HURRICANE ISAAC IN LOUISIANA

4 Nonresidential Construction and Infrastructure

During a disaster, communities rely heavily on certain services, including emergency responders, power, water and communication networks, and shelters.

Similar to the method used for assessing residential construction, the MAT focused on infrastructure and nonresidential buildings that were repaired or reconstructed after Hurricane Katrina that experienced flood conditions during Isaac. Based on the data gathered and damage assessment reports available prior to field investigations, the MAT observed three types of nonresidential construction: community centers, critical facilities, and infrastructure. Very few low-rise office and light commercial buildings experienced flood damage in areas visited by the MAT.

4.1 Community Centers

The Braithwaite Auditorium is a large reinforced masonry and concrete frame building constructed on an elevated concrete foundation system with a concrete slab underneath. The auditorium was

rebuilt in 2011 as a result of damage caused by Hurricane Katrina. The elevation of the facility was based on the 2009 preliminary FIRM BFE (Zone VE [EL21]) rather than the Hurricane Katrina ABFE (Zone AE [EL 18]), with the lowest horizontal structural member more than 19 feet above grade (see Figure 4-1). This placed the structure above the flood levels of Hurricane Isaac, which were approximately 11 feet above grade (see Figure 4-2). However, not all utilities and associated

Figure 4-1:
The Braithwaite Auditorium was rebuilt to the preliminary BFE following damage caused by Hurricane Katrina (Braithwaite Park [East Bank] – Plaquemines Parish, LA).

Figure 4-2:
HWM visible on glass at entrance to elevators below lowest floor of Braithwaite Auditorium (Braithwaite Park [East Bank] – Plaquemines Parish, LA).

equipment were elevated to the same height as the structure. The building has an elevator for handicap access as well as a generator for emergency power (see Figure 4-3); the automatic transfer switch and other electrical service components for this equipment were both damaged by Hurricane Isaac. No damage was observed inside the auditorium (see Figure 4-4).

Figure 4-3:
The Braithwaite Auditorium has an elevated generator for emergency power (Braithwaite Park [East Bank] – Plaquemines Parish, LA).

Figure 4-4:
No damage was observed in the auditorium (Braithwaite Park [East Bank] – Plaquemines Parish, LA).

The auditorium building was elevated much higher than any of the homes in the nearby neighborhood. In fact, the auditorium's lowest floor was higher than some rooftops in this neighborhood. As a result, the new auditorium suffered minimal damage compared to surrounding residential buildings, which were inundated with 8 to 10 feet of water (see Figure 4-5). The primary damage the MAT observed at the auditorium was to the electrical equipment. Although the facility was used shortly after the storm, the generator transfer switch and other electrical components below the lowest floor were in need of repair (see Figure 4-6).

As part of Hurricane Katrina recovery, the Port Sulphur Community Center was constructed in 2010 with FEMA Public Assistance funding (see Figure 4-7). Plaquemines Parish consolidated 10 existing facilities into four community centers with similar construction to the Braithwaite Auditorium. These new centers were built to preliminary FIRM BFE (Zone VE [EL13]) rather than the Hurricane Katrina ABFE (Zone AE [EL 10]). No damage was observed by or reported to the MAT for the Port Sulphur Community Center; there was no flooding in this area.

Figure 4-5: Residences in the Braithwaite Park subdivision were inundated with more than 8 feet of water; the auditorium (red arrow) is at the north end of the subdivision (Braithwaite Park [East Bank] – Plaquemines Parish, LA).

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Figure 4-6:
The Braithwaite Auditorium generator transfer switch and other electrical components were built at grade and damaged by floodwaters (Braithwaite Park [East Bank] – Plaquemines Parish, LA).

Figure 4-7:
Recently constructed Port Sulphur Community Center; no damage was observed or reported for the elevated facility (Port Sulphur [West Bank] – Plaquemines Parish, LA).

4.2 Critical Facilities

The MAT observed the Woodlawn Fire Station in Plaquemines Parish (Figure 4-8). The Woodlawn Fire Station was built on the site of an abandoned high school. The fire station bay is a pre-engineered metal building with a metal roof and walls and brick façade. The fire station has four apparatus bays but housed 10 emergency vehicles prior to the hurricane. Firefighters serving the Woodlawn Fire Station said that the site of the station was selected because "it has never been flooded before." Although the MAT did not observe visible structural damage, the station did receive flooding of approximately 8 feet.

Figure 4-8: Woodlawn Fire Station (Woodlawn [East Bank] – Plaquemines Parish, LA).

According to a representative of the fire department, nine pieces of equipment (fire engines, command vehicles, etc.) and all of the fire department gear (hoses, safety equipment, clothing, tools, etc.) were significantly damaged and, therefore, were not available for response and recovery operations. One fire truck was undamaged because a firefighter drove the truck to the top of a levee prior to inundation. Figure 4-9 shows a post-storm inundation aerial for reference. The fire department did not have a formal continuity of operations or contingency plan in place in the event of a hurricane, but had onsite portable generators that allowed the fire station to serve as a community shelter for the duration of the rescue operations.

Figure 4-9: Post-Hurricane Isaac aerial of Woodlawn Fire Station (Woodlawn [East Bank] – Plaquemines Parish, LA).

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The MAT observed several Plaquemines Parish schools that were under construction. To comply with flood elevation requirements, the new schools were being constructed more than 10 feet above grade (see Figures 4-10 through 4-12). The MAT verified that, based on the flood elevations in the area, these schools would not have been inundated during Hurricane Isaac.

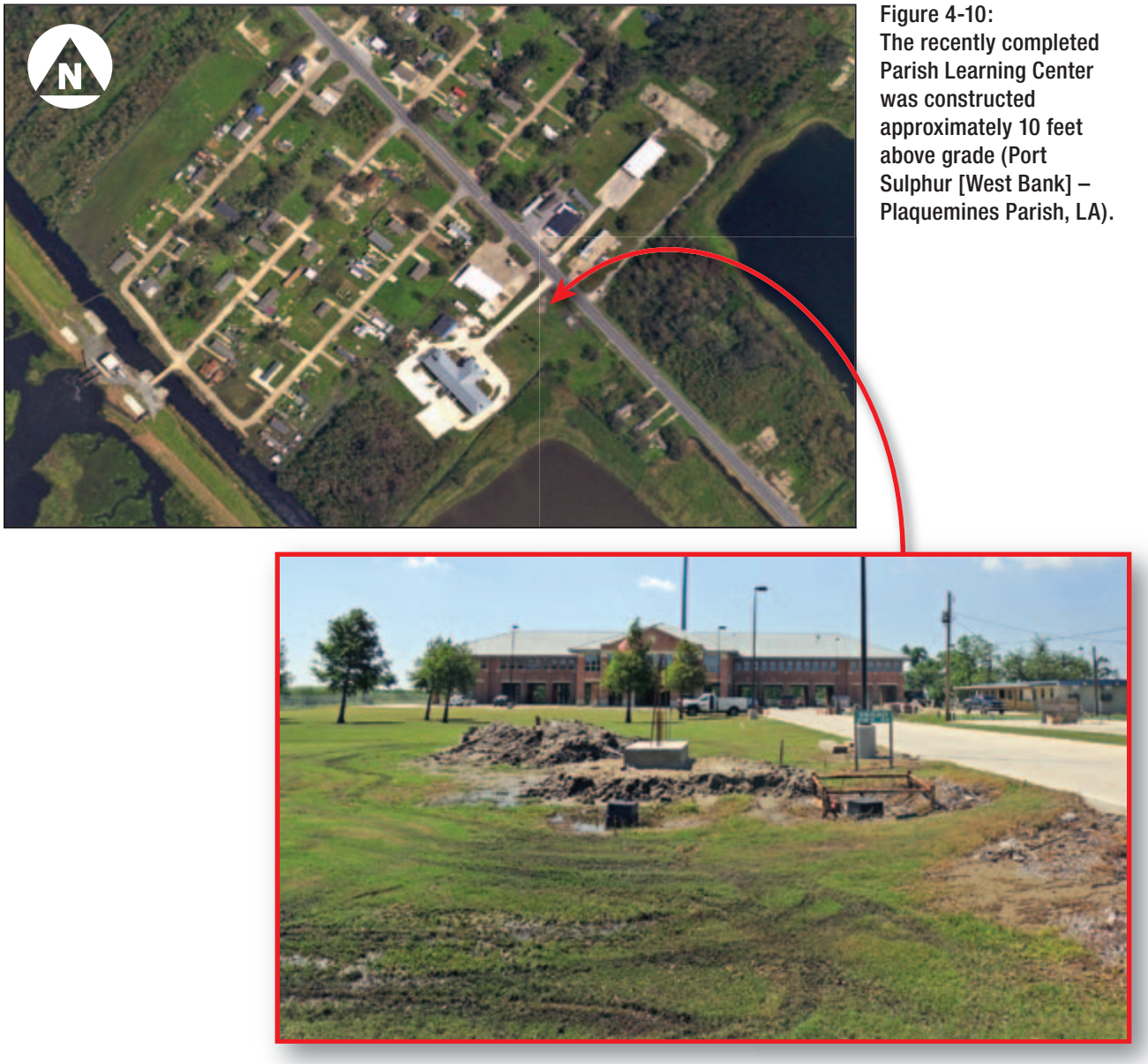

Figure 4-10:
The recently completed Parish Learning Center was constructed approximately 10 feet above grade (Port Sulphur [West Bank] – Plaquemines Parish, LA).

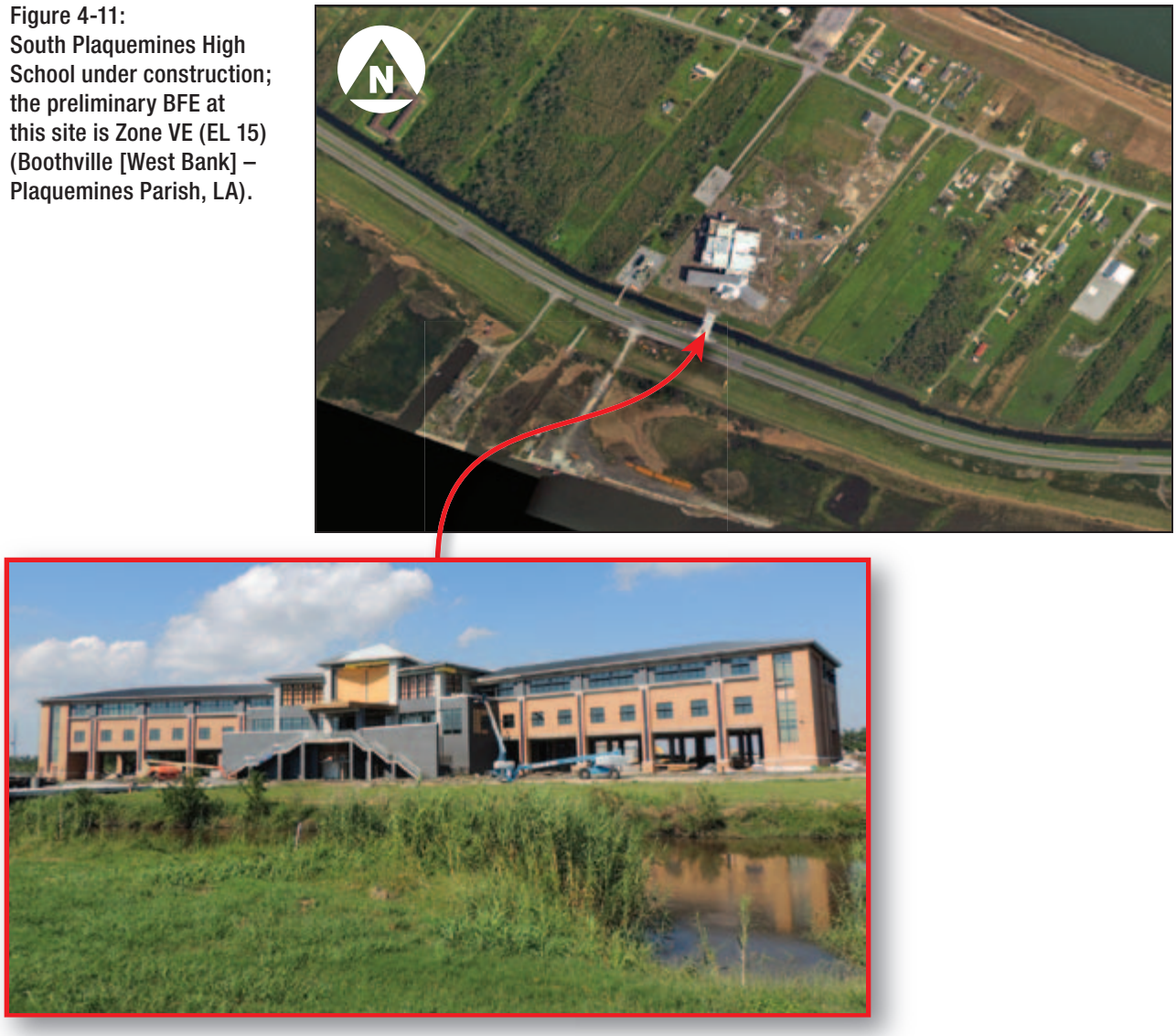

Figure 4-11:
South Plaquemines High School under construction; the preliminary BFE at this site is Zone VE (EL 15) (Boothville [West Bank] – Plaquemines Parish, LA).

Figure 4-12:
The Phoenix Pre-K–12 School under construction; the preliminary BFE at this site is Zone AE (EL 17) (Phoenix [East Bank] – Plaquemines Parish, LA).

4.3 Infrastructure

The MAT visited three substations in Plaquemines Parish, as well as various pump stations and cellular towers, throughout areas impacted by Hurricane Isaac. The three substations were inundated by floodwater, and the damage forced the utility companies to de-energize them. In two of the three substations, utility companies used temporary trailer-mounted substations to energize downstream electrical distribution lines while repairs were made (see Figure 4-13).

In two of the substations, most electrical equipment was placed at or near grade, and the placement offered little protection from floods. In the third substation, some flood protection was evident. In that substation, several pieces of electrical equipment were elevated on steel frames, some several feet above grade (Figure 4-14). Also, a protective berm was constructed around the perimeter of that

substation. The berm was reportedly constructed after the substation flooded during Hurricane Katrina. During Hurricane Isaac, the berm was overtopped and the substation was inundated (see Figures 4-15 through 4-17).

Figure 4-13:
Electrical repairs being completed after substation equipment was inundated by floodwaters (Braithwaite [East Bank] – Plaquemines Parish, LA).

Figure 4-14:
Substation equipment elevated several feet above grade (Belle Chase [West Bank] – Plaquemines Parish, LA).

Figure 4-15:
A berm was constructed around the perimeter of this substation to protect it after Hurricane Katrina (Belle Chase [West Bank] – Plaquemines Parish, LA).

Figure 4-16:
Flood inundation depths were 4 to 5 feet above grade at the substation protected by the berm that was overtopped (Belle Chase [West Bank] – Plaquemines Parish, LA).

Figure 4-17: The protective berm (red arrow) was overtopped, resulting in damage to the substation; note cellular tower (yellow arrow) northwest of the substation (Belle Chase [West Bank] – Plaquemines Parish, LA).

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The MAT observed several cellular towers with equipment elevated on platforms (see Figure 4-18). The MAT did not observe flood damage to the cellular tower equipment.

Figure 4-18: Cellular tower equipment on elevated platform near Port Sulphur Community Center (Port Sulphur [West Bank] – Plaquemines Parish, LA).

The MAT visited stormwater pumping stations in Slidell and Plaquemines Parish. Both were located in SFHAs, and both were repaired and mitigated after Hurricane Katrina under FEMA's Public Assistance Program. The elevation projects included installing new equipment and foundations, relocating control panels, and installing a generator with fuel tank and transfer switch for emergency power generation (see Figures 4-19 through 4-21). The MAT did not observe damage at either pump station, and both remained operational during the storm.

Figure 4-19: Post-Hurricane Isaac aerial of the pump station south of Braithwaite Park (Braithwaite Park [East Bank] – Plaquemines Parish, LA).

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Figure 4-20:
Elevated stormwater pump station south of Braithwaite Park reconstructed after Hurricane Katrina with FEMA Public Assistance funds (Braithwaite [East Bank] – Plaquemines Parish, LA).

Figure 4-21: The control panels and generator at this pump station were elevated as part of a mitigation measure with FEMA Public Assistance funds; insets illustrate connections between equipment and platform (Slidell, LA).