APTIM

MEMO

SUBJECT
Fort Bend LID 19 – Phase 2
DATE
November 27, 2018
FROM
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TO
Fort Bend County LID 19
c/o Nancy Carter

1.0 EXECUTIVE SUMMARY

This memorandum represents APTIM's Review Phase 2: Operations and Response, which involves reviewing the operations and emergency response for Hurricane Harvey by LID 19 and supporting contractors. This review has been divided into four sections, including Preparedness, Emergency Operations, Emergency Response, and Recovery. In reviewing all of the documentation provided, it was determined that the LID performed within the current Emergency Action Plan (EAP) and no significant findings of any deviations were discovered. District personnel performed as best as practical under the given storm events of Hurricane Harvey. It is also important to note that no communications were lost between field operations and the Office of Emergency Management (OEM) throughout the storm.

2.0 INTRODUCTION

Aptim Environmental & Infrastructure, Inc. (APTIM) was selected by Levee Improvement District No. 19 (LID 19) of Fort Bend County, Texas, to provide a multiple phase review of existing LID 19 facilities. After completion of the Phase 1 System Review, APTIM was given notice to proceed with Phase 2: Operations and Response, which involves reviewing the operations and emergency response for Hurricane Harvey by LID 19 and supporting contractors, including Levee Management Systems (LMS) as the Operator; Costello Inc., as the Engineer; and Muller Law Group as the Board Attorney.

3.0 PURPOSE

The purpose of these services is to gather and review all operating manuals and emergency action plans leading up to and during the response of Hurricane Harvey to clearly understand the protocols and trigger points that initiate decision making processes and actions. In our review, we will perform a comparison of the coordination of operations and procedures during Hurricane Harvey against the in-place procedures and recommendations in the existing manuals and plans, along with identifying unexpected issues or deviations identified.

4.0 METHODOLOGY & ANALYSIS

The method used for investigation included discussions with District personnel, as well as with staff from other agencies, and review of any available daily reports and data collected during Hurricane Harvey. We also reviewed all after-action reports and performed a comparison of the coordination of operations and procedures during Hurricane Harvey against the in-place procedures and recommendations in the existing manuals and plans. For any unexpected issues or deviations identified, we have documented and provided findings along with recommendations, included in this memorandum.

In order to successfully and efficiently communicate our process, we have divided our review under the headings of Preparedness, Emergency Operations, Emergency Response, and Recovery.

5.0 BACKGROUND / STORM EVENT

To help better understand the need for the analysis of the performance, the following is provided as a brief description of the magnitude of the event requiring the emergency responses:

Hurricane Harvey was projected to be a Category 3 storm on Thursday, August 24th, but by Friday, August 25th, it was projected to be a Category 4 hurricane with 115 – 130 mph winds. Additionally, it was projected to stall over South Texas for days, resulting in not only damaging winds, but also extremely heavy and excessive rainfall, producing flooding in many areas of the region, especially east of the center of circulation.

In Riverstone, 34" of rain fell between the evening of Friday, August 25, 2017 and Tuesday, August 29, 2017. Within the same time period, the Brazos River rose to levels that prevented gravity drainage. The only means of removing stormwater from within the system was by way of the Steep Bank Creek Pump Station. During this event, waters within the system rose to unanticipated levels; and as a result, LID 19 experienced structural flooding.

6.0 PREPAREDNESS

6.1 Communications

Although not specifically called out in the EAP, the following communication preparedness activities were initiated prior to Hurricane Harvey making landfall:

- LID 19's website was confirmed to have the ability to post emergency information during severe weather.
- It was confirmed by the board attorney that an onsite generator was available for backup power, and that out-of-state personnel would be available to provide assistance, if needed, to assure continual updates to the public.
- The attorney made efforts to ensure the alert systems were operational prior to the event by sending test communications via text message to all participants who signed up for alerts.

- The LID and its representatives (operator, engineer, and attorney) participated in the County's Emergency Operations Center calls in advance of Hurricane Harvey's landfall to receive updates from the National Weather Service (NWS) and the U.S. Army Corps of Engineers (USACE) on the threatening storms and to provide updates to the LID's preparedness.

6.2 Facilities

LMS completed their inspection of the levee and drainage system to insure all waterways were clear of obstructions for proper drainage and were fully operational. The pump station and backup generator were checked and inspected for proper operation. All inspections were completed at least 24 hours prior to expected rainfall as stated in the EAP.

7.0 EMERGENCY OPERATIONS

7.1 Communications

As part of the EAP, participation with the OEM and dissemination of updates to the public continued as normal, as the event escalated.

7.2 Levee inspections

The required levee inspections were performed in accordance with the EAP until the levee crowns were saturated with rainfall preventing safe access for inspection. Alternative means for inspections were considered and implemented.

7.3 Pump Operations

Pumping operations began prior to the loss of gravity drainage. This preemptive action is not specifically included in the EAP.

8.0 EMERGENCY RESPONSE

8.1 Communications

Lines of communication between the field operators and OEM were never lost.

With updates from NWS and USACE, the Engineer was able to advise on risks of flooding to allow LID 19 to make decisions regarding evacuation orders.

It is important to note that the orders of evacuation come from the County Judge. The LID provides recommendations based on relevant information but is not the final decision maker on how and when that information is disseminated to the public.

Due to the extreme rainfall in a short period, the window of advisory appeared to be very small, leading to multiple advisories in a short period of time that may have led to a decreased reaction time by the public. Impassable roads within the district reduced evacuation routes, which led to difficulties in monitoring the area. Once roads became

inaccessible, law enforcement resorted to door-to-door response efforts as well as investigation of stranded vehicles. At this point, law enforcement had limited availability to assist with roadblocks and handle emergency calls.

Although not a specific requirement of the EAP, response to public comments and questions were extremely hindered due to limited resources and availability. Additionally, the County manages mass communication advisories, rather than individual departments or agencies.

8.2 Levee inspections

Levee inspections continued, as required, by drones and helicopters, but were limited by permissible weather.

8.3 Pump Operations

It was reported on August 27, 2017, that the pump station was not able to keep up with the rain intensity, so temporary pumps were ordered immediately. Due to access issues, temporary pumps were not operational until August 31, 2017.

It is important to note that the pump station was staffed 24 hours/day. The Station did not lose power, even after a small power surge that occurred during the event that triggered the backup generator to function.

9.0 RECOVERY

9.1 Communications

Continuous updates were provided to the County on the post-storm condition of LID 19. There was concern regarding the timeliness of debris removal by the county contractor; however, debris removal was found to have taken place in accordance with the requirements of the EAP.

9.2 Levee inspections

In accordance with the EAP, the levees were inspected for any breaches and slides. There were minor incidents of rutting caused by inspection activities and installation of temporary pumps. Any debris located along the levees and outfall structures was removed and properly disposed.

9.3 Pump Operations

The pump station was inspected, and all identified repair needs were addressed.

10.0 FINDINGS

No significant findings of any deviation from the EAP were noted. LID 19 personnel performed as best as practical under the given storm events of Hurricane Harvey.

10.1 Communications

Communications chains were never broken between personnel in the field and the decision makers at the OEM. However, public communication was difficult to manage. For brief moments, calls went unanswered and false information was posted on social media by the public, causing confusion and frustrations among residents and business owners.

10.2 Levee inspections

Inspections continued throughout the event. When levees became inaccessible due to unsafe conditions, inspections were performed by other means.

No significant damage was noted, and no emergency repairs were performed.

10.3 Pump Operations

Although not specifically included in the EAP, the preemptive action to run the pumps prior to losing gravity should be clearly understood. Since one of the gravity culverts must be closed on the upstream side to act as the pump station's outfall, the gravity flow in this location will be reduced to three culverts instead of four. Depending on water levels between the interior and exterior, this culvert may be able to still gravity flow more than the pump station's capacity. The installation of staff gauges at the pump station and the predictive model will help in deciding when this action will provide benefit. In this particular instance, without staff gauge data, it could not be determined whether it provided positive or negative benefits.

With regard to temporary pumps, the uncertainty of Harvey's impact on the Brazos River watershed and not having historical data of similar events effected the anticipation of ordering temporary pumps.

11.0 RECOMMENDATIONS

The main concerns and issues experienced during emergency efforts related to Hurricane Harvey resulted from inefficient communication. These issues can easily be mitigated, and recommendations to consider have been included in this memorandum. These recommendations are made to help LID 19 implement the EAP. In accordance with the after-action reports, APTIM agrees with the following recommendations that have already been provided, and some of these may have already been implemented:

11.1 Communications

- Review website communications, including frequency of updates and procedures for responses to website inquiries and perform a comprehensive review of content.
- Consider methods to provide additional telephone and email responsiveness to residents.
- Work with Fort Bend County to understand procedures for issuance of evacuation orders and communication of safe evacuation routes.

- Discuss protocols for reporting law enforcement needs to contract deputies serving overlapping municipal utility districts.
- Equip District personnel, consultants, and field crew with county radios or purchase similar radios to ensure that communications are not disrupted during future events in case cellular service is lost.
- Create the recommended predictive model to be used as an advisory tool to assist with evacuation routes and to better understand the stormwater conditions throughout the LID.
- Include water level monitoring gauges throughout the system to supplement the newly installed gauges at Steep Bank Creek.
- Develop pre-event checklists and daily report forms to document preparation actions and activities throughout an event.
- Review methods to assist in expediting the County's debris removal efforts, ensuring coordination with FBC's authorized debris removal contractor and debris removal monitoring contractor to remain compliant with FEMA requirements.

11.2 Levees

- In order to allow continuous inspection during adverse weather, it is recommended that weatherproof surfaces be provided along the levee crown.

11.3 Pump Station

- We agree that the board should consider a safe-house solution at the pump station for protection of the operator providing 24-hour manned coverage during emergency operations.
- Develop water level trigger points to be included in the EAP for Steep Bank Creek Facility operations.