An examination of preparedness, response, and recovery for the La Plata, Maryland, tornado

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ABSTRACT
The most severe tornado of spring, 2002, did not occur in Tornado Alley but in La Plata, MD. It was first classified as an F5 but then reclassified as an F4 on the Fujita Tornado Intensity Scale. This paper examines preparedness, response, and recovery issues by studying the town of La Plata (a bedroom community south of Washington, DC), Charles County, Maryland, and the National Weather Service. Methods employed included a site visit, field observations, and interviews.

INTRODUCTION
Maryland is not known for tornadoes; it ranks 35th in the US, averaging four tornadoes per year from 1953 to 1995; 29th for killer tornadoes, with two per year; and 32nd in tornado deaths.1 But during the evening of April 28, 2002, a tornado measuring F4 on the Fujita Tornado Intensity Scale (Table 1) followed a 64-mile path across southeast Maryland (Figure 1). Three fatalities and 122 injuries resulted from the storm in Maryland, along with more than $100 million in property damage.2

During the late morning, supercell thunderstorms, which can produce winds greater than 58 mph and are responsible for most tornadoes in the US,2 formed over Ohio and Kentucky. In mid-afternoon, the storms moved east over the Appalachian Mountains. The supercell remained intense as it advanced from West Virginia through northern Virginia and into southern Maryland. Early Sunday, there was a warm front south of La Plata. When the warm front advanced northward by mid-day, the air mass became unstable, creating optimum conditions for severe weather with the arrival of the supercell.2

The tornado touched down at 6:56 p.m. in western Charles County. Initial damage was minimal, but the tornado intensified as it approached La Plata, causing F3 damage west of the downtown area and F4 damage near downtown. A second tornado developed about a quarter mile south of the first, and both struck the downtown area in a five-minute period beginning at 7:02 p.m. The secondary tornado dissipated, but the first continued east through the rest of Charles County into Calvert County before dissipating in Dorchester County.2

METHODS
This study examines the preparedness, response, and recovery of the town of La Plata and local government; Charles County, which included the Department of Emergency Services and law enforcement; and the Baltimore/Washington Weather Forecasting Office (WFO) of the National Weather Service (NWS), located in Sterling, VA.

Information for this research was attained through archival data, field observations, and interviews. Archival data was compiled from the Maryland Independent, the local newspaper for Charles County; the online Washington Post; the NWS Service Assessment,2 the La Plata Town Hall Emergency Management Task Force Manual,3 the Charles County Sheriff’s Office Emergency Management (EM) manual;4 and the Web site of the Eastern Region Headquarters of the NWS.5

Field observations and direct observations were made by the author, who has more than 20 years experience in assessing damage from severe storms as a licensed contractor in the state of Florida. The author also interviewed residents, law enforcement officers, the Sheriff of Charles County, the Mayor of La Plata, the director of Charles County Department of Emergency...
Services, and the team leader of the NWS Service Assessment team. Similar methods were employed by Drabek in his studies of disaster response.

**RESULTS**

**Town of La Plata.** According to William F. Eckman, the Mayor of La Plata, the town hadn’t done much preparation for tornadoes. Even though a killer tornado had struck La Plata in 1926, basically no disaster plans were in place prior to April 28, 2002.

**Charles County.** The Sheriff’s Office has a manual that sets forth the rules, policies, and procedures for EM personnel. The manual is to be used in coordination with and subordinate to the Charles County Emergency Operations Plan (EOP). The manual details county, agency and Sheriff’s Office responsibilities, alerts and warnings, search and rescue, and evacuations related to disasters stemming from natural or anthropogenic causes.

According to the manual, Charles County is vulnerable to meteorological events such as hurricanes, blizzards, ice storms, flooding, dam failures, tornadoes, wind storms, and drought. The manual calls for planning to mitigate the effects of these hazards, as well as duties related to these types of incidents: law enforcement, traffic control, security at designated facilities, evacuations, and search and rescue.

The Local Emergency Planning Committee (LEPC) for Charles County is involved in the preparation and response of the EOP. This plan meets state and federal guidelines and is coordinated with the appropriate agencies. One LEPC document, the Citizen’s guide to emergency preparedness: Preparing a plan for emergency events, contains a section on tornadoes.
The sirens in Charles County date back to the Cold War era of the 1960s and were used primarily for fires; they did not function for severe weather. When the fire station relocated from downtown La Plata, the siren was removed. Only about half the sirens in the county function properly.

Many radio stations in Charles County are run remotely on weekends. If the Emergency Activation System (EAS) has a problem, there is no human being to correct the situation. Communication with the NWS is by hard-line telephone with no backup system.

The spotting network is limited in Charles County, and is especially lacking in the western side of the county. Charles County, along with Prince George’s and St. Mary’s Counties, rely on volunteers for this service. Since storms move west to east, this is where the majority of the storms enter the county.

National Weather Service. The Baltimore/Washington WFO was well-prepared for the risk of severe weather, since personnel were aware of the situation on the previous day and were advised of the possibility of arriving for their shift early. The WFO was also placed in a critical weather watch for the Advanced Weather Interactive Processing System (AWIPS) by the Network Control Facility (NCF) Sunday morning. The NCF serves as the AWIPS control center and identifies, diagnoses, and corrects system faults and outages; monitors site equipment operations; and alerts users at each site when malfunctions or degradations occur. During critical weather situations, the WFO may ask the NCF to keep a closer eye on AWIPS operations.

The WFO issued several statements on the threat of severe weather in the area. The Hazardous Weather Outlook at 5:25 AM on Saturday, April 27, stated—“Some of these storms may be on the strong side . . . with gusty winds the primary threat.” The outlook issued at 3:20 am on Sunday, April 28, headlined “Possible Severe Thunderstorms Today,” mentioned the possibility of damaging winds that day. When the outlook was disseminated at 10:30 AM on Sunday, it mentioned a tornado threat between 3 PM and 8 PM. The Storm Prediction Center (SPC) issued a tornado watch at 3:30 PM. These watches were communicated to the media and Charles County EM officials.

Response

Town of La Plata. Because the tornado struck on a Sunday evening around 7 PM, there were few people at work or in the downtown area. The immediate problems included electricity outages and very low water pressure. City officials met at Town Hall and discovered the wells had no backup generators, and that the telephone and radio systems did not work without power. There were no backup systems for this vital infrastructure.

The tornado also destroyed the water tower; in half an hour, approximately one million gallons of water were lost. In addition, 41 houses, six apartments, one school, and 48 commercial structures were destroyed, while 400 structures suffered significant damage and 165 businesses were impacted. About 60 percent of this damage occurred in a two-mile radius. The rescue squad building was also damaged; fortunately, the ambulance was not inside the structure.

The first priorities were to get emergency power for the wells supplying water (this was achieved by 10:30 pm) and electricity. A third problem was flooding; many of the structures in the downtown area that were damaged or destroyed were commercial buildings that had fire sprinkler systems. This added more water to an area already flooded due to the destruction of the water tower. Luckily, there were no fires while the water system was down and there is no natural gas in the community.

Fire and rescue squads came to assist from 18 other municipalities, including Ocean City, MD, Baltimore, and Washington, DC. The state of Maryland also sent a large number of workers and equipment.

Charles County. The Sheriff’s Department was involved in a normal disaster response; it was securing the scenes for fire and rescue personnel, and providing security for a pharmacy and other commercial structures. Law enforcement was also involved in search and rescue, with each building searched for survivors or victims three times. Sheriff personnel were also used for traffic control, establishing a command post, and prevention of looting.

Charles County EM personnel were aware of the potential for severe weather on Sunday afternoon and spoke with a forecaster from the WFO regarding the impending storm between 6:10 PM and 6:20 PM.
EAS did not work and had not been working in southern Maryland since 1997.\textsuperscript{10,11}

There was no dedicated Emergency Operations Center (EOC) for Charles County; the EOC was set up in the County Building lunchroom. It took several hours to establish the communications infrastructure. Although there were political issues (city versus county authority), the major problems involved communication, along with the elected officials’ understanding of the Incident Command System.\textsuperscript{10}

National Weather Service. The NWS issued a tornado watch at 1:21 p.m. for most of West Virginia and the western Maryland panhandle; at 3:05 p.m., another tornado watch was issued for most of western Virginia and most of Maryland.

The first tornado warning was in Virginia at 4:37 p.m., with reports of a tornado in Shenandoah County, at 4:45 p.m. This was confirmed as an F2 tornado that destroyed three homes and 19 barns, and damaged 27 residences.\textsuperscript{2} Charles County continued in the tornado watch. The WFO for Baltimore/Washington received confirmation of this tornado, but this confirmation was not given to the warning forecasters. There were more tornado warnings as the storm passed through Virginia between 5 p.m. and 6:45 p.m. Because the warning forecasters did not have a confirmed tornado report, and because lower-level radar indicated that the potential of a tornado from the supercell was decreasing, they issued only a severe thunderstorm warning for Charles and Calvert Counties at 6:45 p.m. This statement said, “Severe thunderstorms can produce tornadoes with little or no advance warning.”\textsuperscript{2,11}

The supercell continued into Maryland and the tornado touched down in western Charles County near Marbury at 6:56 p.m. At 7:02 p.m., a tornado warning was issued for Charles and Calvert Counties. Another forecaster called Charles County EM personnel to warn them of the tornado indicated on radar. However, a hard telephone line was the only means of communication, and as the lines were busy with incoming damage calls, it took three tries to get through. By the time the forecaster reached someone

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with EM, the tornado was halfway through Charles County.\textsuperscript{2,11}

There were problems with the EAS in Charles County. The EAS is used by television and radio stations to broadcast emergency alerts to the public. The NWS activates the EAS for the media with text or audio messages sent through NOAA Weather Radio (NWR). Television stations received the messages but the radio stations had problems. WTOP in Washington, DC, is the primary EAS station; WJFK in Manassas, VA, is the backup. An engineer at WTOP said that they had received flash flood watch messages earlier in the day but no watches or warnings in the afternoon. More than half the stations in the La Plata area had similar problems. Some stations monitor NWR as an additional backup to the EAS.\textsuperscript{2,11}

Recovery

**Town of La Plata.** The town of La Plata had two main priorities: cleaning up the debris and preserving the business community. The tornado had significantly damaged 400 structures and impacted 165 business. Town Manager Douglas R. Miller was in charge of clean-up operations and Mayor Eckman coordinated continuity for the business community.\textsuperscript{7}

An unusually large number of agencies and individuals assisted in the recovery. Emergency managers from the communities of Ocean City, and the District of Columbia were instrumental in setting up the Field EOC along with La Plata personnel. Besides first responders throughout the region, there were many volunteers who assisted in debris removal and covering roofs with tarps. Some volunteers, such as the Amish, showed up with chainsaws and tarps. Many tarps were provided by unknown individuals or groups of volunteers.\textsuperscript{7,10}

The District of Columbia sent more than 100 workers with trucks and equipment to assist in the recovery operations. They also kept a record of recovery progress. Members of the Department of Public Works provided scheduled trash collection while La Plata personnel handled storm debris. Maryland’s State Highway Department sent some 150 pieces of equipment and 300 employees to help with downed trees and tree limbs. A transfer station was established three miles from downtown to separate debris bound for the landfill and burnable debris such as trees. During the cleanup, the state eliminated tipping fees (charges commercial trucks normally pay to dump trash and debris). In 12 days, 98 percent of the downtown area had been cleaned up.\textsuperscript{7,10}

La Plata and FEMA officials did not see eye-to-eye on procedures for cleaning up debris. La Plata officials decided to just get the job done and work from one end of town to the other. This became known as the La Plata method: deciding to clean up first and not being concerned with the expenses until later.\textsuperscript{7}

**Charles County.** Although there were some issues between city and county authorities, these entities did communicate and work together. It was critical to maintain continuity, and the District of Columbia personnel were of great assistance.

Using trailers in the County Complex parking lot, a “one-stop shop” of assistance for clothing, food, and shelter was created, which included FEMA and Small Business Administration (SBA) representatives, and building inspectors. The American Red Cross also had a small presence, although officials established a larger facility in the neighboring town of Waldorf.

According to disaster plans at the state and federal levels, the American Red Cross was to manage donations. However, the Red Cross only manages its own donations. Other organizations were on their own. When it came to donated items, this led to some confusion (although it should be noted that Catholic Charities did an exceptional job\textsuperscript{10}).

The county received assistance from other agencies such as the Maryland Highway Department, Department of Health, and Department of Labor. This assistance was particularly valuable with debris removal (especially when the FEMA system broke down).

Another positive aspect in the recovery effort was aid from the community. The damaged Safeway grocery store donated food for the volunteers, as did local pizza restaurants and Outback Steakhouse. One volunteer said he had never been fed so well during a disaster. Fuel, generators, and golf carts (which made traveling around the debris much easier than larger vehicles) were also donated.\textsuperscript{10}
At the time of the tornado there was no dedicated EOC, although one was in progress. (It is now operational.) A new radio system that was then under contract is now a vital part of the communications network. A new solar-powered siren, with a 3000-foot radius, has been installed downtown and is tested every three months.\textsuperscript{10}

**National Weather Service.** The NWS formed a Service Assessment team to examine the warnings and forecasts provided by the WFO, for the purpose of improving the services to protect life and property. The team consisted of NWS personnel such as Meteorologist in Charge, Warning Coordination Meteorologist, Science and Operations Officer, a public affairs specialist and an engineering consultant.\textsuperscript{2}

The Service Assessment indicated that the WFO did an excellent job of planning for the potential of hazardous weather, including re-arranging schedules so the Meteorologist in Charge, Science and Operations Officer, and Warning Coordination Meteorologist were available with each shift.\textsuperscript{2,11} It also identified four reasons for the WFO issuing a severe thunderstorm warning instead of a tornado warning: no confirmed report of previous tornado in Shenandoah County; radar indicated the supercell was weakening; absence of a constant watch on the existing supercell; and concern over false alarms on tornado warnings. However, it was noted that the WFO breached best practices by not following the “prior offender” rule: “Once an offender, keep following until it is completely dissipated and no longer a threat.”\textsuperscript{11} While radar had indicated weakening of the bow echo signature at the surface, there was still a mesocyclone at the upper levels of the atmosphere. More storm spotters in sparsely populated areas would have assisted the forecasters, although spotter reports are not always reliable.\textsuperscript{2,11}

A backup system for the telephone would have resulted in better communications between the WFO and Charles County EM. This has since been corrected. There is a good working relationship with the WFO and Charles County.\textsuperscript{2,10,11}

Reports indicated that 53 percent of the radio stations in the La Plata area had problems with the EAS. This was due to the receiver and the boxes locking up because of the number of FIPS codes transmitted with the warning. This problem has been addressed with updated software and newer receivers at WTOP and WJFK.\textsuperscript{2,11}

The WFO originally rated the tornado as an F5. However, after the Service Assessment, the tornado was downgraded to an F4. Ratings should be assigned with a “preliminary” indicator until a thorough damage assessment has been completed.\textsuperscript{2,11}

The Service Assessment also recommended additional training for WFO personnel in severe weather forecasting and damage assessment. Other comments addressed communications with other agencies conducting damage assessments.\textsuperscript{2,11}

**DISCUSSION**

**Town of La Plata.** The tornado revealed the need for backup power for items such as pumps for the water supply, lift stations, and communication equipment. Communication equipment needed upgrading, as the radios would not work properly even with generators.

Mayor Eckman noted the importance of being active in state-wide organizations. To reflect the attitude of the citizens, bumper stickers were printed saying “La Plata: Twisted But Not Broken” and “We Will Rebuild.” The surrounding municipalities were also brought together. A parade was held in August of 2002 to thank the many workers who helped during the response and recovery operations.

The author examined La Plata again in late July 2003. The downtown area has enjoyed such a dramatic recovery that the price of land has doubled, making it difficult for small businesses to compete due to the higher overhead. In January 2003, a Design Review Board was created to assist with aesthetic guidelines for the town. Incentive grants for businesses totaled $365,000. It is anticipated that the majority of repairs and rebuilding will be completed by mid-2004.\textsuperscript{7}

**Charles County.** Some of the problems that led to communications issues during the tornado have since been resolved. The EOC is now operational and there is a backup radio system to supplement the hard-line telephone. Charles County has placed warning sirens in La Plata,\textsuperscript{10} including one downtown, but none anywhere else. The local cable network now scrolls storm
watches and warnings, although more education is needed for the public to fully comprehend the difference between a watch and a warning.

A clearer perception of the roles for specific agencies such as FEMA, the American Red Cross, and the United Way would be helpful. This could be incorporated in a revised preparedness plan.

Another mitigative measure would be mandating conformance to the BOCA building code. Some of the damage to homes resulted not from tornado-force winds but poor construction methods. Examination of residences under construction showed varying methods for attaching the walls to the block/concrete walls. Some were properly attached with anchor bolts embedded in concrete; others had very light straps. Roof trusses appeared to have better tie-down systems with clips or straps compared to bottom plates. When residents rebuilt, many of them added basements for increased protection during a future storm. Some residents said they thought building inspectors were more concerned with setbacks and zoning than construction quality. Even with repaired or rebuilt homes, citizens should obtain the proper type of insurance for their dwelling and/or business.

**National Weather Service.** Communications was also a major issue for the NWS. Confirmation of the tornado in Virginia should have been given to the warning forecasters so they could have issued the proper tornado warning for Charles County.

Training will help with proper forecasting and communications during severe weather. Sectorizing—having one meteorologist follow a specific storm—and following best practices as established in the NWS will also help eliminate improper warnings. New training tools, now available in the WFOs, will lead to fewer false alarms for such storms. The EAS problem has been corrected with software and newer receivers. Another possible solution is refining the scale for watch and warning areas.

**SUMMARY**

This research examined preparedness, response, and recovery issues from the standpoints of the town of La Plata, Charles County, and the NWS. All three were plagued by communications issues. It is very difficult to plan for a devastating tornado, but organization and relationships with federal, state, and local bodies need to be established to deal with disasters. The study showed the value of communicating with peers in other municipalities. Citizens should be better educated about severe weather. The lessons learned by the town, the county, and the NWS will help them and others avoid similar mistakes.

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