HAZARD MITIGATION ADDENDUM

FEMA considers measures denoted by an asterisk (*) to be cost-effective Public Assistance mitigation if the measures do not exceed 100 percent of the eligible repair cost.

Building. *Please select which option the Applicant would choose to reduce the potential of future damage.*

☐ Elevate or relocate components above the Base Flood Elevation (based on Best Available Information – plus required freeboard)

☐ Elevate the building *

☐ Dry or wet floodproof the building *

☐ Anchor the building to foundation *

☐ Add defensible space around exterior for wildfire protection

☐ Add seismic bracing; connect roof, walls, and foundation

☐ Relocate the facility

☐ Increase resiliency of openings (doors, windows, and vents)

- ☐ Install shutters on windows
- ☐ Replace doors, door frames, hinges, and hardware with wind-resistant units*
- ☐ Replace glass with impact-resistant material*
- ☐ Strengthen windows*
- ☐ Upgrade the weather stripping to prevent water infiltration*
- ☐ Replace with water-resistance vents. *
- ☐ Use ember and flame-resistant vents (e.g., screen all attic vents with wire mesh or hardware cloth with openings no larger than 1/8 inch).

☐ Improve structural integrity

- ☐ Underpin spread footings
- ☐ Reinforce soft-stories and unreinforced masonry.
- ☐ Replace siding with a stronger materials and attachments to the wall sheathing and structure. *
- ☐ Utilize non-combustible component materials (e.g., concrete, bricks, stucco, and stone)

☐ Increase resiliency of Gutters and Downspouts

- ☐ Upgrade to direct water away from the structure to prevent interior or basement water damage. *
- ☐ Cover gutters with gutter screens to prevent the accumulation of leaves and pine needles for fire protection.

☐ Brace interior walls, partitions, parapets, anchor veneer or cladding, suspended light features, drop ceilings, soffits, etc.

☐ Increase resiliency of Roof(s)

- ☐ Replace gable roof(s) with hipped roof framing
- ☐ Install hurricane clips, fasteners, anchors, straps, and connectors that are compatible with the roof system and corrosion-resistant in coastal areas. *
- ☐ Low slope roof(s)
  - ☐ Replace entire roof covering with a fully adhered roof covering, such as a modified bitumen membrane roof. *
- ☐ Strengthen roof openings, such as hatches and skylights. *
- ☐ Strengthen the high-wind pressure areas (e.g., corner zones, roof soffits, overhangs). *
- ☐ Upgrade the roof system to a wind speed rating above the Codes and Standers minimum wind speed rating.
- ☐ Use roof coverings, sheathing, flashing, skylights, roof and attic vents, eaves, and gutters that conform to ignition-resistant construction standards.

Communication system. *Please select which option the Applicant would choose to reduce the potential of future damage.*

☐ Add guy-wires or additional support. *

☐ Undergrounding communication lines

☐ Upgrade foundation (e.g., larger footings)

☐ Upgrade hardware supporting communication structures (e.g., antennae towers) and/or strengthen assembly connection points.

Contents, equipment, supplies. *Please select which option the Applicant would choose to reduce the potential of future damage.*

☐ Provide seismic ties, straps, or clips to secure replaced furniture, cabinets, computers, bookcases, and other furnishings. *

☐ Elevate components above the Base Flood Elevation (BFE).

☐ Other. *Please describe*:

Drainage Structures. [Hydrologic and Hydraulic study required]

☐ Replace the structure with multiple structures or a larger structure. *

☐ Add properly designed entrance and exit structures, such as a headwall, wingwalls, flared aprons, or energy dissipation measures to increase efficiency and help to minimize scour and erosion. *

☐ Protect bank from erosion by using gabion baskets, rip rap, cast-in-place concrete, crushed stone or rock, grouted rip rap, sheet-piling, geotextile fabric, or similar measures to control erosion. *

☐ Protect back with use of vegetation or a combination of vegetation and construction materials such as live fascines, vegetated geogrids, live crib walls, brush mattresses, root wads, or similar measures are eligible. *

Energy facility or system. *Please select which option the Applicant would choose to reduce the potential of future damage.*

☐ Elevate or dry floodproof components or systems vulnerable to flood damage, including equipment controls, electrical panels; heating, ventilation, and air conditioning/machinery rooms; emergency generators; and fuel tanks. *

☐ Elevate pad transformers above the Base Flood Elevation. *

☐ Provide looped distribution service or other redundancies in the electrical service to critical facilities. *

☐ Install surge suppressors and lightning arrestors. *

☐ Increase resiliency of Power Lines. *Please select all that apply.*

- ☐ Add guy-wires or additional support. *
- ☐ Undergrounding power lines

☐ Increase resiliency of Power Poles. Please select all that apply.

- ☐ Add cross-bracing to H-frame poles to provide additional strength. *
- ☐ Remove large diameter line. *
- ☐ Replace damage power poles with higher-rated power poles (preferably two classes stronger) of the same or different material. *

☐ Support pole-mounted transformers with multiple poles. *

☐ Add seismic retrofitting.

Fence/gate. *Please select which option the Applicant would choose to reduce the potential of future damage.*

☐ Upgrade foundation to concrete or increase the depth of the post.

☐ Add line or corner braces or additional connectors to posts on chain link fencing.

HAZARD MITIGATION ADDENDUM

Signage. *Please select which option the Applicant would choose to reduce the potential of future damage.*

☐ Replace sign panels and their supports with a stronger type of system of supports and panels. *

Parks or recreation. *Please select which option the Applicant would choose to reduce the potential of future damage.*

☐ Anchor components

☐ Strengthen component materials

☐ Elevate or relocate components above the Base Flood Elevation.

☐ Add green roof(s) to reduce the amount of stormwater runoff.

☐ Add permeable pavement which allows stormwater to soak into the ground through porous materials, common in parking lots and shoulders.

☐ Design rain garden(s) to collect and absorb stormwater runoff in a shallow, vegetated basin near the facility.

☐ Integrate rainwater harvesting to collect and store rainfall for later use.

☐ Add tree canopy to reduce stormwater runoff and reduce the urban heat island effect.

☐ Add tree trenches: a row of trees planted in an underground infiltration structure made to store and filter stormwater.

☐ Add vegetated swale(s): a channel holding plants or mulch that absorbs and treats stormwater.

☐ Beaches and Shorelines. Please select all that apply.

- ☐ Stabilize or regrade banks.
- ☐ Beach nourishment.
- ☐ Add bulkhead
- ☐ Add drainage-promoting measures (e.g., chimney slope, trench drain, or a berm).
- ☐ Dune nourishment, vegetation, and fencing
- ☐ Design living shorelines (a combination of living components, such as plants, with structural elements, such as rock or sand).
- ☐ Restore marshland through regrading/fill, planting native vegetation, edging, sills, breakwaters, and reef balls.
- ☐ Install oyster reefs to buffer coasts from waves and filter surrounding waters.
- ☐ Relocate components outside Base Flood Elevation.
- ☐ Restore coastal wetlands along the ocean, estuary, or freshwater coastlines.
- ☐ Revetment
  - ☐ Add sloped structure placed at the toe and/or face of a coastal bank to dissipate wave energy.
- ☐ Design waterfront parks to intentionally flood during extreme events, reducing flooding elsewhere.

☐ Pier. *Please select all that apply.*

- ☐ Upgrade substructure components (e.g., larger diameter piling, install pile trips to deeper elevation, upgrade piling material inconsideration of marine environment, evaluate the benefits of a sacrificial superstructure in an effort to protect the substructure.
- ☐ Install open decking or floating decking with uplift-resistance tie-downs and fasteners, if attached to decking. *

Transportation. *Please select which option the Applicant would choose to reduce the potential of future damage.*

☐ Road(s). *Please, select all that apply.*

- ☐ Use geotextile fabric and revetments to stabilize shoulders and embankments. *
- ☐ Use geotextile drainage blankets between the pavement sections and the subbase. *
- ☐ Reduce ground motion hazards, like liquefaction and ground failure.

☐ Strengthen foundation, construct structural slabs to bridge narrow susceptible zones, or replace rigid pavement with flexible pavement.

☐ Add permeable pavement allows stormwater to soak into the ground through porous materials, common in parking lots and shoulders.

☐ Add permeable pavement allows stormwater to soak into the ground through porous materials, common in parking lots and shoulders.

☐ Bridge(s). *Please, select all that apply.*

☐ Install Longitudinal Peaked Stone Toe Protection with nature planting, upstream of a failed abutment. *

☐ Install cables to restrain a bridge from being knocked off piers or abutments during floods or earthquakes. *

☐ Install girder and deck uplift tie-downs to prevent their displacement from the substructure. *

☐ Replace with a low-water crossing where traffic counts are low. *

☐ Use geotextile fabric and revetments to stabilize shoulders and embankments. *

☐ Use fire resistant materials on bridge.

☐ Elevate the bridge above the Base Flood Elevation.

☐ Extend or underpin bridge footings below the scour line.

☐ Increase the bridge span to increase the cross-sectional area of flow.

☐ Install automatic bridge closures using Earthquake Early Warning Systems.

☐ Install flow deflectors and bull noses on upstream piers.

☐ Realign pier and abutment to match direction of stream flow.

☐ Reduce ground motion hazards, like liquefaction and ground failure.

☐ Strengthen foundation, construction of structural slabs to bridge narrow susceptible zones, or replacement of rigid pavements with flexible pavement.

☐ Low-water crossing(s). *Please, select all that apply.*

☐ Use geotextile fabric and revetments to stabilize shoulders and embankments. *

☐ Add culvert(s)

☐ Anchor the toes with vertical steel rebars in holes drilled into the bedrock.

☐ Form and pour deeper concrete toes along the upstream and downstream edges.

☐ Form and pour steel reinforced concrete instead of grouted riprap on the slopes.

☐ Increase the steel reinforcing in the concrete slab and toes.

☐ Reduce ground motion hazards, like liquefaction and ground failure.

☐ Replace the low water crossing with a bridge.

Water control. *Please select which option the Applicant would choose to reduce the potential of future damage.*

☐ Add headwall, wingwalls, flared aprons. *

☐ Bank protection (gabion baskets, rip rap, cast-in place concrete).

☐ Bank protection with a combination of vegetation and construction materials.

☐ Embankment and slope stabilization techniques.

☐ Energy dissipation measures.

☐ Evaluation of trees and brush growth on slopes and crests.

☐ Geotechnical engineering design concepts such as soil nailing.

☐ If pumps and their attached motors are damaged by stormwater inundation, replace them with submersible or inline pumps as appropriate. *

☐ Strengthen or widen spillway.

☐ Culvert(s). *Please, select all that apply.*

☐ Add or improve the designed entrance and exit to minimize erosion and scour. *

☐ Realign the culvert vertically or horizontally or relocate the culvert to improve flow and minimize erosion and scour. *

☐ Change or increase the shape, size, and/or number of culvert(s). *

☐ Extend the discharge end beyond the toe of the embankment. *

☐ Install a debris barrier or fins to prevent blockage. *

☐ Install a debris barrier riser to allow debris to float up with the rising floodwaters without blocking flow into the culvert. *

☐ Use geotextile fabric and revetments to stabilize shoulders and embankments. *

☐ Reduce ground motion hazards, like liquefaction and ground failure.

☐ Remove and replace culvert liners.

☐ Strengthen foundation, construct structural slabs to bridge narrow susceptible zones, or replace rigid pavements with flexible pavement.

Water/ Wastewater. *Please select which option the Applicant would choose to reduce the potential of future damage.*

☐ Elevate or dry floodproof components or systems vulnerable to flood damage. *

☐ Install camlocks, transfer switches, and electrical panels to facilitate the connection of portable emergency generators. *

☐ Install switches, circuit isolation, and/or quick connect capability to facilitate rapid connection of backup power for any damaged or susceptible mechanical and electrical components. *

☐ Provide seismic bracing for electrical lines, conduit, piping, ductwork, water heaters, and other Mechanical, Electrical, and Plumbing equipment. *

☐ Roof-Mounted Equipment. *Please select all that apply.*

☐ Secure to roof top via a continuous load path. *

☐ Other. *Please describe:*

☐ Pipe(s). *Please select all that apply.*

☐ Install automatic shut-off valves so that damage sections of pipe can be isolated.

☐ Install continuous lining or encasement to prevent infiltration or structural collapse. *

☐ Install pipe joint restraints, flexible piping at pipe/conduit connections, or replace pipes with more ductile material. *

☐ Underground Pipes. *Please select all that apply.*

☐ Install shut-off valves so that damaged sections of the underground pipe can be isolated. *

☐ Storage Tank(s). *Please select all that apply.*

☐ Anchor or otherwise protect from movement by strengthening or stiffening base connections. *

☐ Install self-initiating disconnects and shut-off valves between storage tanks and distribution lines to minimize damage and leaks. *

☐ Replace concrete tanks with steel.

☐ Replace combustible tanks with non-combustible tanks.

☐ Water/Wastewater: *Please select all that apply.*

☐ If pumps and their attached motors are damaged by stormwater inundation, replace them with submersible inline pumps as appropriate. *

☐ Raw water intakes: Install buttressing to prevent damage from erosion, scour, and flood debris. *

☐ Sewer Access Covers: Elevate to the hydraulic grade line. When elevation is not feasible or practicable, install devices to prevent infiltration into access holes such as cast-iron watertight frames and covers. *

☐ Well Systems: Seal exposed portions of well casing or raise the elevation of the well head to prevent infiltration of flood waters. *