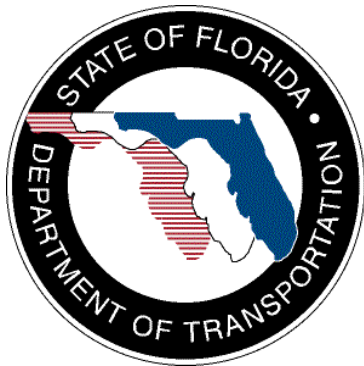


Executive Summary

Contraflow Plan for the Florida Intrastate Highway System

June 13, 2005



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FIHS Contraflow Plan Executive Summary

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Table of Contents

List of Acronyms	iii
1. Introduction	1
1.1 Background.....	2
2. Contraflow Issues and Operations	4
2.1 Access and Shoulder Issues	5
2.2 Roles of Individual Agencies	6
2.3 Communication and Coordination	6
2.4 Contraflow Plan Documentation	8
3. Specific Plan Information.....	9
4. Neighboring States	10
5. Conclusion.....	11



List of Acronyms

ALDOT	Alabama Department of Transportation
FDEM	Florida Division of Emergency Management
FDLE.....	Florida Department of Law Enforcement
FDOT	Florida Department of Transportation
FHP	Florida Highway Patrol
FIHS	Florida Intrastate Highway System
FTE	Florida’s Turnpike Enterprise
GDOT	Georgia Department of Transportation
HAR	Highway Advisory Radio
SEOC	State Emergency Operations Center
SR.....	State Road
TEOO	Traffic Engineering and Operations Office
TIM	Traffic Incident Management
VMS	Variable Message Sign

1. Introduction

The Florida Intrastate Highway System (FIHS) Contraflow Plan Review project was initiated in February 2005 as a response to the unusually high level of hurricane activity during the summer of 2004, when a tropical storm and four major hurricanes struck Florida during a seven-week period. Another contributing factor was the continuing need to re-examine the Florida Department of Transportation (FDOT) hurricane response policies and procedures with the intent of improving travel safety and efficiency during times of natural disasters.

The task of reviewing the state's contraflow operational plans was assigned to the Traffic Engineering and Operations Office (TEOO). The project included the preparation of a report offering statewide policy guidance and procedural recommendations for use in hurricane evacuation events. The project's three primary tasks were:

- To review and revise the FDOT's contraflow plan entitled *Analysis of Florida's One-Way Operations for Hurricane Evacuation*¹
- To conduct six (later seven) meetings with FDOT District-level personnel and representatives from other emergency response agencies to discuss individual contraflow route plans and solicit input from participants
- To discuss methods for improving the coordination of hurricane evacuation activities with state transportation officials in Georgia and Alabama

The technical memorandum entitled *Analysis of Florida's One-Way Operations for Hurricane Evacuation* was produced by PBS&J in 2000 after the massive evacuation prior to Hurricane Floyd in 1999. At that time, several FDOT Districts had produced local contraflow plans – part of the wave of evacuation planning efforts throughout the Southeast in response to Floyd.

The technical memorandum was updated in 2002. More recently, FDOT Districts and Florida's Turnpike Enterprise (FTE) have been updating their individual contraflow plans, so the FDOT intends for its contraflow update effort to be regarded as a statewide strategic plan that is easily distinguished from the Districts' tactical plans. The purpose of the statewide plan is to provide general guidelines for contraflow planning and criteria for the utilization of reverse-lane operations on limited-access highways.

¹ *Analysis of Florida's One-Way Operations for Hurricane Evacuation – Compendium of Route by Route Technical Memoranda* (Rev. March 2002). Available online at http://www.rsip.lsu.edu/anb10-3/Resources/Analysis_of_Florida_s_One-Way_Operations_for_Hurricane_Evacuation.pdf

Another important aspect of the project is the effort to benefit from District insights and experiences in hurricane evacuation, given the storm-related activities of 2004 when many communities' emergency response capabilities were tested to the limit. Each of the hurricanes – Charley, Frances, Ivan, and Jeanne – was unique in its characteristics, path, and the demand it placed on emergency operations. Evacuation efforts figured prominently in each and no District was unaffected by the resulting traffic impacts.

The series of meetings held around Florida from February 22 to April 1, 2005, gave FDOT Districts, the Florida Highway Patrol (FHP), Florida Department of Law Enforcement (FDLE), local emergency response agencies, and others an opportunity to offer their perspectives on contraflow issues and evacuation planning. The six District meetings were followed by a seventh meeting in Tallahassee with FDOT Central Office staff and individuals from other state government departments who are involved in emergency response.

Later, separate FDOT meetings were held with transportation officials in Alabama and Georgia to acquaint them with Florida's evacuation planning and explain potential impacts on their highway systems from Florida residents fleeing hurricanes. Contraflow was discussed in detail, including the contraflow policies and procedures employed in these neighboring states, and how they have worked.

1.1 Background

Until the summer of 2004, the largest evacuation in Florida's history occurred in September 1999 as a result of Floyd, a Category 4 hurricane that skirted Florida's Atlantic coast and made landfall in North Carolina. Though Florida residents were able to evacuate without harm, they encountered congested highways and long hours mired in traffic with little or no guidance on where to find shelter. Government agencies were generally better able to respond to Floyd than they were to earlier hurricanes, but nothing prepared them for the public's quick reaction to the evacuation warnings and the sheer numbers of people intent on getting away from the storm. There were complaints about the state's apparent inability to manage the traffic.

Considering the population growth along the Atlantic and Gulf coasts, it was not feasible or prudent to build more roads to accommodate the numbers of evacuees from storms like Floyd. In the fall of 1999, the Governor's Hurricane Task Force assigned its traffic management team the job of evaluating the feasibility of reversing travel lanes on limited-access interstate highways. The team members conducted meetings around the state and identified routes that might support one-way evacuations in the event of another major hurricane. The highways they named included portions of Interstates 4, 10, and 75; Florida's Turnpike, and the Beeline Expressway, also known as State Road (SR) 528. Contraflow plans have been developed for each of these highways.

The 2004 hurricane season was marked by a series of major hurricanes that hammered the state during August and September. While Hurricane Floyd prompted an estimated 2 million people to evacuate Florida five years earlier, that number was easily eclipsed by Hurricane Charley, which compelled 2.7 million to flee prior to the storm's landfall on August 13, 2004, in Charlotte County. According to the Florida Division of Emergency Management (FDEM), evacuation for Hurricane Frances was 1.8 million, Hurricane Ivan was 545,000, and Hurricane Jeanne totaled 4.4 million people.

In each case, traffic conditions on the limited-access corridors prompted an assessment of the evacuation's progress and whether an area's contraflow plan should be initiated. It must be stressed that in none of the cases mentioned above was a contraflow operation implemented on the designated highways, though local FDOT Districts, FHP personnel, and other responders were prepared to do so if asked.

Conditions that prompt consideration of a contraflow mirror the criteria for declaring a large-scale evacuation: strength of the hurricane, its direction of travel, the point of anticipated landfall, and what measures are warranted to protect the population threatened. Enacting a contraflow plan is considered in that context.

While the *usage* of contraflow plans may indicate otherwise, the *need* for them as an emergency management tool has not diminished. If anything, it is generally agreed that another busy hurricane season could bring the kind of situation that can trigger a large-scale evacuation of a major urban population prior to the arrival of a rapidly advancing major hurricane. Such a scenario could easily warrant the execution of a one-way plan for the area's designated route. In short, it's not *if* a contraflow operation would be declared under such circumstances, but *when*.

2. Contraflow Issues and Operations

Though the scope of work for this statewide contraflow plan update did not call for a detailed review of each District's plan for contraflow implementation, operational issues must be taken into account to offer guidance on staging effective reverse-lane procedures. These issues often arose in discussions during the various District-level meetings and reflect areas of agreement among Florida's transportation professionals as to how contraflow operations should be carried out. The consensus of those who participated is that contraflow operations should only occur during the daytime for safety reasons. To maximize the time available for a contraflow operation, the actual device deployment (i.e., the placement of barrels, barricades, signs, vehicles, etc.) for contraflow must occur during predawn hours to ensure that the roadway is adequately prepared for the reverse-lane operation as soon after sunrise as possible. Later in the day, vehicle entry at the beginning of the contraflow route ceases in time to allow the last cars in line to clear the contraflow termination before sundown.

As for restoring a contraflow roadway to conventional traffic flow, Districts generally want to retrieve the devices deployed before the onset of tropical storm-force winds and not simply move barrels, cones, and vehicles out of the way. This enables crews to have these items in hand for redeployment in support of re-entry after the storm. It also eliminates the chance that the devices will be blown by high winds, becoming additional storm debris.

Successful contraflow scheduling and operation must take into account all of these parameters, plus the minimum 24-hour notice to other participating agency personnel so they can mobilize their resources. Given the requirement for daytime operation and the variation of available daylight hours during hurricane season, predawn setup, and takedown before nightfall, the resultant contraflow timeframe is one day, or perhaps less, as dictated by the arrival of the hurricane itself. At the end of the contraflow operation, the roadway should be restored to normal flow and opened to all traffic so that evacuation can continue.

While the terminating point of a contraflow operation is one of considerable focus and concern due to the potential for traffic congestion, the beginning point of a contraflow operation is nearly as significant. The preferred means of contraflow loading is the ability to begin the contraflow operation with the same number of lanes that the contraflow roadway will provide — typically two. Less loading capacity creates two different risks: the potential for congestion at the loading point and the potential public relations issue associated with the apparent poor use of contraflow capacity.

The most critical element of a contraflow operation is its termination. Any misdesign or mishandling of the contraflow termination has great potential to cause a multimile traffic backup, and with it commensurate criticism of the overall operation. All contraflow plans reviewed involved the reversing of two lanes of capacity. Successful termination of all these contraflow plans requires provision of two lanes of capacity to ensure minimal congestion. Several plans terminate contraflow operations at an interchange with another limited-access facility, where a two-lane exit is employed to move two lanes of contraflow capacity to another roadway. This appears to be the most favorable means of terminating contraflow operations and the most likely means of ensuring success.

2.1 Access and Shoulder Issues

The contraflow plans in place statewide are inconsistent in allowing access for evacuating vehicles. While most plans permit contraflow vehicles to exit at interchanges, some allow re-entry to the contraflow side; others allow it at some interchanges, while others not at all.

Limiting access for contraflow vehicles may streamline reverse-lane operations, but limited access can have negative impacts on contraflow operations, too. All evacuating vehicles will have routine travel needs, such as gas, food, and rest stops. The easiest way to provide these services is through access provided at interchanges and existing rest areas or service plazas. Further, allowing evacuating traffic to exit may encourage some motorists to leave the roadway entirely, whether to seek shelter or to find an alternate route, reducing (even if slightly) the corridor's evacuating traffic flow.

As for emergency vehicle access, a contraflow operation imposes limits from the perspective that one direction of approach is simply eliminated. This results in an additional burden being placed on emergency responders that may have to be met through other means, such as repositioning emergency vehicles along the contraflow route, or using nearby alternative roads as a means of traveling counter to the contraflow direction.

Agencies should also agree on the response procedures for disabled vehicles, including their prompt removal from travel lanes and roadway shoulders, which must remain clear for emergency access.

As an alternative to contraflow operations, use of the existing paved shoulder is employed on I-75 in Sarasota County as a means of creating additional evacuating capacity. Still, this method does not have widespread support. Most shoulders have rumble strips cut into the pavement, which makes extended driving on that surface intolerable. There may be inadequate shoulder width at some bridges, and motorist aid call boxes are uncomfortably close to the edge of the paved shoulder. Further, if the shoulder is used as a travel lane, emergency vehicle access is eliminated. Disabled vehicles in travel lanes are more likely to block traffic and increase congestion while attempting to get off the road.

2.2 Roles of Individual Agencies

Over the course of a contraflow operation, various agencies are involved to varying extents. The roles and responsibilities of each agency (or agency type) need to be clearly understood to ensure that each aspect of contraflow operations is addressed – but only once. Plan development is a multiagency effort that includes state and local representatives. The different agencies anticipated to be involved in contraflow operations include the FDOT, FHP, FDLE, local law enforcement, and local fire and emergency response agencies. The State Emergency Operations Center (SEOC), among other responsibilities, serves as a coordinator between state and local agencies.

The FDOT is responsible for the development of the contraflow plan's route; identifying its beginning and ending points; and identifying any additional hard infrastructure needed to make the contraflow route complete, such as paved crossovers. Plan development should be performed in a coordinated manner between the FDOT and the appropriate FHP troop commander to ensure that, to the greatest extent possible, the plan accurately reflects the FHP's resource needs.

At the time of contraflow plan implementation, the FDOT is responsible for furnishing such resources as cones, flares, barricades, and portable variable message signs (VMS), placing them according to the contraflow plan's guidelines. Additionally, FDOT personnel will furnish vehicles and manpower to assist in implementing the contraflow plan. The FDOT is also responsible for infrastructure maintenance before, during, and after a contraflow operation.

The FHP is the agency responsible for implementing and operating a contraflow plan. It is also responsible for communicating the decision to implement a contraflow operation to the FDOT; local law enforcement; and local fire and emergency response agencies. The FHP may choose (or be required) to develop a contraflow operational plan independent of the FDOT's contraflow plan, but the FHP plan should not deviate from the FDOT-developed plan. The FHP plan should only differ in its method of presentation, as required to meet FHP procedures.

2.3 Communication and Coordination

Just as the various agencies must work together, there must be communication and coordination between Tallahassee and District field operations. A dialogue must take place between local authorities and state emergency management in determining the advisability of instituting a contraflow. The near-contraflow of the Beeline Expressway in 2004 is perhaps the best example of this. Tallahassee did not contraflow the highway then because local officials did not think it was needed. Local personnel indicated they were ready to contraflow, but the order never came because traffic was moving fine without it. Ultimately, it was demonstrated that information was exchanged, conditions were evaluated, and based on that, the right thing was done in not implementing contraflow operations on the Beeline.

One concept proposed that may improve communication is the establishment of an Evacuation Executive Council. This committee, based in Tallahassee, should be responsible for the planning and oversight of contraflow operations. The panel would represent the various entities involved in the emergency management and response effort, including the FDOT, FHP, FDEM, SEOC, Florida Sheriff's Association, and related responders. The council would be the body responsible for receiving reports from local agencies and assessing local conditions prior to a hurricane, then making a contraflow recommendation that would be forwarded to the director of the FDEM.

In having a formally established committee with a channel for two-way contraflow communications, coordination would be easier and there would be less uncertainty regarding the information flow between Tallahassee and field operations. The Contraflow Executive Council could also be a resource for contraflow policy, training, and public outreach, and for the periodic review of various reverse-lane plans.

There are few times when public information efforts are more crucial than when emergency situations occur. In the case of hurricanes, Florida residents and visitors seek information on two levels: weather conditions due to the storm itself, and agency guidance on hurricane preparations and evacuations.

The dissemination of essential information on roadway conditions and traffic flow is of particular importance during times of natural disaster. Both prior to and following hurricane events, the public must be able to receive accurate and timely information so that they may evacuate from and return to affected areas safely and quickly. Because most travelers are unfamiliar with contraflow operations and how they function, the FDOT, its Districts, and their agency partners have a much greater task before them in educating the public and increasing awareness of this evacuation procedure.

The public outreach strategy for contraflow operations can be planned around content, timing, and mode of delivery. Each of these aspects will have an effect on an awareness campaign's success, and each should be utilized for message impact and effectiveness. Guidelines are given in the report to aid the planning process, but are by no means intended to supplant proven procedures or practices for public information campaigns. Throughout these efforts, the FDOT, FHP, and SEOC public information officers should coordinate their activities to ensure consistent message delivery and the broadest coverage possible.

Once a contraflow operation has begun, both fixed and portable varieties of VMS are valuable for on-scene advisories that are site specific. This enables the FDOT to deliver evacuation information at the exact location where it is needed and often during times when power outages limit available options. During past weather emergencies, FDOT Districts have supplemented sign deployment with highway advisory radio (HAR) broadcasts. This gives the Districts a greater ability to prepare and broadcast detailed messages that explain the alerts and provide more information on the corridors being used. There is no time limit on the message duration, and the broadcasts can be done in Spanish and Creole, as well as English.



Another tool is the 511 telephone service, which is available in Southeast Florida, Central Florida, and the Tampa Bay area. Motorists can dial 511 to obtain information on traffic congestion, road closures, travel times, and separate hotline numbers to call for hurricane shelter locations. The 511 service has the advantage of being very reliable: at no time during any of the 2004 hurricane events were the operating 511 systems in Florida down or unable to function.

2.4 Contraflow Plan Documentation

The individual contraflow plans differed significantly in several aspects. While some of these variations are simply a matter of different plan preparation or document formatting decisions, other differences are due to varying design, and operational philosophies or assumptions. Nonetheless, certain needs became apparent based on the review of all plans. Most had no planwide summary of quantities for such essentials as barricades, signs, personnel, and vehicles. A standardized summary of quantities is needed for every plan, and these figures must be totaled for non-FDOT resources as well, including FHP vehicles and troopers.

Plan format frequently provided a single interchange on a single plan sheet. This is a good documentation strategy that both simplifies plan development and provides some assurance that, if the plan set is broken up and each sheet distributed separately, then the entire plan need for a single interchange is illustrated on a single sheet. However, many plans had no summary of materials or resources per sheet, which would be a helpful aid to plan implementers.

Recognizing that the contraflow plans may be widely distributed, even to individuals (both within and outside the FDOT) that have little experience reading plans, an easily understood plan appearance is necessary. The plan appearance and format used for the I-10 contraflow plan in District 2 meets this need. These plans are not necessarily to scale, and exaggerate the roadway width, especially for exit ramps and crossroads. This exaggeration helps to clarify the location of specific devices and vehicles, especially for the inexperienced plan reader. Adoption of such a format, with quantity information added, is recommended.

Plan symbols for portable VMS, as well as for the various types of vehicles, should be standardized statewide. This would ease the comparison of one plan with another and provide an “apples-to-apples” view of the different vehicles and personnel required. And, to the greatest extent possible, consistent portable VMS messages need to be employed. Recognizing the unique characteristics of each evacuation route, the opportunities for consistency may be limited. The FDOT has developed guidance that would be a starting point for the development of approved hurricane evacuation VMS messages, which should be developed for use statewide.

3. Specific Plan Information

The combinations of plans and situations are unique for each FDOT District. For example, while District 2 only has a single plan on I-10, it has the greatest need for interaction with the Georgia Department of Transportation (GDOT) on I-95 and I-75. At another point on the scale, District 5 has three separate plans all converging on Orlando, though the likelihood of all three plans being in operation simultaneously is very low. As this project revealed, there are specific issues unique to each District that can influence the use and potential success of hurricane evacuation plans.

The information presented in this section was received from each District for the plans under their jurisdiction, and reflect plan status as of the date this document was prepared. Updates are underway for several of these plans, so the information in this section is subject to change as these updates are completed.

Sarasota County's shoulder use plan covers 21 miles of I-75 northbound and is the only plan of its type in Florida. After traffic reaches SR 681, the four-lane interstate becomes six lanes, so the traffic proceeding on the shoulder simply switches over to the newly added third travel lane.

The contraflow plan in Jacksonville takes traffic west on I-10 to the interchange with I-75 in Columbia County. Before this plan was revised, it was the state's longest contraflow – totaling 131 miles from the I-295 interchange on I-10 to U.S. 19 in Jefferson County.

When its first segment opened in 1967, the Beeline Expressway was utilized as a limited-access toll road connecting Brevard County's Space Coast with Orlando. It has since become the main westerly evacuation route for Brevard County residents, who can take this contraflow route all the way to SR 417.

The 63-mile I-4 contraflow plan originates in Tampa and provides a means of evacuation to the SR 417 interchange southwest of Orlando. A cooperative effort involving FDOT Districts 1, 5, and 7, the I-4 plan is noteworthy in that it requires the most extensive use of equipment, vehicles, and personnel of any plan in the state.

Florida's Turnpike offers a prime northbound evacuation route for the major urban areas of South Florida. Unlike I-95, which parallels the coast, the Turnpike begins a northwesterly track after it passes Fort Pierce, which helps move threatened populations further inland in advance of a hurricane. The plan extends for 114 miles from Fort Pierce to Ocoee.

Alligator Alley along I-75 crosses the Everglades between Broward and Collier counties. It provides additional eastbound lanes for evacuating residents of Southwest Florida and is also a westbound evacuation corridor for those from Southeast Florida. The route, however, offers little in the way of motorist services. Access for emergency responders is also a concern.

4. Neighboring States

As part of this project's activities, meetings with Alabama and Georgia were held to furnish those states with information on Florida's contraflow activities, and to learn about their recent experiences with hurricane evacuation and contraflow operations.

Florida's primary contraflow interaction with Alabama is along I-10, as it is the only limited-access facility that traverses both states. However, neither state operates I-10 as a contraflow route in the Gulf Coast or Panhandle for any purpose, including hurricane evacuation. Neither Alabama nor Florida regards I-10 as a suitable evacuation route due to its east-west orientation, which does not allow evacuating traffic to move definitively away from a threatened coastline.

Alabama has a contraflow plan in place for I-65 from a beginning point northeast of Mobile to the metropolitan Montgomery area. The location of I-65 makes it potentially attractive for evacuees coming from Pensacola and the western Florida Panhandle. Alabama Department of Transportation (ALDOT) officials regard the I-65 contraflow plan as able to serve the eastern half of Alabama's Gulf coastline, Pensacola, and the west part of the Florida Panhandle. Alabama did implement a contraflow on I-65 in September 2004 in advance of Hurricane Ivan. The state's experiences serve to validate many of Florida's contraflow operational approaches.

Florida's primary contraflow interaction with Georgia would be along I-75 and I-95. While Florida does not have contraflow operations planned for I-95 at all, and for I-75 only in the southern end of the state, Georgia has contraflow plans for both routes in response to a current, but temporary, capacity limitation being remedied through the widening of both highways to six lanes. Because that construction is not yet complete, Georgia's plans were developed to provide contraflow operations along portions of I-75 and I-95 where there are only four lanes.

5. Conclusion

Contraflow operations should be one of many hurricane response actions at the disposal of the FDOT, though the Districts agree that the practice is one they hope they never use. There are risks inherent in the implementation of contraflow operations, and limitations on both available hours for operation and viable termini. The resources and personnel that would be devoted to a contraflow operation may actually be better utilized in some other response action, or even in support of the “shelter in place” strategy being advocated by state emergency management.

Contraflow plans referenced in this document are just that – plans. None have ever been used under actual conditions or otherwise initiated in connection with a hurricane evacuation. Though each has been carefully crafted and contingencies accounted for, the true test will come in the implementation. To their credit, Florida’s transportation professionals and emergency responders have mapped their contraflow plans with considerable thought and critical analysis. They realize that the precontraflow assessment of conditions is as crucial as the execution of the contraflow plan itself. Indeed, the decision *not* to institute a contraflow operation is a valid outcome of such assessment, depending on the hurricane’s force, speed, direction, anticipated landfall, the population threatened, and the type of evacuation necessary to move that number of people out of harm’s way.

Coordination essential for contraflow operations to work effectively occurs well before the plan is activated. Besides District personnel from the Maintenance, Traffic Operations, and Safety offices, there must be involvement of local government representatives, police, fire, emergency medical services, and other Traffic Incident Management (TIM) team members so that the scope of contraflow action is understood and its operational phases carried out properly. When the time comes to implement a contraflow operation, this supporting framework of agencies and expertise will increase the likelihood of success.

With the big picture in mind, the final focus must be on the details. As past efforts elsewhere have illustrated, large-scale evacuations using contraflow procedures depend on setup; proper timing of operations; choosing the right starting and termination points; and the availability of emergency responders who have access to disabled vehicles and other incidents. Sufficient numbers of vehicles, staff, and equipment are essential. Consistent, predictable, logical plans must be readily available. The contraflow traffic function must be supported with motorist information supplied using VMS units, 511 advanced traveler information services, HAR broadcasts, and other means.

Contraflow is a play in Florida’s hurricane response playbook. If the time comes to call the play, and the team is practiced and prepared, the result will be a safe, effective evacuation of the people a hurricane threatens.