

Preliminary Study of Louisiana Hurricane Evacuations and Effects on Mississippi

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This Technical Memorandum is prepared as a first look at the traffic impacts of traffic evacuating from southeast Louisiana due to an approaching hurricane and the potential impact to Mississippi. The work is being accomplished under the FEMA/ U S Army Corps of Engineers Southeast United States Hurricane Evacuation Study effort with inputs from initial work accomplished in southeast Louisiana under the Bi-State Hurricane Evacuation Study effort. A series of 1600 behavioral interviews is also being accomplished in the Mississippi Louisiana study area under the auspices of these two important hurricane studies. Once the behavioral effort is completed in the fall of 2001, more definitive traffic analysis and shelter demand work can be completed.

Contribution of Louisiana Evacuating Vehicles to Mississippi

To estimate the number of potential evacuating vehicles entering Mississippi for various hurricanes threatening both southeast Louisiana and Mississippi, previous hurricane evacuation study work was examined. PBSJ completed a hurricane traffic modeling analysis for southeast Louisiana in the 1990-1992 timeframe. The work was done under contract to the US Army Corps of Engineers, New Orleans District. Looking at various evacuating vehicle volumes exiting the southeast Louisiana area by specific route and the origin parish of that modeled exiting traffic, a table was constructed showing the percentage of each parishes' exiting traffic on each route. Table 1 shows the data that was developed and includes Interstate 10, Interstate 59, and Interstate 55 into Mississippi. The percentages of each parishes' exiting traffic by route will be modified once behavioral survey/destination data is provided by Dr. Jay Baker of Hazards Management Group. He is the contractor performing the 1600 behavioral interviews.

Based on the percentages reported in Table 1 and various socioeconomic and behavioral data contained in the Corps HES for southeast Louisiana, Table 2 was constructed which shows by storm intensity, the number of evacuating vehicles by route. The table also shows the assumed hourly service volume for each key route under normal conditions and then with contraflow/one way operations in place. Potential contraflow segments include Interstate 10 eastbound over Lake Pontchartrain, Interstate 10 westbound between Kenner and Interstate 55, and Interstate 59 northbound into Mississippi. At the present time, the Interstate 59 contraflow has been planned to the Mississippi line but details of the operation within Mississippi have not been completely worked out.

Table 1
Percentage Contribution of Out of Region Evacuation Vehicles to Routes by Parish

Percent of Evacuating Vehicles Traveling Out of Parish by Major Route										
Southeast Louisiana Parish	I-12 west	I-10 eastbound over Lake Ponchartrain	I-10 east into Miss.	I-59 north into Miss.	Lake Ponchartrain Causeway	US61 west bound	I-10 westbound east of I-55	I-55 north into Miss.	I-10 westbound west of I-55	Louisiana Highway 1
Jefferson	0%	30%	5%	25%	25%	5%	40%	20%	20%	0%
Orleans	0%	30%	5%	25%	25%	5%	40%	20%	20%	0%
Plaquemines	0%	40%	10%	30%	20%	0%	40%	20%	20%	0%
St. Bernard	0%	40%	10%	30%	20%	0%	40%	20%	20%	0%
St. Charles	0%	20%	5%	15%	20%	10%	50%	25%	25%	0%
St. John the Baptist	0%	15%	5%	10%	5%	10%	0%	40%	30%	0%
St. James	0%	15%	5%	10%	5%	10%	0%	40%	30%	0%
St. Tammany	15%	0%	10%	40%	0%	0%	0%	35%	0%	0%
Terrebonne	0%	10%	3%	7%	0%	0%	20%	20%	0%	40%
St. Mary	0%	10%	3%	7%	0%	0%	0%	5%	0%	75%
Assumption	0%	10%	3%	7%	0%	0%	0%	5%	0%	75%
Lafourche	0%	10%	3%	7%	0%	0%	20%	20%	0%	40%

Please Note: Percentages by parish add up to more than 100% because traffic uses some listed roadway segments to get to other listed roadway segments. For example, the five percent of Jefferson Parish "out traffic" using I-10 eastbound into Mississippi also is included in the I-10 eastbound over Lake Pontchartrain percentage as well. Percentages are based on traffic assignments contained in PBS&J's hurricane transportation modeling work for the New Orleans District Corps of Engineers in the 1990 -1992 timeframe. Figures will be updated based on behavioral survey work/destination data to be provided by Dr Jay Baker in late 2001.

Table 2
Evacuating Vehicles by Critical Roadway Segment

Critical Roadway Segment	Directional Serv Vol	Directional Serv Vol	Cat 1 Fast Cat 2	Cat 1 Fast Cat 2	Slow Cat 2 Fast Cat 3	Slow Cat 2 Fast Cat 3	Fast Cat 3-4 Evac Veh	Fast Cat 3-4 Evac Veh	Slow Cat 3-4 Cat 5	Slow 3-4 Cat 5
	LOS D - NO Contraflow	LOS D -with Contraflow	Evac Veh Low Occ	Evac Veh High Occ	Evac Veh Low Occ	Evac Veh High Occ	Evac Veh Low Occ	Evac Veh High Occ	Evac Veh Low Occ	Evac Veh High Occ
	I-12 westbound	3,000	3,000	688	694	1,197	1,204	1,599	1,605	2,693
I-10 east over Lake Ponchartrain	3,000	5,000	7,586	8,651	22,991	24,070	56,851	57,942	94,095	95,185
I-10 eastbound into Mississippi	3,000	3,000	2,160	2,359	6,063	6,267	12,033	12,239	19,643	19,849
I-59 northbound into Mississippi	3,000	5,000	7,719	8,606	20,917	21,815	50,148	51,055	83,426	84,333
Lake Ponchartrain Causeway	2,500	2,500	4,203	4,982	12,828	13,606	40,890	41,675	69,589	70,374
US61 westbound	1,800	1,800	791	946	1,925	2,081	7,700	7,857	14,775	14,932
I-10 westbound east of I-55	3,000	5,000	9,409	10,794	27,476	28,878	72,444	73,859	122,920	124,334
I-55 northbound into Mississippi	3,000	3,000	8,092	8,900	20,126	20,955	44,135	44,973	77,816	78,652
I-10 westbound west of I-55	3,000	3,000	3,925	4,548	12,166	12,788	35,024	35,653	61,169	61,797
Louisiana Highway 1	1,000	1,000	8,783	9,510	17,750	18,564	18,402	19,241	28,692	29,528

Evacuation Clearance Time for Major Exiting Routes

By simply dividing the potential evacuating traffic volumes (by route and storm scenario) by the hourly service volume/assumed flow rate, a rough estimate of clearance time can be developed. Table 3A&B provide these calculations by route and storm scenario and also builds in a response time/background traffic factor to make the calculations a little more realistic. Table 3A provides the rough clearance time estimates for situations without the contra flow/one way operations. Table 3B shows clearance times with contra flow and highlights times that changed.

Without the contraflow operations, clearance time for a worst-case hurricane will be over 50 hours for the southeast Louisiana area. Since current warning capabilities of the National Hurricane Center can't possibly pinpoint where a storm will hit this far out before actual landfall, the area will not have this kind of lead time available for evacuation. This will necessitate the implementation of contraflow plans. With the contraflow plans activated, clearance times could drop to around 36 hours which means full scale evacuations and significant participation by Orleans and Jefferson Parishes would have to commence as soon as a hurricane watch is issued. However, this assumes that local in-parish bottlenecks and the time required to process traffic through those bottlenecks would not exceed 36 hours.

Impact of Louisiana on Mississippi

The impact of Louisiana traffic and evacuees on the Mississippi road network and sheltering resources (including available hotel/motels) will be significant in a major storm threat with or without contraflow measures. Even using somewhat dated socioeconomic and behavioral data, this analysis identifies the potential for some 84,000 vehicles to enter Mississippi on I-59, 78,000 vehicles to enter on I-55, and 19,000 vehicles to enter on I-10 for a worst case hurricane threat. The greatest impact will be at the US 49 interchange with I-59 at Hattiesburg as evacuees from the Mississippi coast mix with the influx of Louisiana evacuees. Jackson's evacuation traffic will also be intense but somewhat more manageable. In that regard, it would be prudent for the emergency management and transportation officials of both states to look at the possible benefits of reverse laning I-55 as an alternative to the proposed I-59 contraflow. The most difficult task of designing an I-59 contraflow from the Louisiana state line to Hattiesburg will be how to end the operation.

As new socioeconomic and behavioral data becomes available these traffic demand figures can be adjusted and estimates of inland shelter demand derived for inland destinations like Hattiesburg and Jackson.

Table 3A
Evacuating Clearance Times for Critical Roadway Segments No Contra flow

Critical Roadway Segment	Response Time	Clearance Times	Clearance Times	Clearance Times	Clearance Times	Clearance Times	Clearance Times	Clearance Times	Clearance Times
	Background	Cat 1	Cat 1	Slow Cat 2	Slow Cat 2	Fast Cat 3-4	Fast Cat 3-4	Slow Cat 3-4	Slow 3-4
	Traffic Factor	Fast Cat 2 Low Occ	Fast Cat 2 High Occ	Fast Cat 3 Low Occ	Fast Cat 3 High Occ	Evac Veh Low Occ	Evac Veh High Occ	Cat 5 Low Occ	Cat 5 High Occ
I-12 westbound	8.00	8.23	8.23	8.40	8.40	8.53	8.54	8.90	8.90
I-10 east over Lake Ponchartrain	10.00	12.53	12.88	17.66	18.02	28.95	29.31	41.36	41.73
I-10 eastbound into Mississippi	8.00	8.72	8.79	10.02	10.09	12.01	12.08	14.55	14.62
I-59 northbound into Mississippi	8.00	10.57	10.87	14.97	15.27	24.72	25.02	35.81	36.11
Lake Ponchartrain Causeway	10.00	11.68	11.99	15.13	15.44	26.36	26.67	37.84	38.15
US61 westbound	8.00	8.44	8.53	9.07	9.16	12.28	12.37	16.21	16.30
I-10 westbound east of I-55	10.00	13.14	13.60	19.16	19.63	34.15	34.62	50.97	51.44
I-55 northbound into Mississippi	8.00	10.70	10.97	14.71	14.98	22.71	22.99	33.94	34.22
I-10 westbound west of I-55	8.00	9.31	9.52	12.06	12.26	19.67	19.88	28.39	28.60
Louisiana Highway 1	4.00	12.78	13.51	21.75	22.56	22.40	23.24	32.69	33.53

Table 3B
Evacuating Clearance Times for Critical Roadway Segments With Contra flow

Critical Roadway Segment	Response Time	Clearance Times	Clearance Times	Clearance Times	Clearance Times	Clearance Times	Clearance Times	Clearance Times	Clearance Times
	Background	Cat 1	Cat 1	Slow Cat 2	Slow Cat 2	Fast Cat 3-4	Fast Cat 3-4	Slow Cat 3-4	Slow 3-4
	Traffic Factor	Fast Cat 2 Low Occ	Fast Cat 2 High Occ	Fast Cat 3 Low Occ	Fast Cat 3 High Occ	Evac Veh Low Occ	Evac Veh High Occ	Cat 5 Low Occ	Cat 5 High Occ
I-12 westbound	8.00	8.23	8.23	8.40	8.40	8.53	8.54	8.90	8.90
I-10 east over Lake Ponchartrain	10.00	11.52	11.73	14.60	14.81	21.37	21.59	28.82	29.04
I-10 eastbound into Mississippi	8.00	8.72	8.79	10.02	10.09	12.01	12.08	14.55	14.62
I-59 northbound into Mississippi	8.00	9.54	9.72	12.18	12.36	18.03	18.21	24.69	24.87
Lake Ponchartrain Causeway	10.00	11.68	11.99	15.13	15.44	26.36	26.67	37.84	38.15
US61 westbound	8.00	8.44	8.53	9.07	9.16	12.28	12.37	16.21	16.30
I-10 westbound east of I-55	10.00	11.88	12.16	15.50	15.78	24.49	24.77	34.58	34.87
I-55 northbound into Mississippi	8.00	10.70	10.97	14.71	14.98	22.71	22.99	33.94	34.22
I-10 westbound west of I-55	8.00	9.31	9.52	12.06	12.26	19.67	19.88	28.39	28.60
Louisiana Highway 1	4.00	12.78	13.51	21.75	22.56	22.40	23.24	32.69	33.53

Recommendations for Future Study Efforts

- As FEMA, and the US Army Corps of Engineers (and other agencies who have a stake in evacuation planning and management for the Louisiana/Mississippi area) program HES study efforts for the near future, the following items should be addressed:
- -Expedite the hazards and vulnerability components of the Southeast Louisiana Hurricane Evacuation Restudy
- -Look at the possibility of reducing the expanse of evacuation zones in the southeast Louisiana area based on newly mapped surge limits and/or levee improvements
- -Update the exiting travel demand figures from both Louisiana and Mississippi study areas based on newly released census data and newly obtained behavioral survey information
- -Develop potential inland shelter demand figures for key inland urban areas based on new behavioral data, route capacity, and alternative timeframes available for evacuation (e.g. 12,18,24,36, and 48 hour evacuation durations)
- -Add other identified evacuation route combinations such as La 25/Miss 27 and explore their potential contribution to helping with the major evacuation problems facing this study area.
- -Explore alternative traffic control options that will reduce traffic conflicts between Louisiana and Mississippi.
- -Explore non-traditional major shelter options/opportunities within both states
- -Obtain and review latest contraflow operation and concept designs