



# Office of Infrastructure Protection Houston Area Hurricane Analysis Summary

	<h2 style="text-align: center;"><u>Scenario Storm Characteristics</u></h2> <ul style="list-style-type: none"> <li>• Category 4 hurricane at landfall</li> <li>• Maximum sustained winds &gt; 150 mph</li> <li>• Estimated storm surge of 20 feet</li> <li>• Landfall in south of Houston, TX</li> <li>• Major cities most impacted: Houston; Galveston; and Port Arthur, TX</li> </ul>	
<b>Population</b>		
<b>Population within Potential Surge Zones</b> (population within each flood depth range)	16+ feet	90,000
	11-15 feet	91,000
	9-10 feet	18,000
	6-8 feet	49,000
	1-5 feet	130,000
<b>Population Impacted by Potential Power Outages</b> (widespread power outages expected in eastern Texas, localized outages expected in remaining areas) Times to restoration are after damage assessment	Affected	~ 5,000,000
	13-14 days	75% restored
	20+ days	Fully restored
<b>Estimated Economic Impacts</b>		
Direct costs for business interruptions	\$4-8 billion	
Total costs for business interruptions	\$14-22 billion	
<b>Facilities of Interest</b>		
<b>Major Seaports</b>	<ul style="list-style-type: none"> <li>• Port of Houston</li> <li>• Port of Beaumont</li> <li>• Port of Corpus Christi</li> <li>• Port of Texas City</li> <li>• Port of Lake Charles</li> <li>• Port of Freeport</li> </ul>	
<b>Major Transportation Routes</b>	<ul style="list-style-type: none"> <li>• I-10 and I-45</li> </ul>	
<b>Expected Major Airport Closures</b>	<ul style="list-style-type: none"> <li>• George Bush Intercontinental Houston</li> <li>• William P Hobby Houston</li> <li>• San Antonio Intl</li> <li>• Austin-Bergstrom Intl</li> </ul>	
<b>Water Distribution Treatment Plants</b> (impacted by potential storm surge)	<ul style="list-style-type: none"> <li>• East Water Purification Plant</li> <li>• Southeast Water Purification Plant</li> </ul>	
<b>Major Wastewater Treatment Facilities</b> (large plants impacted by storm surge)	<ul style="list-style-type: none"> <li>• City Of Galveston</li> <li>• Gulf Waste Disposal</li> <li>• Houston, City Of (Sims Bayou)</li> </ul>	

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## Impacts by Infrastructure Sector

Infrastructure	Level	Impacts	-Low	-Medium	-High
Agriculture		Not analyzed			
Banks & Finance		<ul style="list-style-type: none"> <li>No long-term impacts expected due to backup systems but electronic transfers could be affected due to loss of electric power and telecommunications services</li> </ul>			
Chemical: Plants		<ul style="list-style-type: none"> <li>Houston area has the highest concentration of specialty and commodity chemical plants in the United States</li> <li>303 chemical plants in the affected area</li> </ul>			
Commercial Facilities		<ul style="list-style-type: none"> <li>Impacts not major, loss of business due to electric power outages</li> </ul>			
Dams		<ul style="list-style-type: none"> <li>Not analyzed</li> </ul>			
Defense Industrial Base		<ul style="list-style-type: none"> <li>Not analyzed</li> </ul>			
Emergency Services		<ul style="list-style-type: none"> <li>Emergency response delays expected due to transportation, electrical power, and telecommunications disruptions</li> </ul>			
Energy: Electric Power		<ul style="list-style-type: none"> <li>Widespread power outages expected in eastern TX – potential for &gt;5,000,000 people to experience power outages</li> <li>Localized outages expected in the rest of TX and southern LA in the study area</li> <li>75% restoration expected within 13-14 days following damage assessment</li> <li>Full restoration may take over 20 days following damage assessment</li> </ul>			
Energy: Natural Gas		<ul style="list-style-type: none"> <li>158 compressor stations and 107 processing plants in affected area</li> <li>Over 21,000 miles of pipelines</li> </ul>			
Energy: Petroleum		<ul style="list-style-type: none"> <li>Refining capability could drop by 18 million barrels per week</li> <li>Some oil and natural gas wells in the Gulf of Mexico could be shut down for an extended time</li> </ul>			
Government Facilities		<ul style="list-style-type: none"> <li>Impacts may be locally or regionally significant</li> </ul>			
Information Technology		<ul style="list-style-type: none"> <li>Impacts may be locally or regionally significant</li> </ul>			
National Monuments		<ul style="list-style-type: none"> <li>Impacts may be locally or regionally significant</li> </ul>			
Nuclear Facilities		<ul style="list-style-type: none"> <li>South Texas (2,709 MW) nuclear power plant is within the study area</li> </ul>			
Postal & Shipping		<ul style="list-style-type: none"> <li>Expect delays due to transportation impacts</li> </ul>			
Hospitals & Nursing Homes		<ul style="list-style-type: none"> <li>Evacuations and potential closure of some facilities in impacted area will increase demand on neighboring regional facilities</li> </ul>			
Telecomm: Wireline		<ul style="list-style-type: none"> <li>Expect damage to telecommunications infrastructure (poles and overhead lines) especially in coastal areas of TX</li> <li>Restoration of full service may take weeks</li> </ul>			
Telecomm: Wireless		<ul style="list-style-type: none"> <li>Not analyzed</li> </ul>			
Transport: Road/Rail		<ul style="list-style-type: none"> <li>Ground transportation impacts due to flooding and debris and I-10 could be impacted due to flooding</li> </ul>			
Transport: Airports		<ul style="list-style-type: none"> <li>Airport closure in Houston expected and could result in delays nationally as Houston is a major hub</li> </ul>			
Transport: Seaports		<ul style="list-style-type: none"> <li>Four ports in this scenario are subject to extensive damage to port infrastructure: Freeport, Texas City, Galveston and Houston</li> <li>Much crude oil and refined products are exported from these affected ports</li> </ul>			
Water: Drinking Water		<ul style="list-style-type: none"> <li>The San Jacinto Water Filtration Plant is the largest plant in the area and has a maximum rated capacity of 350 MGD</li> <li>Most of this supply comes from the Lake Conroe, Lake Houston, and Lake Livingston reservoirs</li> </ul>			
Water: Wastewater		<ul style="list-style-type: none"> <li>Houston operates 401 lift stations over a 650 square mile region indicating a high reliance on electric power</li> <li>34 plants in potential storm surge zones</li> </ul>			

