Project Working Group, and the Project Principals to identify the transportation assets within the region that were damaged as a result of Hurricane Sandy. It is anticipated that much of this information will be readily available from existing data sources. A draft initial list of transportation assets shall be identified within 10 weeks of the effective date of award for review by FHWA and the Project Working Group. FHWA and the Project Working Group will review the draft list of transportation assets and provide any feedback within two weeks of receipt of the draft list and the Contractor shall submit the final list of assets within 1 week of receipt of this feedback. The list of assets will be considered as input to the selection of the assets to be identified in Task 4.1 for the engineering analysis.

Deliverables for Subtask 3.1:

- Draft list of transportation assets damaged by Hurricane Sandy (within 10 weeks of effective date of award)
- Final list of transportation assets damaged by Hurricane Sandy (within 13 weeks of effective date of award)

Subtask 3.2 Establish Information Sharing Platform

The Contractor shall provide a platform for sharing the information needed for or developed as part of this Task Order, including data, mapping, plans, surveys, and other data sets or reports for access by FHWA, the Project Working Group, Project Principals, and members of the Technical Experts Group. The Contractor shall establish guidelines for data and mapping consistent with the Project Principal members' GIS protocols and standards, including copyright. This information sharing platform will be used to store data and mapping associated with this project. The Contractor shall develop a conceptual plan for the information sharing platform for review by FHWA and the Project Principals within 10 weeks of the effective date of award. The plan should include 2-3 preferred alternatives for consideration.[1] The plan should also include information on any user fees or associated maintenance costs for each alternative to inform decisions by FHWA and the Project Principals. This will also inform the Project Principals so that they may consider

[1] Including, but not limited to, SharePoint, BaseCamp, centraldesktop, or DropBox

the implications of continuing to use the Platform in future projects (FHWA support will be limited to use while this Task Order is active). FHWA and the Project Principals will review the plan and provide any feedback within two weeks of receipt of the concept and the Contractor shall submit the final plan for the information sharing platform within 1 week of receipt of this feedback. The final plan will identify the preferred platform option only.

Deliverables for Subtask 3.2:

- Conceptual plan for information sharing platform for data sets (within 10 weeks of effective date of award)
- Final information sharing platform for data sets (within 13 weeks of effective date of award)

Subtask 3.3: Collect Information on Recent Storm Impacts and Analyze Damage to Transportation Infrastructure

The Contractor shall collect and analyze historical data from recent storm-related damage to transportation infrastructure, including interruption of transportation services such as mass transit, and communication and recovery activities from recent tropical and mid-latitude storms. The Contractor shall collect recorded storm impacts including the extent of flooding, storm surge, rainfall, and other data. The effect on the transportation system from Hurricane Sandy, as well as Hurricanes Irene and Lee, and the Halloween nor'easter of 2011, will be included in the analysis. Data to be collected for this analysis may include, but should not be limited to:

- Data collected specifically for Hurricane Sandy, such as USGS LiDAR flight surveys along the coastline.(http://coastal.er.usgs.gov/hurricanes/sandy/coastal-change/);
- The vulnerability of areas to increased groundwater and flash flooding will be guided by use of existing products, such as the USGS's depth-to-water maps for Long sland. (http://ny.water.usgs.gov/projects/gisunit/Long_Island_SIM3066.html)
- Information and products produced using existing storm-tide data, such as FEMA inundation maps and USGS flood reports.

The data collected shall be used to develop digital GIS base maps showing the extent of the storm impacts and the affected transportation assets. A draft set of GIS maps and draft technical memorandum (not to exceed 25 pages) on the extent of the storm damage to the transportation system shall be developed within 24 weeks of the date of award for FHWA and Project Principals review. FHWA and the Project Principals will review the draft GIS maps and draft technical memorandum and provide any feedback within two weeks of receipt of the draft materials and the Contractor shall submit the final GIS maps and technical memorandum within 1 week of receipt of this feedback. The Contractor shall develop additional outreach materials, such as high level summaries, maps, etc., as requested by FHWA. [Note: The final deliverables in this Subtask are subject to the minimum requirements described in Section H.3 of this Task Order]

Deliverables for Subtask 3.3

- Draft GIS maps and technical memorandum detailing recent storm damage to the transportation system in the region (within 24 weeks of the date of award)
- Final GIS maps and technical memorandum detailing recent storm damage to the

transportation system in the region (within 27 weeks of the date of award)
- Additional outreach materials, as requested by FHWA (TBD)

Subtask 3.4: Conduct Gap Analysis and Identify Lessons Learned

The Contractor shall collect and analyze climate modeling projections conducted by various agencies within the region and compare those projections with the recent storm events in order to identify gaps or deficiencies in the modeling as they relate to recent extreme weather within the region. Data to be used for this assessment may include, but not be limited to:

- Climate change scenario of USGS groundwater models such as current NACP model, include projections of sea level rise and groundwater recharge increases. This model can be adapted to address coastal transportation infrastructure issues in the North Atlantic Coastal Plain (http://ny.water.usgs.gov/projects/NACP/).
- Storm-tide elevations, such as those available from the USGS Hurricane Sandy and Irene mappers (http://water.usgs.gov/floods/events/2012/sandy and http://water.usgs.gov/floods/events/2011/irene).

The Contractor shall also identify any lessons learned regarding the use of climate modeling and projections in the region and determine if additional climate modeling will need to be conducted in Task 5. The Contractor shall develop a draft technical memorandum detailing the gap analysis and any lessons learned (not to exceed 25 pages) within 35 weeks of the date of award for FHWA and Project Principals review. FHWA and the Project Principals will review the draft technical memorandum and provide any feedback within two weeks of receipt of the draft materials and the Contractor shall submit the final technical memorandum within 1 week of receipt of this feedback.

The Contractor shall develop a draft PowerPoint briefing of up to 10 pages, summarizing the gap analysis and any lessons learned (including speaker notes) for FHWA and Project Principals review within 38 weeks of the effective date of award. FHWA and the Project Principals will review the draft presentation and provide any feedback within two weeks of receipt of the draft and the Contractor shall submit the final PowerPoint within 1 weeks of receipt of this feedback. The Contractor shall develop additional outreach materials, such as high level summaries, maps, etc., as requested by FHWA. [Note: The final deliverables in this Subtask are subject to the minimum requirements described in Section H.3 of this Task Order]

Deliverables for Subtask 3.4:
- Draft technical memorandum detailing the gap analysis and lessons learned (within 35 weeks of the date of award)
- Final technical memorandum detailing the gap analysis and lessons learned (within 38 weeks of the date of award)
- Draft PowerPoint summarizing the gap analysis and any lessons learned (within 35 weeks of the date of award)
- Final PowerPoint summarizing the gap analysis and any lessons learned (within 38 weeks of the date of award)

- Additional outreach materials, as requested by FHWA (TBD)

Task 4: Engineering Assessment and Adaptation Analysis for Representative Set of Transportation Assets

The purpose of this task is to identify a set of up to 10 representative transportation assets and develop a process for conducting engineering-based assessments of adaptation options.

Subtask 4.1: Identify Set of Representative Assets for Engineering Analysis
The Contractor shall work with FHWA and the Project Principals to select a set of up to 10 representative transportation assets from the impacted transportation assets identified in Task 3 for further engineering based assessments of adaption options. The criteria for selection may include: the level of damage incurred as a result of Hurricane Sandy and/or other recent storms (identified in Task 3), potential for effective adaptation options, criticality of the asset to the region, geographic diversity, asset type, etc. The Contractor shall develop a draft list of up to 10 representative assets for FHWA and Project Principals review within 10 weeks of the effective date of award. FHWA and the Project Principals will review the proposed list of assets and provide any feedback within two weeks of receipt of the draft materials and the Contractor shall submit the final list of assets within 1 week of receipt of this feedback.

Deliverables for Subtask 4.1

- Proposed list of up to 10 representative transportation assets (within 10 weeks of the date of award)
- Final list of up to 10 representative transportation assets (within 13 weeks of the date of award)

Subtask 4.2: Engineering-based Adaptation Assessment Process
The Contractor shall develop a process to conduct detailed engineering analysis of adaptation options for improving the resilience of transportation infrastructure to climate change and extreme weather events. There are many possible types of assets with differing design criteria, but the approach to the engineering analysis of resiliency options should follow along these common steps:

1. Clearly identify the physical limits of the asset and what is to be analyzed.
2. Clearly identify the climate variables to be examined and the mechanisms by which the climate variable can damage the asset (e.g. wave action on bridge decks, roadway embankment failure due to high velocities associated with weir overtopping flow, softening/rutting of asphaltic pavements due to vehicle loading combined with extended high temperatures, etc.)
3. Identify design criteria and standards currently used to design the asset.
4. Does the asset meet current design criteria/standards? What is required to bring the asset to meet current standards?
5. Identify relevant climate data applicable to engineering analysis. If exact data required for design cannot be obtained from climate modeling, how can the readily obtainable data be used in the analysis? Is there an alternative design method that can be substituted or a data surrogate that could be used? Also include discussion of uncertainty and appropriate level

of risk based on traffic, criticality, current development, and examination of check floods.
6. Develop a reasonable range of climate scenarios to analyze.
7. Identify design thresholds and perform a sensitivity analysis of which design standards are violated by which climate variables.
8. Perform an economic analysis that includes present worth of the capital cost, maintenance, failure replacement cost, damage cost, and economic loss of each design option.
9. Consider practicality of each option, obstacles to implementation.
10. Make a final judgment based on sound scientific principles and peer acceptance.

To ensure that the process is grounded and practical, the contractor shall run a sample asset from the project study area through the process as the process is being developed. The sample asset will be identified by FHWA and the Project Principals at the project Kick-off Meeting in Task 1. The Contractor shall develop a technical memo including the proposed process to conduct a detailed engineering analysis of adaptation options, including the results of the assessment of the sample asset, for FHWA and Project Principals review within 10 weeks of the effective date of award. FHWA and the Project Principals will review the technical memo and provide any feedback within two weeks of receipt of the draft materials and the Contractor shall submit the final engineering analysis process within 1 week of receipt of this feedback.

The Contractor shall also develop a draft PowerPoint briefing of up to 10 pages, summarizing the proposed process to conduct detailed engineering analysis of adaptation options (including speaker notes) for FHWA and Project Principals review within 10 weeks of the effective date of award. FHWA and the Project Principals will review the draft presentation and provide any feedback within two weeks of receipt of the draft and the Contractor shall submit the final PowerPoint within 1 weeks of receipt of this feedback. The Contractor shall develop additional outreach materials, such as high level summaries, maps, etc., as requested by FHWA. [Note: The final deliverables in this Subtask are subject to the minimum requirements described in Section H.3 of this Task Order]

Deliverables for Subtask 4.2:

- Draft technical memo including the proposed process to conduct detailed engineering analysis of adaptation options (within 10 weeks of the date of award)
- Final technical memo including the process to conduct detailed engineering analysis of adaptation options (within 13 weeks of the date of award)
- Draft PowerPoint summarizing proposed process to conduct detailed engineering analysis of adaptation options (within 10 weeks of the date of award)
- Final PowerPoint summarizing final process to conduct detailed engineering analysis of adaptation options (within 13 weeks of the date of award)
- Additional outreach materials, as requested by FHWA (TBD)

{OPTIONAL} Subtask 4.3: Conduct Engineering-Based Assessments of Select Set of Representative Assets

The Contractor shall conduct a detailed engineering analysis of adaptation options (such as design changes in reconstruction, retrofits, protective features, relocation, etc.) for improving the

resilience of transportation infrastructure to climate change and extreme weather events on the set of representative transportation assets identified in Subtask 4.1 and using the process developed in Subtask 4.2. The Contractor shall work with FHWA and the Project Principals to develop the scope of the analysis for each asset before proceeding with each analysis. The scope will include a schedule for each assessment, including logistical plans for site visits to each of the identified assets. The scope should also include a list of required and optional personnel from transportation agencies in the study area that will attend the site visits and provide technical data and assistance. The scope may also include additional surveying of five to ten transportation assets to confirm vertical elevation data needed for conducting the engineering assessments and for identifying vulnerable assets in Task 5.

The Contractor shall develop the scope of each analysis for FHWA and Project Principals review within 18 weeks of the effective date of award. FHWA and the Project Principals will review the proposed scope and provide any feedback within two weeks of receipt of the proposed analysis and the Contractor shall submit the final project scope within 1 week of receipt of this feedback.

Upon approval from FHWA, the Contractor shall proceed with the engineering analysis and provide a draft of the assessments for FHWA and Project Principals review within 34 weeks of the effective date of award. FHWA and the Project Principals will review the draft assessments and provide any feedback within two weeks of receipt of the proposed analysis and the Contractor shall submit the final engineering assessments within 1 week of receipt of this feedback.

The Contractor shall develop a draft PowerPoint briefing summarizing the overall engineering assessment of the representative assets and specific information on each asset (including speaker notes) for FHWA and Project Principals review within 37 weeks of the effective date of award. FHWA and the Project Principals will review the draft presentation and provide any feedback within 1 week of receipt of the draft and the Contractor shall submit the final PowerPoint within 1 week of receipt of this feedback. The Contractor shall develop additional outreach materials, such as high level summaries, maps, case studies, handouts, etc., as requested by FHWA. [Note: The final deliverables in this Subtask are subject to the minimum requirements described in Section H.3 of this Task Order]

Deliverables for Subtask 4.3:

- Draft scope of the engineering analysis for each asset for up to 10 representative assets (within 18 weeks of the date of award)
- Final scope of the engineering analysis for each asset for up to 10 representative assets (within 21 weeks of the date of award)
- Draft engineering assessment of adaptation options for up to 10 representative assets (within 34 weeks of the date of award)
- Final engineering assessment of adaptation options for up to 10 representative assets (within 37 weeks of the date of award)
- Draft PowerPoint summarizing the overall engineering assessment of the representative assets and specific information on each asset (within 37 weeks of the date of award)
- Final PowerPoint summarizing the overall engineering assessment of the representative assets and specific information on each asset (within 39 weeks of the date of award)
- Additional outreach materials, as requested by FHWA (TBD)

Task 5: Climate Change Vulnerability Assessment and Adaptation Analysis

The purpose of this task is to assist transportation agencies in preparing for and adapting the transportation system to the impacts of extreme weather recently experienced within the region and future climate threats. As part of this task the Contractor shall identify transportation assets in the region that are vulnerable to current climate stressors and future climate change impacts. The Contractor shall also conduct an adaptation analysis on sub-areas of the region identified as critically vulnerable and the associated transportation assets. To the extent possible, the Contractor should follow the vulnerability assessment process outlined in FHWA's Climate Change & Extreme Weather Vulnerability Assessment Framework.

Subtask 5.1: Identify Future Climate Effects for Analysis

The contractor shall use the gap analysis conducted under task 3.4 to conduct updates to the climate projections and additional climate change modeling if necessary and appropriate. Existing or updated climate models will be used to identify additional transportation infrastructure that may be vulnerable to extreme weather. This may include additional sea level rise projections, storm surge and inland flooding analyses, and/or of changes in extreme heat and precipitation. The Contractor shall develop a draft technical memorandum detailing any additional climate modeling and analysis and accompanying GIS data (not to exceed 10 pages) within 40 weeks of the date of award for FHWA and Project Principals review. FHWA and the Project Principals will review the draft technical memorandum and provide any feedback within two weeks of receipt of the draft materials and the Contractor shall submit the final technical memorandum within 1 week of receipt of this feedback. [Note: The final deliverable in this Subtask is subject to the minimum requirements described in Section H.3 of this Task Order]

Deliverables for Subtask 5.1:

- Draft Technical memo detailing any additional climate modeling and analysis and accompanying GIS data (within 40 weeks of the date of award)
- Final Technical memo detailing any additional climate modeling and analysis and accompanying GIS data (within 43 weeks of the date of award)

Subtask 5.2: Conduct Vulnerability Assessment

The Contractor shall identify the transportation assets of the region that are vulnerable to the current climate stressors identified in Task 3 and future climate change impacts. The Contractor shall complete an analysis of how the vulnerable transportation assets may affect the overall transportation system in the region. This subtask will require extensive collaboration with FHWA, the Project Working Group, Project Principals, and the Technical Experts in order to evaluate how a transportation asset affected by climate change impacts might disrupt the overall transportation network.

The Contractor shall review existing documents including, but not limited to: relevant federal plans and surveys; state climate action plans, coastal community and emergency management plans; MPO member climate, coastal community and emergency management plans; relevant coastal community plans and surveys; relevant academic plans, studies, forecasts and surveys; and

relevant utilities' plans and surveys.

The Contractor shall also map sub-areas within the region identified as critically vulnerable by the Project Principals for inundation/storm surge, groundwater flooding, wind damage, and temperature extremes. In conducting this analysis, the Contractor shall include areas and associated transportation assets that serve as evacuation routes, key goods movements, transportation services, debris removal, pre-emptive closure, and transportation redundancy.

The Contractor shall develop a draft technical memorandum detailing the vulnerability assessment process, including feedback on problems encountered, databases used, and accompanying GIS data (not to exceed 20 pages) within 60 weeks of the date of award for FHWA and Project Principals review. FHWA and the Project Principals will review the draft technical memorandum and provide any feedback within two weeks of receipt of the draft materials and the Contractor shall submit the final technical memorandum within 1 week of receipt of this feedback. [Note: The final deliverable in this Subtask is subject to the minimum requirements described in Section H.3 of this Task Order]

Deliverables for Subtask 5.2:

- Draft Technical memo detailing the vulnerability assessment process, including feedback on problems encountered, databases used, and accompanying GIS data (within 60 weeks of the date of award)
- Final Technical memo detailing the vulnerability assessment process, including feedback on problems encountered, databases used, and accompanying GIS data (within 63 weeks of the date of award)

Subtask 5.3: Adaptation Analysis for Transportation Assets in Vulnerable Sub-Areas

The Contractor shall conduct an adaptation analysis using climate adaptation tools or processes that provide a comprehensive GIS-based picture of the climate threat posed for the sub-areas identified as critically vulnerable in Task 5.2 and the associated transportation assets. The process, at a minimum, should be able to anticipate the cost of damage caused by rising sea levels, storm surges, and groundwater flooding and calculate or visualize the economic benefits of the various adaptive actions that could be taken in response. The adaptation analysis shall incorporate the data sets collected in previous tasks, including projected SLR and storm surge scenarios, vulnerable transportation assets, any completed engineering-based assessments, and infrastructure costs into a comprehensive GIS-based picture of potential geospatial and economic damage. Adaptation options or strategies to be evaluated in the analysis may include coastal protection/mitigation, planning process enhancements, capital investments and disinvestments, relocation, transportation redundancy and land use impacts. To the extent possible, existing, off-the-shelf tools should employed to perform this analysis.

This subtask shall also integrate the vulnerability data and climate change projections collected with the decision-making practices of relevant transportation agencies in the Region. The Contractor shall build upon the existing climate change research work from the Region, including but not limited to the 2011 PlaNYC and the 2012 North Jersey Transportation Planning Authority Vulnerability Assessment Study. Additional resources include the Consortium for Climate Risk

in the Urban Northeast (www.ccrun.org); NYSERDA ClimAID (www.nyserda.ny.gov/climaid), and New York City Panel on Climate Change report available online at (www.nyas.org); Urban Climate Change Research Network (www.uccrn.org); NYS 2100 Commission draft report (http://www.rockefellerfoundation.org/news/publications/nys-2100-commission-report-building); NYS Climate Action Plan Interim Report (http://www.dec.ny.gov/energy/80930.html); NYS Sea Level Rise task Force Report (http://www.dec.ny.gov/energy/67778.html); and other applicable state, regional, and local documents.

The Contractor shall develop a draft technical memorandum detailing the adaptation options analysis and accompanying GIS data (not to exceed 40 pages) within 72 weeks of the date of award for FHWA and Project Principals review. FHWA and the Project Principals will review the draft technical memorandum and provide any feedback within two weeks of receipt of the draft materials and the Contractor shall submit the final technical memorandum within 1 week of receipt of this feedback. The Contractor shall develop additional outreach materials, such as high level summaries, maps, etc., as requested by FHWA. [Note: The final deliverables in this Subtask are subject to the minimum requirements described in Section H.3 of this Task Order]

Deliverables for Subtask 5.3:

- Draft Technical memo detailing the adaptation options analysis and accompanying GIS data (within 72 weeks of the date of award)
- Final Technical memo detailing the adaptation options analysis and accompanying GIS data (within 75 weeks of the date of award)
- Additional outreach materials as requested by FHWA (TBD)

Task 6: Project Report

The purpose of this task is to develop a comprehensive report detailing the work performed, conclusions drawn, parties involved, roles and responsibilities of partners, issues encountered, lessons learned and recommendations for future applications. The report shall include a one-page brochure suitable for distribution via the web and in printed form at meetings and conferences, as well as a stand-alone Executive Summary detailing key conclusions and compelling maps and visuals. The Contractor shall develop the draft report (not to exceed 75 pages, excluding the Executive Summary and any technical appendices) for FHWA and Project Principals review within 88 weeks of the effective date of award. FHWA and the Project Principals will review the draft report and provide any feedback within two weeks of receipt of the draft and the Contractor shall submit the final report within 2 weeks of receipt of this feedback.

The Contractor shall develop a PowerPoint briefing of up to 20 pages, summarizing the research and resulting report (including speaker notes) for FHWA and Project Principals review within 93 weeks of the effective date of award. FHWA and the Project Principals will review the draft presentation and provide any feedback within two weeks of receipt of the draft and the Contractor shall submit the final report within 1 weeks of receipt of this feedback. The Contractor shall develop additional outreach materials, such as high level summaries, maps, etc., as requested by FHWA. Note: The final deliverables in this Subtask are subject to the minimum requirements described in Section H.3 of this Task Order]

Deliverables for Task 6:

- Draft comprehensive report, including a one-page brochure and stand-alone Executive Summary (within 88 weeks of the date of award)
- Final comprehensive report, including a one-page brochure and stand-alone Executive Summary (within 92 weeks of the date of award)
- Draft PowerPoint briefing (within 93 weeks of the date of award)
- Final PowerPoint briefing (within 95 weeks of the date of award)
- Additional outreach materials, as requested by FHWA (TBD)

DELIVERABLES SCHEDULE

Task	Deliverable	Deliverable Date (number of weeks following effective date of award, unless otherwise noted)
Task 1: Kickoff Meeting and Project Plan		
	Plan and Hold Kick-off Meeting	2 weeks
	Draft Project Work Plan and Kick-off Meeting Minutes for FHWA review	4 weeks
	Final Project Work Plan and Kick-off Meeting Minutes	7 weeks
Task 2: Project Management and Stakeholder Coordination and Collaboration		
Subtask 2.1: Develop and Administer Project Management Process	Draft Project Management Process	4 weeks
	Final Project Management Process	7 weeks
	Draft one-page summary brochure or handout describing the purpose and scope of the project	4 weeks
	Final one-page summary brochure or handout describing the purpose and scope of the project	7 weeks
	Written project updates	Bi-weekly
	Project review meetings	Bi-weekly
	Unscheduled project updates/meetings as required.	TBD
Subtask 2.2: Facilitate Project Stakeholder Coordination and Collaboration Activities	Meetings or conference calls with FHWA and the Project Principals	Quarterly

	Organize and facilitate up to three meetings with the Technical Experts Group and other stakeholders on selected project topics, including the development of a technical summary document for each meeting	TBD - specified project milestones
Task 3: Conduct Extreme Weather Impacts Assessment		
Subtask 3.1: Identify Transportation Assets Damaged by Hurricane Sandy	Draft list of transportation assets	10 weeks
	Final list of transportation assets	13 weeks
Subtask 3.2: Establish Information Sharing Platform	Conceptual plan for information sharing platform for data sets	10 weeks
	Final plan for information sharing platform for data sets	13 weeks
Subtask 3.3: Collect Information on Recent Storm Impacts and Analyze Damage to Transportation Infrastructure	Draft GIS maps and technical memorandum detailing recent storm damage to the transport system	24 weeks
	Final GIS maps and technical memorandum detailing recent storm damage to the transport system	27 weeks
	Additional outreach materials as requested by FHWA	TBD
Subtask 3.4: Conduct Gap Analysis and Identify Lessons Learned	Draft technical memo detailing gap analysis and lessons learned	35 weeks
	Final technical memo detailing gap analysis and lessons learned	38 weeks
	Draft PowerPoint summarizing gap analysis and lessons learned	35 weeks
	Final PowerPoint summarizing gap analysis and lessons learned	38 weeks
	Additional outreach materials as requested by FHWA	TBD
Task 4: Engineering Assessment and Adaptation Analysis for Representative Set of Transportation Assets		
Subtask 4.1: Identify Set of Representative Assets for Engineering Analysis	Proposed list of up to 10 representative transportation assets	10 weeks

	Final list of up to 10 representative transportation assets	13 weeks
Subtask 4.2: Engineering-based adaptation assessment process	Draft technical memo including the proposed process to conduct detailed engineering analysis of adaption options	10 weeks
	Final technical memo including the process to conduct detailed engineering analysis of adaption options	13 weeks
	Draft PowerPoint summarizing proposed process to conduct engineering assessment	10 weeks
	Final PowerPoint summarizing final process to conduct engineering assessment	13 weeks
	Additional outreach materials as requested by FHWA	TBD
Optional Subtask 4.3: Conduct Engineering-Based Assessments of Select Set of Representative Assets	Draft scope of engineering analysis for each asset for up to 10 representative assets	18 weeks
	Final scope of engineering analysis for each asset for up to 10representative assets	21 weeks
	Draft engineering assessment of adaptation options for up to 10 representative assets	34 weeks
	Final engineering assessment of adaptation options for up to 10 representative assets	37 weeks
	Draft PowerPoint summarizing the overall engineering assessment and specific information on each asset	37 weeks
	Final PowerPoint summarizing the overall engineering assessment and specific information on each asset	39 weeks
	Additional outreach materials as requested by FHWA	TBD
Task 5: Climate Change Vulnerability Assessment and Adaptation Analysis		
Subtask 5.1: Identify Future Climate Effects for	Draft technical memo detailing climate modeling, analysis, and	40 weeks

Analysis	GIS data	
	Final technical memo detailing climate modeling, analysis, and GIS data	43 weeks
Subtask 5.2: Conduct Vulnerability Assessment	Draft Technical memo detailing vulnerability assessment process and GIS data	60 weeks
	Final Technical memo detailing vulnerability assessment process and GIS data	63 weeks
Subtask 5.3: Adaptation Analysis for Transportation Assets in Vulnerable Sub-Areas	Draft technical memo detailing adaptation options analysis and GIS data	72 weeks
	Final technical memo detailing adaptation options analysis and GIS data	75 weeks
	Additional outreach materials as requested by FHWA	TBD
Task 6: Project Report		
	Draft Comprehensive Report, including a one-page brochure and stand-alone Executive Summary	88 weeks
	Final Comprehensive Report, including a one-page brochure and stand-alone Executive Summary	92 weeks
	Draft PowerPoint Briefing	93 weeks
	Final PowerPoint Briefing	95 weeks
	Additional outreach materials as requested by FHWA	TBD

PERIOD OF PERFORMANCE

The period of performance for the Contract is 24 months from the effective date of the award.