

Appendix B-3

U.S. Marine Transportation System WIST Needs Template

U.S. Marine Transportation System Sector Activities

Inland water activities

Ferries

Commerce. Includes barge traffic on major rivers.

Recreational Boating. Includes fresh water lakes, rivers and streams.

Open water activities

Cargo/freight. Includes large ocean-going vessels, including U.S. Navy ships

Cruise lines

Commercial fishing. Primarily includes near-shore and off-shore salt water operations.

Recreational Boating. Salt-water operations.

Port operations. Operations include keeping port facilities open and safe movement of vessels in and out.

St. Lawrence Seaway operation. Operation of locks and canals, control of navigation and movement of vessels.

NASA movement of launch vehicle/payload elements via barge. Primarily external fuel tank and solid rocket boosters moving to and from the launch facility.

Marine Modeling. Forecasting oceanographic conditions for waterway and coastal operations to specifically improve predictions of water levels to facilitate ships entering/leaving ports.

Weather Needs for the Marine Transportation System, including Inland Waterway and Open Water Activities						
Weather Element	Threshold	Activity	Impacts	Action	Lead Time	
Freezing Rain	Any	All inland activities (ferries, boating, commerce), all open water activities (boating, cargo/freight, cruise lines, and fishing)	Possible injury to personnel because of ice covered decks and walkways, impaired equipment operation due to ice cover, line handling difficult because of ice, schedule delays due to time required for ice removal	Take precautions such as limiting ondeck activities. Cover equipment to keep it clear of ice. Avoid operating during periods or in areas of freezing rain.	12 hours/ current observation	
		NASA movement of launch vehicle and payload elements via barge	Risk to personnel, equipment and cargo from ice buildup	Consider restricting ondeck activities. Cover equipment and cargo. Delay barge movement.	12 hours	
		St. Lawrence Seaway operations	Vessel lockage operations delayed/suspended (dangerous conditions for lock linehandlers)	Apply sand and salt to surfaces.	12 hours	
		Port operations	Difficult ground travel, cargo handling, equipment operation, etc., because of ice	Implement snow/ice emergency plan.	12 hours/ current observation	
Snow (inches)	Any	All inland activities (ferries, boating, commerce), all open water activities (boating, cargo/freight, cruise lines, and fishing)	Possible injury to personnel from snow-covered decks and walkways, reduced visibility (depending on rate of snowfall), impaired equipment operation	Take precautions such as limiting ondeck activities. Cover equipment to keep the equipment clear of snow.	12 hours/ current observation	
		NASA movement of launch vehicle and payload elements via barge	Risks to personnel, equipment, and cargo from snow buildup	Consider restricting ondeck activities. Cover equipment and cargo. Delay barge movement.	12 hours	
		>4 inches	Port operations	Difficult ground travel, cargo handling, equipment operation, etc., because of snow	Implement snow/ice emergency plan.	24 hours/ 12 hours
		Heavy	St. Lawrence Seaway operations	See Visibility weather element	If equipped with radar, use it for navigation and maintaining clearance. Otherwise exercise extra vigilance and reduce speed as conditions require.	24 hours/ 12 hours
Drifting Snow	Any	Port operations	Travel difficult due to blowing snow and reduced visibility, snow clearing operations hampered	Implement snow/ice emergency plan.	6 hours	
Rain (intensity)	Heavy	All inland activities (ferries, boating, commerce)	Impaired operations due to reduced visibility, danger to personnel, and equipment from flooding	Exercise caution and reduce speed. If visibility is reduced below 1 statute mile, modify or delay operations until conditions improve.	6 hours/ current observation	
		All open water activities (boating, cargo/freight, cruise lines, and fishing)	Operations impaired by reduced visibility	Increase vigilance and reduce speed as conditions require.	6 hours/ current observation	
		NASA movement of launch vehicle and payload elements via barge	Operations impaired by reduced visibility	Increase vigilance and reduce speed as conditions require.	12 hours	
		St. Lawrence Seaway operations	Visual navigation restricted, risk of collisions increased	If equipped with radar, use it for navigation and maintaining clearance. Otherwise exercise extra vigilance and reduce speed as conditions require.	24 hours/ 12 hours	
		Port operations	Flooding possible	Move equipment to high ground and take precautions.	12 hours	
Any	Marine modeling	Freshwater inputs important to models	Improve model results by making more data available.	48 hours		
Flooding	Any	All inland activities (ferries, boating, commerce)	Danger to all inland activities, including lock operations, from high water levels and swift currents	Restrict/suspend operations until the flood threat has passed.	24 hours	

Weather Needs for the Marine Transportation System, including Inland Waterway and Open Water Activities					
Weather Element	Threshold	Activity	Impacts	Action	Lead Time
		NASA movement of launch vehicle and payload elements via barge	Potential problems in handling barges because of high water levels and swift currents	Restrict/suspend operations until the flood threat has passed.	12 hours
		Port operations	Operations disrupted, facilities damaged	Implement emergency procedures.	48 hours
		Marine modeling	Modeling of estuarine dynamics affected by freshwater inflow	Make more data available (e.g., hydrologic models and the real-time data needed to provide boundary conditions for estuarine models).	24-48 hours
Storm Surge or Abnormal High/Low Tides	Any	Port operations	Potential damage to port facilities from flooding and from vessels tied alongside	Exercise extra vigilance in tending mooring lines for ships alongside. Decide whether large ships should put to sea.	24 hours
		Recreational boating	Potential damage to moored boats	Arrange mooring lines for significantly higher water levels.	24 hours
		Ferries	Increased potential for groundings, potential damage to docks and terminals, impaired accessibility for passengers (particularly those with disabilities)	Modify operations as required.	12 hours
		Marine modeling	Estuarine models affected by coastal boundary conditions	Improve model results by making more data on boundary conditions available.	48 hours
Wind Wave Height (feet)	2 to 4 feet	Inland recreational boating	Reduced passenger comfort, increased risk to small boats	Warn small boats to exercise caution.	12 hours/ current observation
		Open water recreational boating	Reduced passenger comfort, increased risk to small boats	Exercise caution, adjust speed accordingly.	12 hours/ current observation
	4 to 6 feet	Inland recreational boating, ferries, and commerce	Potential safety risks to crew and passengers; potential hull damage to small boats; open barges may take on water, depending on loading	Exercise extreme caution, stop small boat activities. Advise passengers. Modify ferry operations. Reduce speed or suspend operations.	12 hours/ current observation
		Open water recreational boating, open water cruise lines	Risks to personnel, possible hull damage, reduced passenger comfort	Boats should reduce speed, exercise caution. Advise passengers.	12 hours
		Port operations	Possible damage to port facilities	Implement emergency procedures.	12 hours
	6 to 12 feet	Inland ferries	Safety risk to crew and passengers, damage risk to cargo	Advise passengers, secure cargo.	24 hours/ current observation
		Open water recreational boating, cargo/freight, cruise lines, and fishing	Safety risk to crew and passengers	If encounter unavoidable, adjust course/speed for best ride. Ensure cargo is secure, consider restricting ondeck activities.	24 hours/ current observation
		Port operations	Likely damage to port facilities	Implement emergency procedures.	24 hours
	≥10 feet	NASA movement of launch vehicle and payload elements via barge	Risk to personnel, possible damage to very sensitive, high value space program resources	Consider delaying movements until conditions improve.	24 hours
	≥12 feet	Open water cargo/freight, cruise lines, and fishing	Safety risk to crew and passengers, potential for damage to cargo and structural damage to the ship	Ensure cargo is secure. Consider restricting personnel from weather decks. Ensure freeing ports are clear. Adjust speed/course for best ride. Implement Heavy Weather Bill.	24 hours
Any	Marine modeling	Wave effects on model dynamics, mixing	Include waves in models to improve model results.	48 hours	
Inland Waterway Ice (coverage)	Any	All inland activities (ferries, boating, commerce)	All activities threatened by potential hull damage from ice	Change course and/or speed to avoid areas of ice. Request ice breaking services.	12 hours/ current observation

Weather Needs for the Marine Transportation System, including Inland Waterway and Open Water Activities					
Weather Element	Threshold	Activity	Impacts	Action	Lead Time
River Ice, Ice Gorging (coverage)	Any	Inland commerce	Damage risk to vessels, vessels may become icebound	Reduce tow size for better maneuverability. Stop operation if conditions prevent safe passage. Request ice breaking services.	12 hours/ current observation
Open Water Sea Ice	Any	All open water activities (cargo/freight, cruise lines, and fishing)	All activities threatened by potential hull damage from sea ice	Change course and/or speed to avoid areas of ice.	12 hours
		Port operations	Possible damage to port facilities including docks, piers, and watercraft	Be prepared to keep ice away from facilities.	24 hours
Freezing Spray (seas and low temperature)	Any	All open water activities (boating, cargo/freight, cruise lines, and fishing)	Reduced stability, ice loading may exceed maximum weight limit	Change heading and/or speed to reduce amount of spray. Remove as much ice as possible. If conditions do not improve, seek shelter.	12 hours/ current observation
Thunderstorms with Lightning or Hail (distance from operation in statute miles)	5 statute miles	All inland activities (ferries, boating, commerce)	Risk to personnel from lightning, potential damage to cargo and injury to crew and passengers from hail, threats to barge tow equipment and personnel from reduced visibility and wind	Stop boating activities. Exercise caution. Stop refueling. Stop outside work, reduce speed.	3 hours/ current observation
Thunderstorms with Lightning or Hail (distance from operation in nautical miles)	5 nautical miles	All open water activities (boating, cargo/freight, cruise lines, and fishing)	Risk to personnel from lightning, potential damage to cargo and injury to crew and passengers from hail, impaired ability to see and be seen from reduced visibility	Delay departure until storm has passed. Adjust course and speed to avoid storm. Consider restricting personnel from weather decks.	3 hours/ current observation
		NASA movement of launch vehicle and payload elements via barge	Potential for injury to personnel, possible damage to very sensitive, high value space program resources	Delay departure until conditions improve. Restrict outside activities. Adjust course and speed to avoid storm if possible.	3 hours
		Port operations	Safety risk to personnel, damage risk to port facilities	Implement wind/hurricane/tornado emergency plan.	3 hours/ current observation
Thunderstorms with Tornado or Waterspout (distance from operation in statute miles)	25 statute miles	All inland activities (ferries, boating, commerce)	Serious threat to all inland activities from tornadoes or waterspouts	Adjust course and/or speed to avoid storm.	3 hours/ current observation
Thunderstorms with Tornado or Waterspout (distance from operation in nautical miles)	20 nautical miles	All open water activities (boating, cargo/freight, cruise lines, and fishing)	Serious threat to all open water activities from waterspouts	Adjust course and/or speed to avoid storm.	3 hours/ current observation
		Port operations	Safety risk to personnel, damage risk to port facilities	Implement wind/hurricane/tornado emergency plan.	3 hours/ current observation
Air Temperature (degrees F)	≤32°	Inland ferries and commerce	Risks to crew, passengers, and equipment	Ensure that proper clothing is available. Monitor equipment.	12 hours
		Open water cargo/freight, cruise lines, and fishing	Health hazard to personnel, equipment operation impaired	Ensure proper clothing is available for personnel. Ensure equipment is properly maintained for cold weather operations.	12 hours
		Port operations	Risk to operators and equipment	Ensure that proper clothing is available. Monitor equipment.	24 hours
	≥90°	All MTS activities (10)	Risk to personnel from heat exhaustion, risk to equipment from overheating	Advise operators. Ensure proper clothing and water are available. Monitor equipment and limit outside activities.	12 hours

Weather Needs for the Marine Transportation System, including Inland Waterway and Open Water Activities					
Weather Element	Threshold	Activity	Impacts	Action	Lead Time
	≥90°	NASA movement of launch vehicle and payload elements via barge	Risk to personnel from heat exhaustion, risk to equipment from overheating, possible damage to very sensitive, high value space program resources	Advise operators. Ensure proper clothing and water are available. Monitor equipment and limit outside activities. Protect cargo.	12 hours
	All	Marine modeling	Air temperature effects on heat flux in models	Include data on air temperature and modeling of heat flux interactions to improve model results.	48 hours
Water Temperature (degrees F)	≤32°	All inland activities (ferries, boating, commerce)	Threat to all inland activities if waterways freeze over	Monitor water conditions and modify/restrict operations as required.	24 hours/ current observation
		St. Lawrence Seaway operations	Underpowered vessels may become icebound	Restrict certain vessels from operating, based on their power-to-length ratio.	24 hours
	All	Marine modeling	Water temperature important as initial condition for models	Improve model results by incorporating water temperature data.	Current observation
Heat Index (degrees F)	≥105°	All MTS activities (10)	Risk to personnel from heat exhaustion	Ensure that personnel wear proper clothing, drink water, and limit exposure.	12 hours
Wind Chill (degrees F)	≤20°	All MTS activities (10)	Risk to personnel from hypothermia and frost bite	Ensure that personnel wear proper clothing and limit exposure.	12 hours
Visibility (statute miles)	1 statute mile	Inland recreational boating	Visual navigation restricted, risk of collisions increased	If equipped with radar, use it for navigation and maintaining clearance. Otherwise exercise extra vigilance and reduce speed as conditions require.	6 hours/ current observation
	3 statute miles	Inland ferries			
	1 mile or less	Inland commerce			
Visibility (nautical miles)	≤1/8 nautical mile	NASA movement of launch vehicle and payload elements via barge	No movement when visibilities are below threshold	Wait for improved conditions.	24 hours/ current observation
	3 nautical miles	All open water activities (boating, cargo/freight, cruise lines, and fishing)	Reduced ability to maintain visual clearance, visual navigation restricted	If equipped with radar, use it for navigation and maintaining clearance. Otherwise exercise extra vigilance and reduce speed as conditions require.	6 hours/ current observation
	1 nautical mile	Port operations	Reduced ability to maintain visual clearance	Consider delaying ship movement (departures and arrivals).	6 hours/ current observation
	1/4-1/2 nautical mile	St. Lawrence Seaway operations	Reduced ability to maintain visual clearance	Suspend two-way navigation. Continue one-way navigation.	6 hours/ current observation
	≤1/4 nautical mile		Reduced ability to maintain visual clearance	Stop all vessel movements.	Current observation
Glare	Any	All MTS activities	Difficult to see for navigation and avoidance	Consider adjusting heading and/or reducing speed.	Current observation
Wind Speed and Direction (speed in miles per hour)	25 mph	All inland activities (ferries, boating, commerce)	Small boat handling may be difficult; control during ferry docking may be impaired; difficulty handling empty barges in tow; depending on wind direction, tows may become windbound; if wind opposes tidal current, expect increased wave heights	Warn all operators to exercise caution. If appropriate, stop small boat operations.	12 hours/ current observation
	All	Marine modeling	Wind provides surface momentum flux to models	To improve models, include wind data and model effects of	48 hours

Weather Needs for the Marine Transportation System, including Inland Waterway and Open Water Activities					
Weather Element	Threshold	Activity	Impacts	Action	Lead Time
Wind Speed and Direction (speed in knots or miles per hour)	20 knots	Open water boating and fishing	Boat handling difficulties because of wind and seas	Advise all operators to exercise caution. If appropriate, stop small boat operations.	24 hours/ current observation
	25 knots	Port operations	Possible wind damage to port facilities	Implement Emergency Wind Procedures. Consider delaying ship movements.	24 hours
	35 mph	All inland activities (ferries, boating, commerce)	Small boat handling and control difficulties because of wind and seas, control during docking impaired, difficulty handling empty barges in tow	Operations by small boats are not recommended. Operators of ferries and commerce traffic should exercise caution. If appropriate, stop operations until conditions	24 hours/ current observation
	30 knots	All open water activities (boating, cargo/freight, cruise lines, and fishing)	Minimal to extreme difficulty maintaining control, depending on size of vessel	Operations by small boats are not recommended. Cargo/freight, cruise line, and fishing operators should exercise caution and modify operations as conditions require.	24 hours/ current observation
	15-20 knots	St. Lawrence Seaway operations	Winds may affect vessel maneuverability, especially vessels in ballast conditions; normal flow of canal traffic may be interrupted	Require Seaway Entities to enforce "Wind Rules." Order vessels to anchor, as appropriate.	24 hours/ current observation
	30 knots	Port operations	Possible damage to port facilities	Implement Emergency Wind Procedures. Consider delaying ship movements.	24 hours/ current observation
	50 mph	All inland activities (ferries, boating, commerce)	Extreme difficulty with handling and maintaining control likely	Modify operations as required by conditions.	24 hours/ current observation
	45 knots	Open water cargo/freight, cruise lines, and fishing	Likely difficulty with handling and maintaining control	Adjust course and speed for best ride.	24 hours/ current observation
	45 knots	Port operations	Likely damage to port facilities Ship handling becomes difficult	Begin preparation activities. Implement emergency wind procedures. Consider delaying ship movements.	24-36 hours 12 hours
Air Quality (characterization/code)	Unhealthful/red	All MTS activities (10)	Health and safety risks to operators, passengers, and crew	Advise operators and modify operations as required.	12 hours
Space Weather (solar flares, etc.)	Any	All MTS activities (10)	Degraded GPS navigation and radio/cellular communications	Advise operators and monitor communications.	12 hours
Volcanic ash	Any	All MTS activities (10)	Reduced visibility, health hazard, damage to equipment from ash accumulation	Protect equipment, have breathing masks available. Make preparations to clear ash, curtail operations.	24 hours
Nuclear, Biological, or Chemical Dispersion	Any	All MTS activities (10)	Severe threat to life, health and safety risks (dispersion of extremely dangerous hazardous materials, agents, or substances)	Notify operators. Do not travel in affected areas.	1-3 hours/ current observation