

Risk-Based Decision Making



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June 2nd, 2006

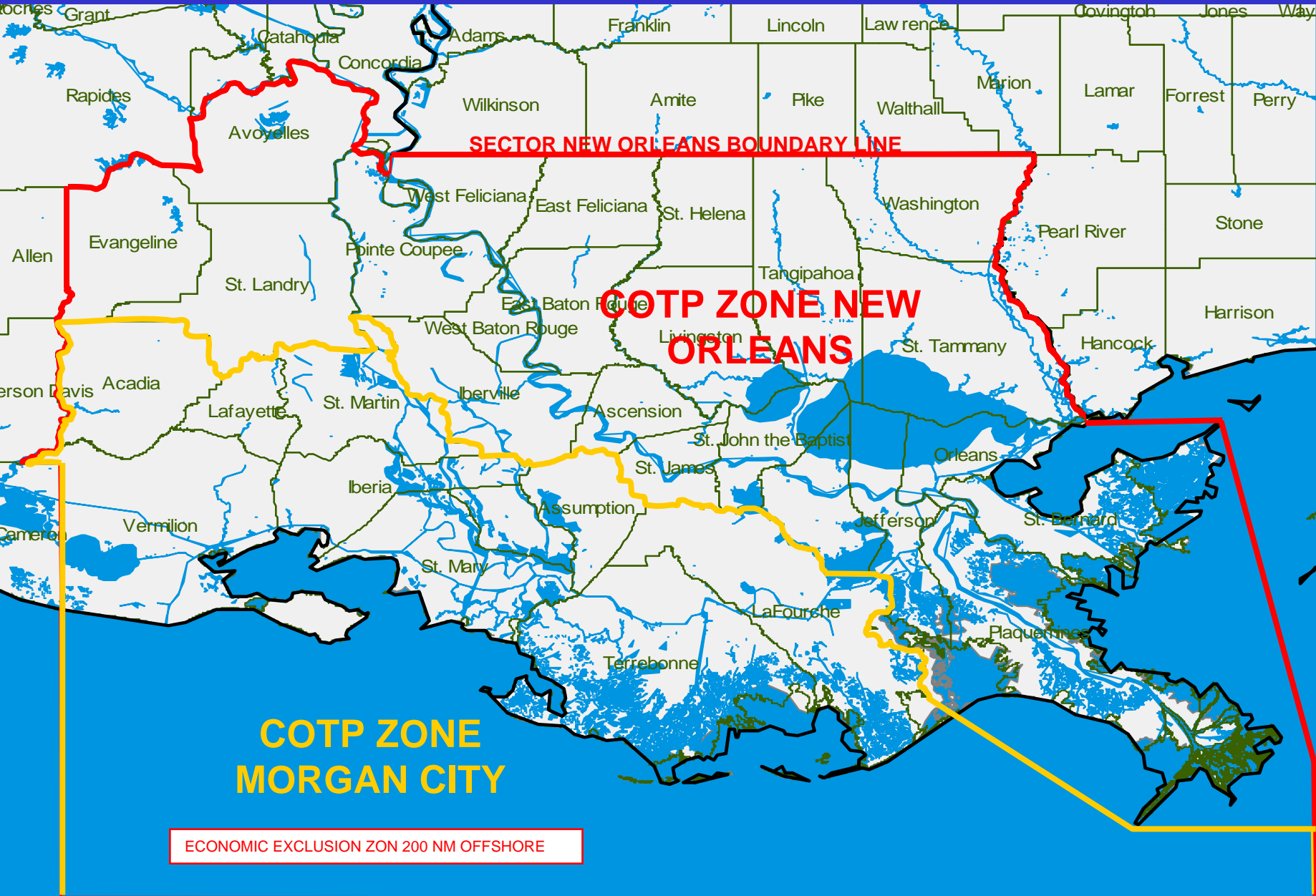


U. S. COAST GUARD

Outline

- Case Study: USCG Katrina Response
- What is RBDM?
- How was RBDM used?
- Was RBDM effective?
- Q&A





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EVINRUDE

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1C

MURPHY OIL, Meraux, LA 05 SEP 05

Ruptured Tank



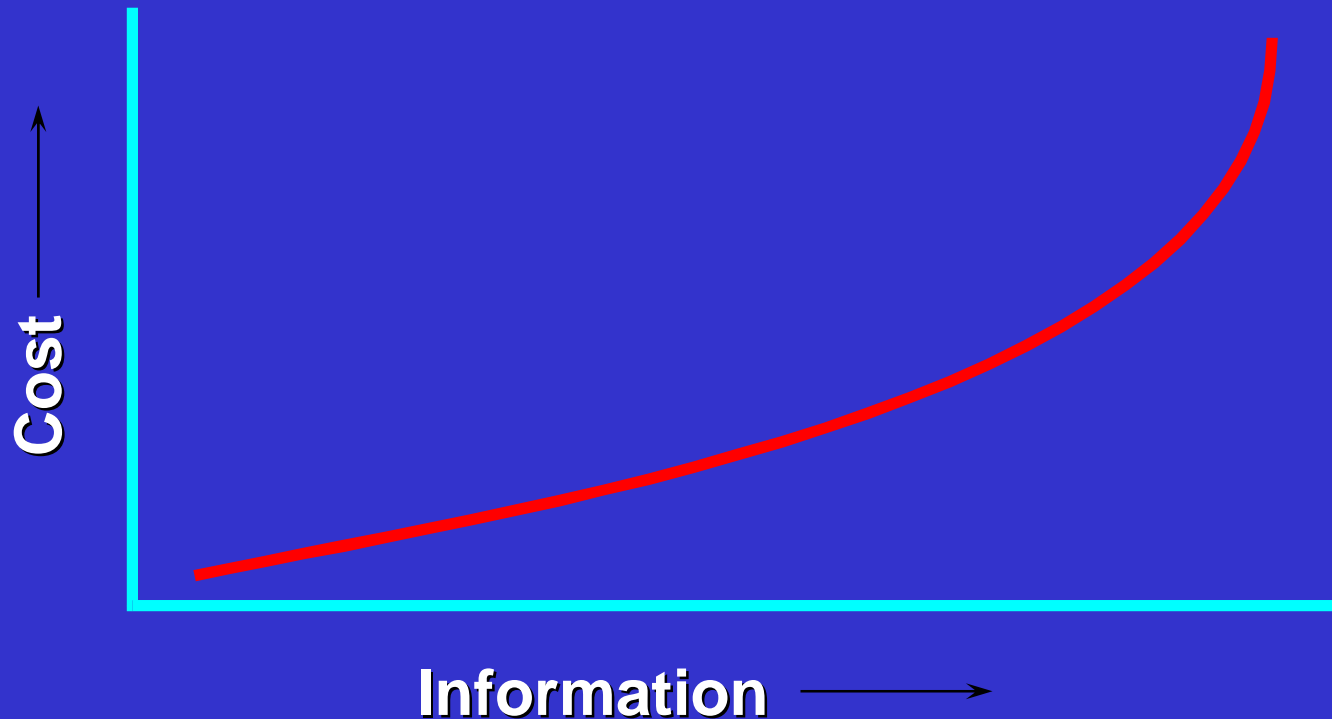


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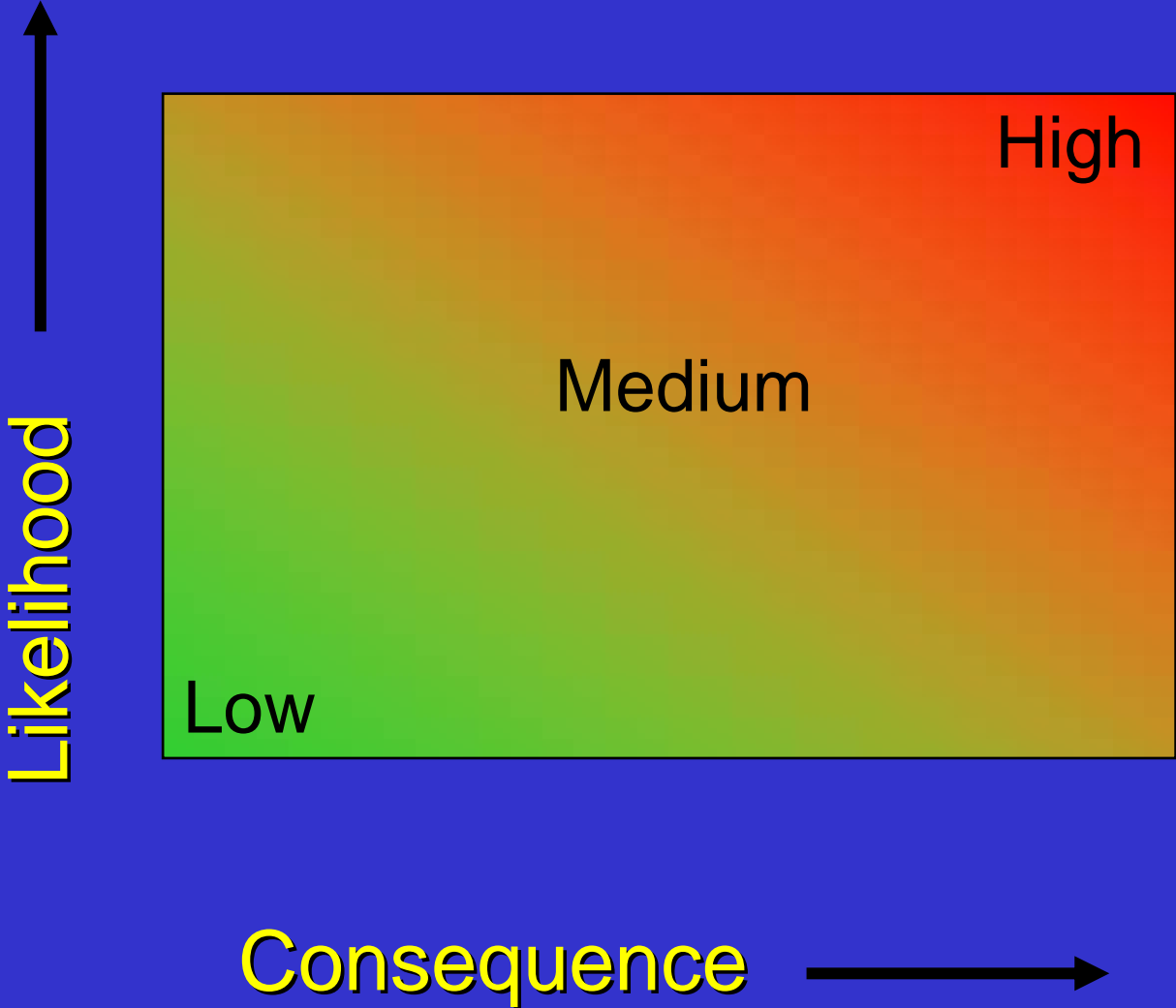


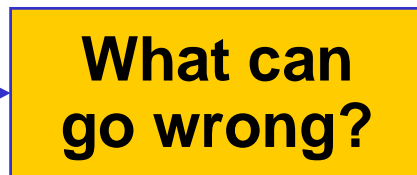


Decisions Are Always Made with Some Uncertainty

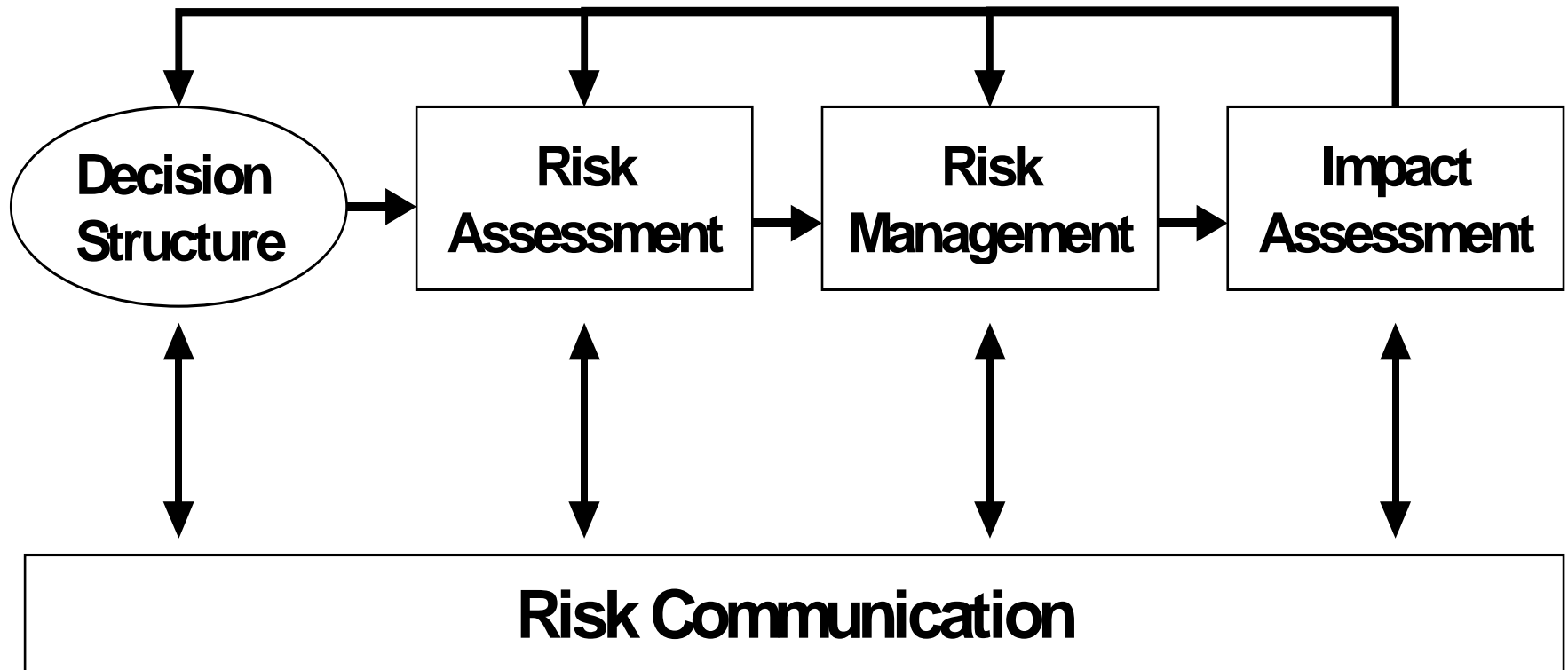


Risk can be described qualitatively or quantitatively...





Coast Guard RBDM Process











CHOS BEAUTY
PERU



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SEVERITY INDEX

ENCLOSURE (1)

| Type of Effects | Impacts on People | Property Damage | Impacts on Mobility, Recovery & Commerce | Environmental Impacts | | Impacts on Homeland Security | | | Impacts on National Defense | Public Reaction | | | Category number | Pain Points |
|-----------------|--|------------------------------|---|---|--|---|-------------------------------|--|--|---|---|--|-----------------|-------------|
| 6-Catastrophic | >1000 deaths or serious injuries | >\$3 billion | Interruption of vessel traffic/port commerce(1) or recovery operations for several months | Spill of more than 150,000 bbls (6.3 million gallons) of oil. Catastrophic HAZMAT spill. | Complete collapse of multiple living marine species over a large area | | | Transportation of WMD successful, Successful non-WMD terrorist attack | Critical long-term vulnerabilities in national defense | | Major damage to nationally important symbol | 6 | 3,000,000,000 | |
| 5-Major | 100 - 999 deaths or serious injuries | \$300 million - \$3 billion | Interruption of vessel traffic/port commerce(1) or recovery operations for a month | Spill of 15,000 bbls to 149,000 bbls (63,000 gallons to 6.29 million gallons) of oil. | Long-term collapse of at least one living marine species over a large area | | >300 migrant, sustainable | Transportation of components of WMD Successful, non-WMD terrorist attack | Short-term vulnerabilities in national defense | | Long-term national attention that results in shift of resources and permanent change in organizational policy | 5 | 150,160,000 | |
| 4-Severe | 10 - 99 deaths or serious injuries | \$30 million - \$299 million | Interruption of vessel traffic/port commerce(1) or recovery operations for several weeks | Spill of 1,500 bbls to 14,900 bbls (6,300 to 62,900 gallons) of oil. Major HAZMAT spill. | Short-term collapse of at least one living marine species over a large area | Contraband kept off the market; Cocaine: 10+ Tons; MJ 10+ Tons | >300 migrant, non-sustainable | Improper shipment of radioactive goods, resulting in implementing of WMD Response Plan | Long-term disruption in military actions | Short-term disruption of regional public safety(3); Long term regional disruption of normal passenger/transportation operations(2). | Short-term national attention and long-term regional media attention, which results in resource/policy loading review | Major damage regionally important symbol | 4 | 16500000 |
| 3-Substantial | 1 - 9 deaths or serious injuries | \$3 million - \$29 million | Interruption of vessel traffic/port commerce(1) or recovery operations for a week | Spill of 150 bbls to 1,490 bbls (630 to 6,290 gallons) of oil. | Living marine species to become locally endangered | Contraband kept off the market; Cocaine: 1 to 9.9 Tons; MJ 3.3 to 29.9 Tons | 100 to 299 migrants | Illegal shipment of personal weapons Known terrorists analyzing port | Short-term disruption in military actions | Medium to long term effect on local public safety(3); Long-term local disruption to normal passenger/transportation operations (2) | Long-term local attention and short-term regional attention that requires a resource/policy shift. | Major damage to locally important symbol | 3 | 1650000 |
| 2-Moderate | More than one life threatening injury | \$300,000 to \$2.9 million | Interruption of vessel traffic/port commerce(1) or recovery operations for up to a day | Spill of 15 bbls to 149 bbls (63 to 629 gallons) of oil. Major HAZMAT spill. Becomes an illegal Dumping site for oil & hazmat | Cumulative effect could cause a living marine species to become locally endangered | Contraband kept off the market; Cocaine: 1pd to 0.9 Tons; MJ 50 pds to 3.2 Tons | 10 to 99 migrants | Port surveillance by instigators; Intelligence may be used to adversely affect port security | Military nuisance | | Short-term local attention to which USCG applies resources. | | 2 | 165000 |
| 1-Minor | More than one significant but non-fatal injury | \$10,000 to \$299,999 | Interruption of vessel traffic/port commerce(1) or recovery operations for several hours | Spill of 1.5 bbls to 14.9 bbls (84 to 62.9 gallons) of oil. | Environmental Nuisance | Contraband kept off the market; Cocaine: < 1 lb; MJ <50 lbs | <10 migrants | Port surveillance by non-violent instigator | Civil disturbance | | Short-term local disruption to normal passenger transportation operations | | 1 | 55000 |

(1) Port commerce includes disruption of fishing, offshore and other commercial operations.

(2) Includes ferries, roads and bridges damaged to flood control structures needed during storms.

(3) Includes damaged to flood control structures needed during storms.

SEVERITY INDEX

| Type of Effects | Impacts on People | Property Damage | Category number | Pain Points |
|-----------------|--------------------------------------|-----------------------------|-----------------|---------------|
| 8-Catastrophic | >1000 deaths or serious Injuries | >\$3 billion | 6 | 3,000,000,000 |
| 6-Major | 100 - 999 deaths or serious Injuries | \$300 million - \$3 billion | 5 | 1501500000 |

| | | | | |
|------------|--|-------------------------|---|---------|
| 2-Moderate | More than one life threatening Injury | \$300,000 to \$2.9 mill | 2 | 1650000 |
| 1-Minor | More than one significant but non-fatal Injury | \$10,000 to \$299,999 | 1 | 66000 |



Kent Scale

| Bin No. | Probability | Lower Bound | Upper Bound | Description |
|---------|-------------|-------------|-------------|--------------------------------------|
| 6 | 99.00% | 99 | 100 | Virtually Certain to occur |
| 5 | 93.00% | 87 | 99 | Event is almost certain to occur |
| 4 | 75.00% | 63 | 87 | Event is probable |
| 3 | 50.00% | 40 | 60 | Chances of the event are about even |
| 2 | 30.00% | 20 | 40 | Event is probably not going to occur |
| 1 | 7.00% | 2 | 12 | Event is almost certain not to occur |
| 0 | 1.00% | 0 | 2 | Virtually Impossible to occur |



Risk-Based Prioritization

| Probability | | | | | | | |
|-------------|-------------------|--------|-----------|------------|-------------|---------------|---------------|
| Category | Range | | | | | | |
| 6 | .99 - 1.0 | 54,450 | 1,633,500 | 16,335,000 | 163,350,000 | 1,486,485,000 | 2,970,000,000 |
| 5 | .87 - .99 | 51,150 | 1,534,500 | 15,345,000 | 153,450,000 | 1,396,395,000 | 2,790,000,000 |
| 4 | .63 - .87 | 41,250 | 1,237,500 | 12,375,000 | 123,750,000 | 1,126,125,000 | 2,250,000,000 |
| 3 | .40 - .60 | 27,500 | 825,000 | 8,250,000 | 82,500,000 | 750,750,000 | 1,500,000,000 |
| 2 | .20 - .40 | 16,500 | 495,000 | 4,950,000 | 49,500,000 | 450,450,000 | 900,000,000 |
| 1 | .02 - .12 | 3,850 | 115,500 | 1,155,000 | 11,550,000 | 105,105,000 | 210,000,000 |
| 0 | 0 - .02 | 550 | 16,500 | 165,000 | 1,650,000 | 15,015,000 | 30,000,000 |
| | Severity Category | 1 | 2 | 3 | 4 | 5 | 6 |



| Potential Salvage Operation | Primary Hazard Considered (priority classification) | Port/Area | Impacts on People | Property Damage | Impacts on Mobility, Recovery & Commerce | Environmental Impacts | Impacts on Homeland Security | Impacts on National Defense | Public Reaction | Sort by Pain Points | Likelihood of immediate impacts (without salvage response) | Sort by Immediate Risk | Likelihood long-term impacts (without salvage response) | Sort by Long-Term Risk |
|--|---|-----------|-------------------|-----------------|--|-----------------------|------------------------------|-----------------------------|-----------------|---------------------|--|--------------------------|---|--------------------------|
| | | | | | | | | | | Total Pain Points | | Immediate Risk Index No. | | Long-Term Risk Index No. |
| Tank barge w/ Cargo sunk near channel | Pollution - Fire - Explosion | | 3 | 2 | 3 | 4 | 0 | 0 | 3 | 216150000 | 6 | 213988500 | 6 | 213988500 |
| Tank barge w/ Cargo partially afloat | Pollution - Fire - Explosion | | 3 | 2 | 3 | 4 | 0 | 0 | 3 | 216150000 | 5 | 201019500 | 6 | 213988500 |
| Tank Barge w/Cargo high n dry | Pollution - Fire - Explosion | | 3 | 2 | 0 | 4 | 0 | 0 | 3 | 199850000 | 2 | 59895000 | 5 | 185674500 |
| Inland Workboats (tug/tows) sunk near channel | Pollution - Navigation | | 2 | 2 | 3 | 3 | 0 | 0 | 2 | 37950000 | 6 | 37570500 | 6 | 37570500 |
| Fishing Vessels sunk near channel | Pollution - Navigation | | 2 | 2 | 3 | 3 | 0 | 0 | 2 | 37950000 | 6 | 37570500 | 6 | 37570500 |
| Fishing Vessels sunk in channel (above ND for shallow channel) | Pollution - Navigation | | 2 | 2 | 3 | 3 | 0 | 0 | 2 | 37950000 | 6 | 37570500 | 6 | 37570500 |
| Offshore workboats (osv, crew boats, liftboats) sunk near channel | Pollution - Navigation | | 2 | 2 | 3 | 3 | 0 | 0 | 2 | 37950000 | 6 | 37570500 | 6 | 37570500 |
| Crane/Construction Barges high n dry | Opportunity Cost | | 0 | 2 | 3 | 3 | 0 | 0 | 2 | 36300000 | 6 | 35937000 | 6 | 35937000 |
| Inland Workboats (tug/tows) sunk in channel (below ND) | Pollution | | 2 | 2 | 0 | 3 | 0 | 0 | 2 | 21450000 | 6 | 21235500 | 6 | 21235500 |
| Offshore workboats (osv, crew boats, liftboats) sunk in channel (below ND) | Pollution | | 1 | 2 | 0 | 3 | 0 | 0 | 2 | 19855000 | 6 | 19856450 | 6 | 19856450 |
| Offshore Workboats aground | Navigation - Pollution | | 2 | 2 | 3 | 3 | 0 | 0 | 2 | 37950000 | 3 | 18975000 | 5 | 36293500 |
| Bottom debris in channel (above ND) | Navigation | | 1 | 2 | 3 | 0 | 0 | 0 | 0 | 18205000 | 5 | 18930650 | 6 | 18022950 |
| Tank (gas free) barge hard aground | Navigation - Fire - Explosive | | 3 | 2 | 2 | 3 | 0 | 0 | 3 | 52800000 | 2 | 15840000 | 3 | 26400000 |
| Offshore workboats (osv, crew boats, liftboats) high and dry | Pollution - Navigation | | 1 | 2 | 3 | 3 | 0 | 0 | 2 | 36355000 | 2 | 10906500 | 5 | 33810150 |
| Hopper/Deck Barge Submerged near channel | Navigation | | 2 | 2 | 3 | 0 | 0 | 0 | 2 | 21450000 | 3 | 10725000 | 4 | 16087500 |
| Fishing Vessels hard aground | Pollution - Navigation | | 2 | 2 | 2 | 3 | 0 | 0 | 2 | 23100000 | 2 | 8930000 | 6 | 22869000 |
| Inland Workboats (tug/tows) high and dry | Pollution - Navigation | | 2 | 2 | 0 | 3 | 0 | 0 | 2 | 21450000 | 2 | 6435000 | 5 | 19948500 |
| Fishing Vessels high n dry | Pollution - Navigation | | 2 | 2 | 0 | 3 | 0 | 0 | 2 | 21450000 | 2 | 6435000 | 5 | 19948500 |
| Hopper/Deck Barge Submerged out of channel | Navigation | | 2 | 2 | 3 | 0 | 0 | 0 | 2 | 21450000 | 2 | 6435000 | 3 | 10725000 |
| Bottom debris near channel | Navigation | | 1 | 1 | 3 | 0 | 0 | 0 | 0 | 16610000 | 2 | 4983000 | 4 | 12457500 |
| Hopper/Deck Barge partially afloat | Navigation | | 2 | 2 | 2 | 0 | 0 | 0 | 2 | 6600000 | 4 | 4950000 | 5 | 8138000 |
| Hopper/Deck Barge hard aground | Navigation | | 2 | 2 | 2 | 0 | 0 | 0 | 2 | 6600000 | 3 | 3300000 | 3 | 3300000 |
| Recreational Vessels capsized/floating | Pollution - Navigation | | 2 | 1 | 1 | 2 | 0 | 0 | 1 | 3485000 | 5 | 3222450 | 6 | 3430350 |
| Recreational Vessels aground | Pollution - Navigation | | 2 | 1 | 1 | 2 | 0 | 0 | 1 | 3485000 | 3 | 1732500 | 6 | 3430350 |
| Hopper/Deck Barge on revetment | Navigation | | 1 | 2 | 2 | 0 | 0 | 0 | 2 | 5005000 | 2 | 1501500 | 3 | 2502500 |
| Hopper/Deck Barge Submerged in channel (Below ND) | Navigation | | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 4950000 | 1 | 348500 | 1 | 348500 |
| Hopper/Deck Barge High n Dry | Navigation | | 1 | 2 | 0 | 0 | 0 | 0 | 2 | 3365000 | 0 | 336500 | 0 | 336500 |



U. S. COAST GUARD





Sector New Orleans



Semper Paratus!

