

TRANSIT INNOVATIONS, INFRASTRUCTURE & STRATEGIES

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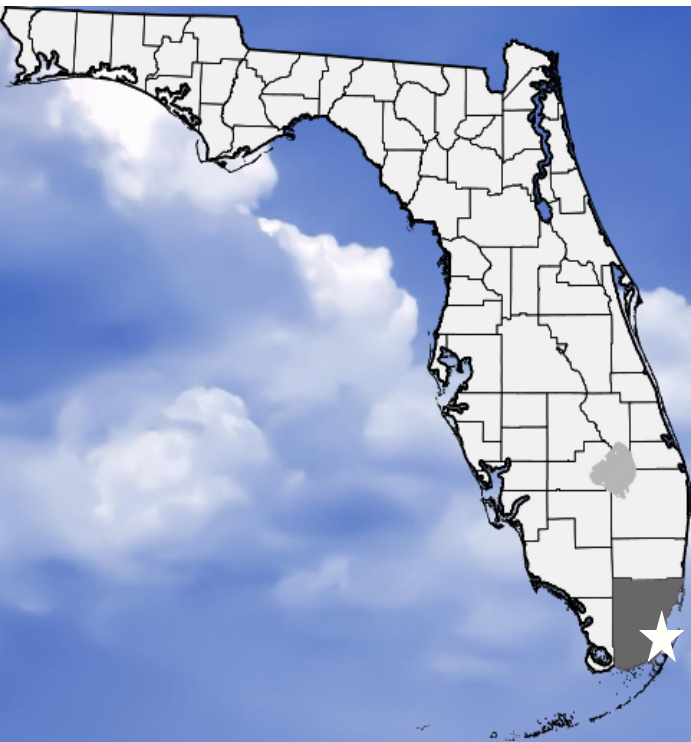
# EMERGENCY PREPAREDNESS & RESPONSE



MIAMI-DADE COUNTY |  
DEPARTMENT OF TRANSPORTATION + PUBLIC WORKS

presented by **Alice N. Bravo, PE, Director**

FEBRUARY 12, 2018

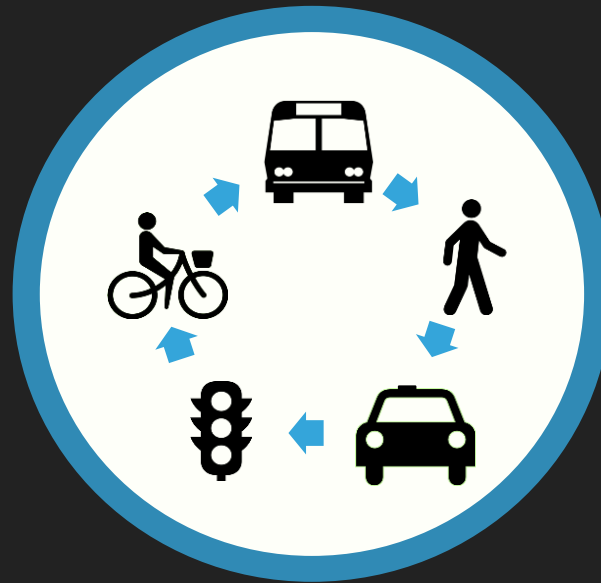


over 2,400 sq. mi.  
2.7 million residents  
15.4 million visitors  
34 municipalities

## Miami-Dade

Florida's most populous County  
and largest metro area





### TRANSIT SYSTEM

transit system in US 14<sup>TH</sup> LARGEST  
transit service area of 360 SQ. MI.  
weekday boardings of 281,700  
95 routes | 177,900 boardings 800+ BUSES  
exclusive bus TransitWay 22-MILE  
elevated heavy rail | 68,400 boardings 25-MILE  
autom. people mover | 29,300 boardings 4.4-MILE  
paratransit services | 6,100 weekday trips STS

### PUBLIC WORKS

5<sup>TH</sup> MOST CONGESTED metro area in US  
7,680 paved lane miles roadway  
18 MILLION linear feet sidewalk  
171 MILLION drainage canals  
1 MILLION traffic signs  
26,400 street lights  
3,000 traffic signals  
209 bridges

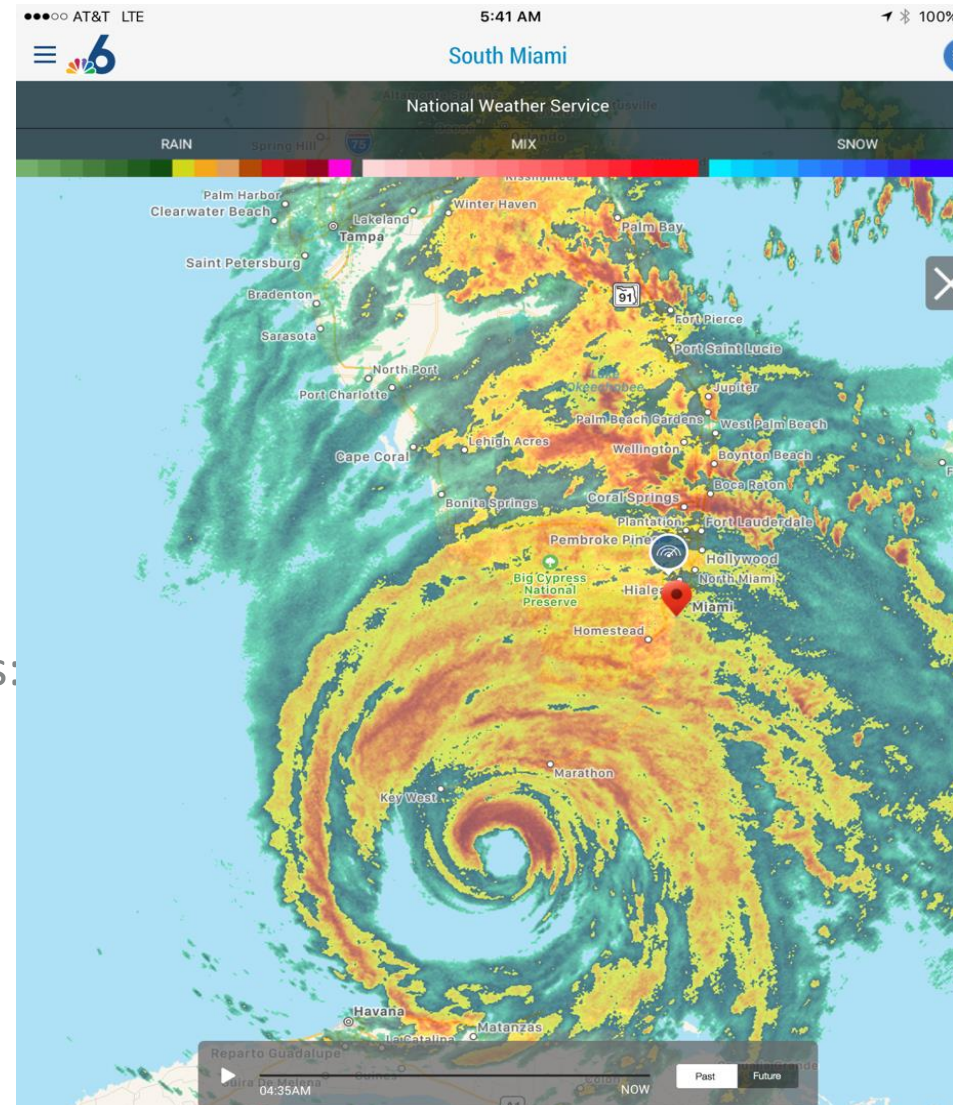
# RECENT STORMS IMPACTING MIAMI-DADE

## ? HURRICANE WILMA

- Hurricane Category 3
- October 24, 2005

## ? HURRICANE IRMA

- Hurricane Category 4
- September 10, 2017
- DTPW's pre, and after storm efforts:
  - Pre-Storm: September 5 – 9
  - Post Storm: September 11-18



## HURRICANE IRMA | PRE-STORM PREPARATION ACTIONS

September 7-18:

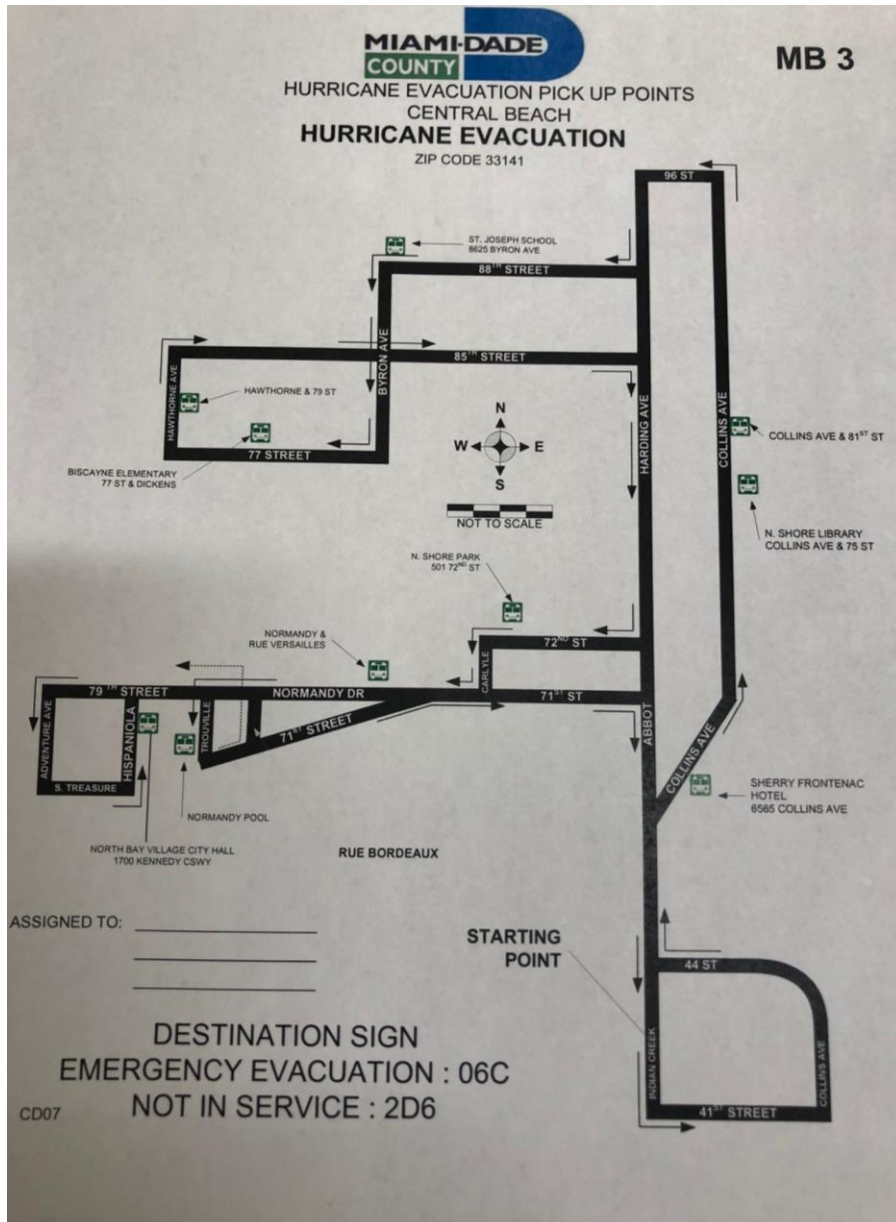
- ❑ DTPW followed procedures from 2017 DTPW Hurricane Manual
- ❑ DTPW maintained 6 staff members at the Emergency Operations Center (EOC) from:
  - Bus Operations
  - Special Transportation Service
  - Office of Safety & Security
  - Public Works
- ❑ Transit operations closed at the end of the regularly scheduled service on September 9, 2017
- ❑ All covered Metrorail parking garages (approx. **6,500 parking spaces**) open to the public and full, prior to landfall of storm

# HURRICANE IRMA | PRE-STORM PREPARATION ACTIONS

## BUS OPERATIONS

- ❑ Began running pre-determined **evacuation routes** on September 7
- ❑ Bus Operations personnel assigned to shelters for 2 days
- ❑ Used **75-125 buses per day** for evacuation and reverse evacuation





## BUS OPERATIONS STORM EVACUATION ROUTES

Transported **8,362**  
passengers

- **Evacuation:** 2,536 passengers taken to shelter
- **Reverse evacuation:** 5,826 passengers taken from shelter

# HURRICANE IRMA | PRE-STORM PREPARATION ACTIONS

## PUBLIC WORKS (PW)

- ☐ Prepared **Emergency Contracts** to address recovery efforts
- ☐ Negotiated **disaster relief work** with contractors
- ☐ Contacted vendors for fuel, water, and food delivery before and after storm
- ☐ Assigned previously surveyed **pre-determined areas to Damage Assessment Teams** for damaged assessment and provided section maps
- ☐ Informed staff of roadway **clearing responsibilities** and **reporting locations** for immediate post-storm action
- ☐ Secured County's **8 bascule bridges and 18 water pump stations**, fueled generators 8 hours prior arrival of storm force winds
- ☐ **Staged recovery action equipment** at pre-assigned sites
- ☐ **Coordinated primary roadway clearing efforts** with Parks Recreation and Open Spaces and Solid Waste Management



# HURRICANE IRMA | PRE-STORM PREPARATION ACTIONS

## SPECIAL TRANSPORTATION SERVICES (STS)

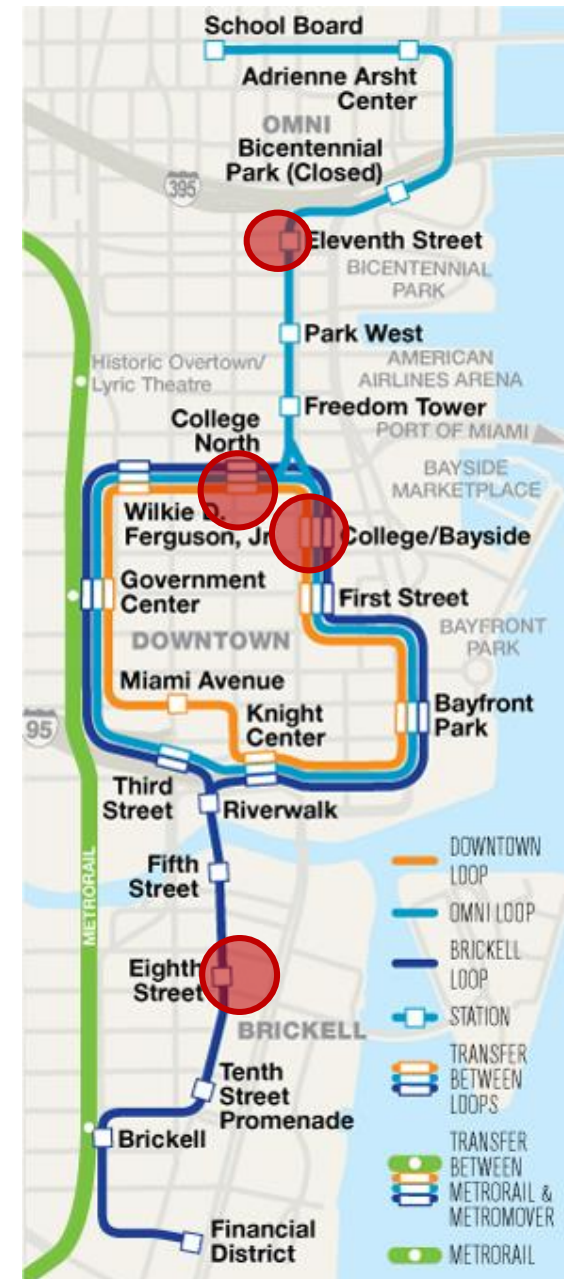
- ❑ Assisted with evacuation of clients and provided medically necessary trips (dialysis patients, etc.) to hospitals prior to the storm
- ❑ **Emergency Evacuation Program:** 340 participants assigned to STS
  - Transported **70 clients** to Medical Management Facilities (MMF)
  - **240 clients** declined to be evacuated
- ❑ Additional **72 post-hurricane trips** assigned and transported by STS
  - Evacuees from the State of Florida Health Department, Red Cross and School Board

# POST-STORM RECOVERY EFFORTS

## METROMOVER SYSTEM

### ? Damaged to system:

- Signal, Ground and power rail in 4 locations adjacent to stations:
  - Eight Street Station
  - Eleven Street Station
  - College North Station
  - College-Bayside Station
- Infrastructure replaced:
  - 270 feet of signal/ground rail
  - 240 feet of 3-phase power rail



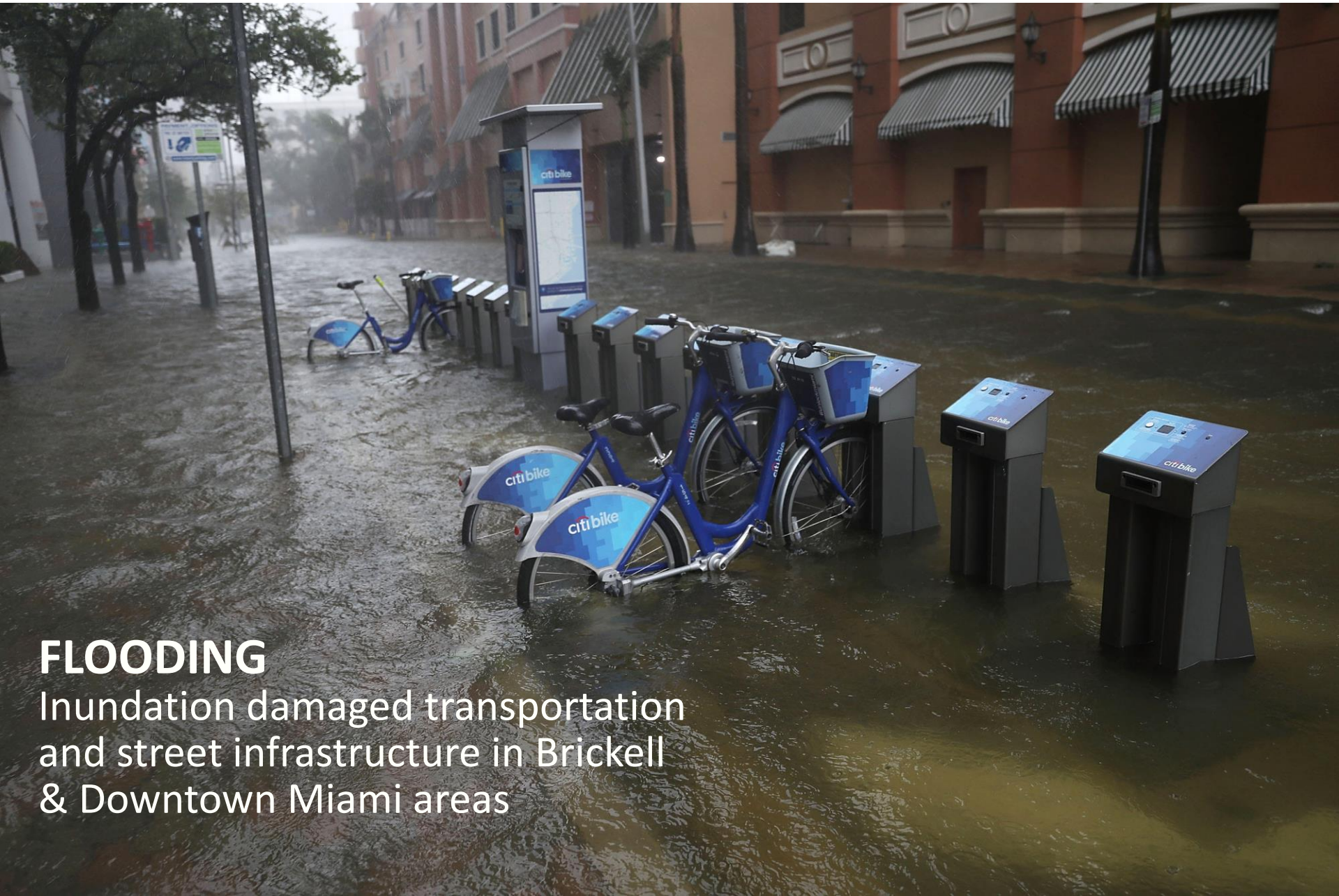
## TRANSPORTATION & STREET INFRASTRUCTURE

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### **FLOODING**

Inundation impacted infrastructure in Brickell and Downtown area



### **FLOODING**

Inundation damaged transportation and street infrastructure in Brickell & Downtown Miami areas



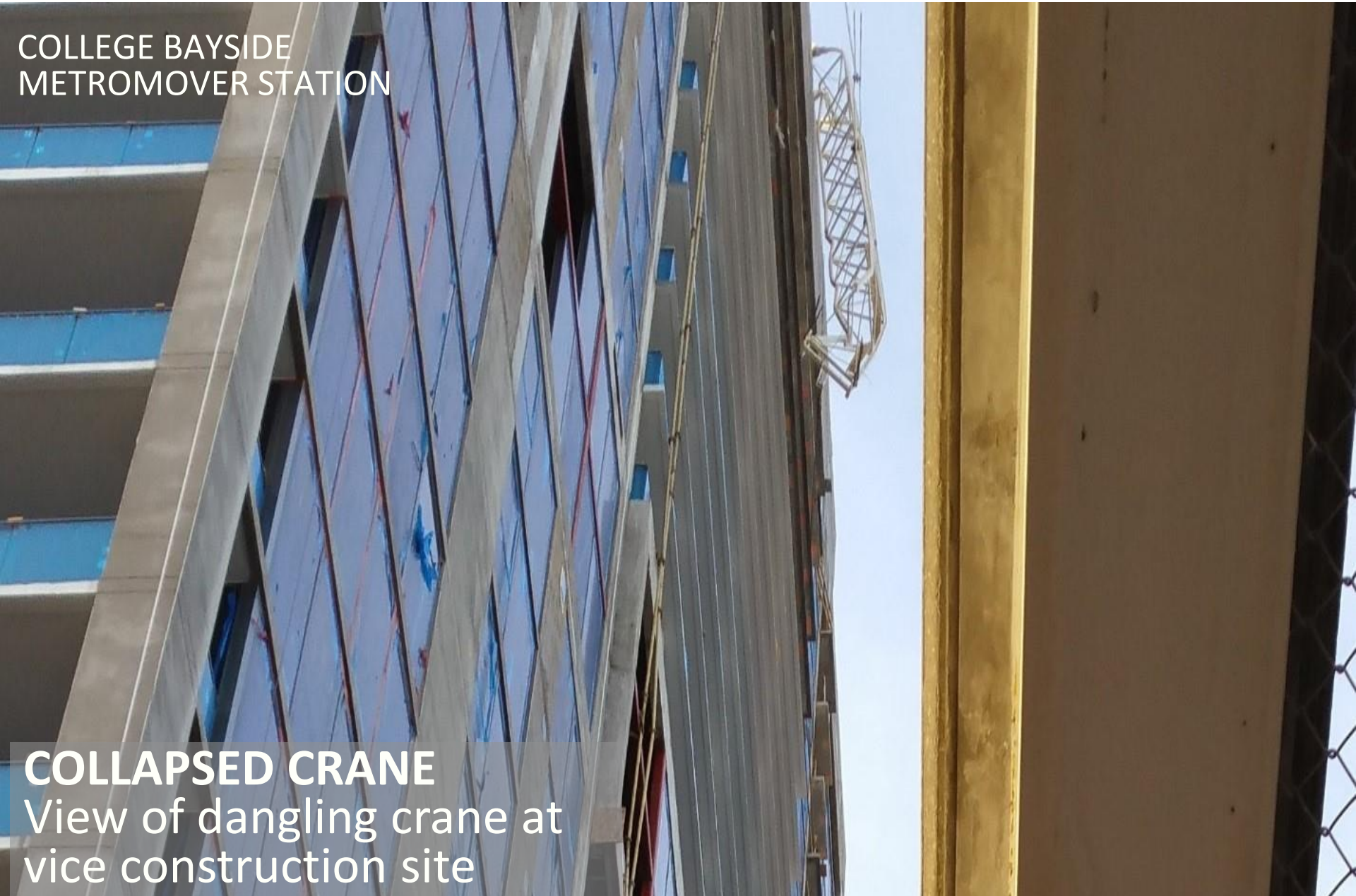
DAMAGED INFRASTRUCTURE

# COLLEGE BAYSIDE METROMOVER STATION

**COLLAPSED CRANE** at  
adjacent construction site  
**prevented access** for  
maintenance assessments &  
operations

**Delayed re-opening** of  
Metromover system

COLLEGE BAYSIDE  
METROMOVER STATION



**COLLAPSED CRANE**  
View of dangling crane at  
vice construction site



**DAMAGED  
METROMOVER GUIDEWAY**

Damaged caused by debris from adjacent  
construction projects



**PEDESTAL SIGNS BLOWN OFF  
PLATFORM**

Eleventh Street

&

Park West

Metromover Stations





**DAMAGES TO METROMOVER  
STATION PLATFORM SIGNS**

**DAMAGES TO METROMOVER  
STATION ELECTRIC SCALATORS**



## CEILING SLATS

The wind got under the ceiling slats, depositing them throughout neighborhood

## CONSTRUCTION DEBRIS ON DOWNTOWN METROMOVER STATION AREAS

Construction materials relocated by storm winds on adjacent construction projects

## DAMAGED STATION ROOF

PARK WEST STATION  
Roof material damaged by storm winds

# WATER IN ELEVATOR SHAFTS & PITS

Created problems for hydraulic systems  
and electrical and electronic control of  
elevators and escalators.

- 28 units affected



**SEA WATER & RAIN IN ELEVATOR  
SHAFTS & ESCALATOR PITS IN  
METROMOVER STATIONS CAUSED  
PROBLEMS WITH:**

Devices  
Hall call buttons  
Electronic controls  
Control wiring  
Motors

# DAMAGED ELECTRONIC CONTROLLERS

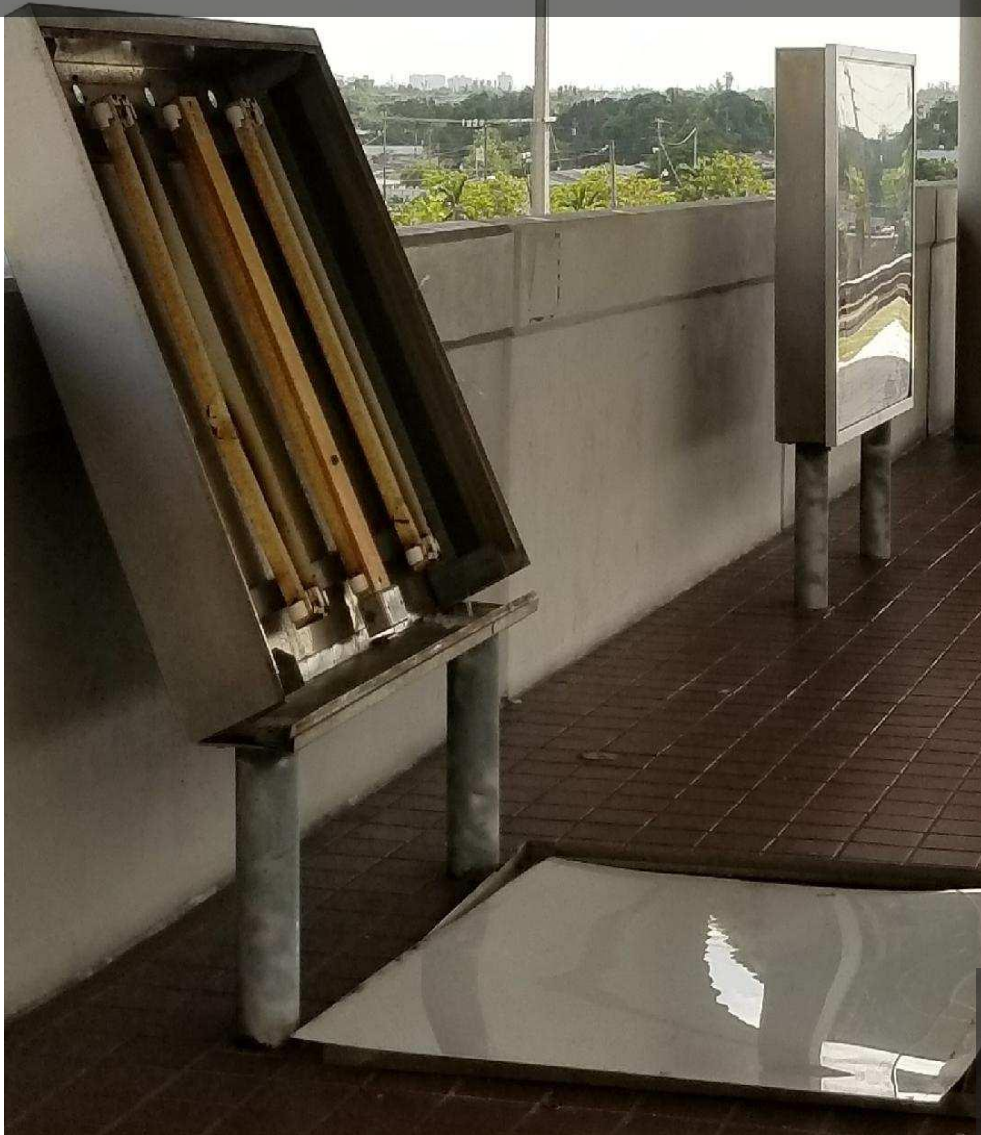
Water intrusion damaged escalator controllers



METROMOVER  
INFRASTRUCTURE

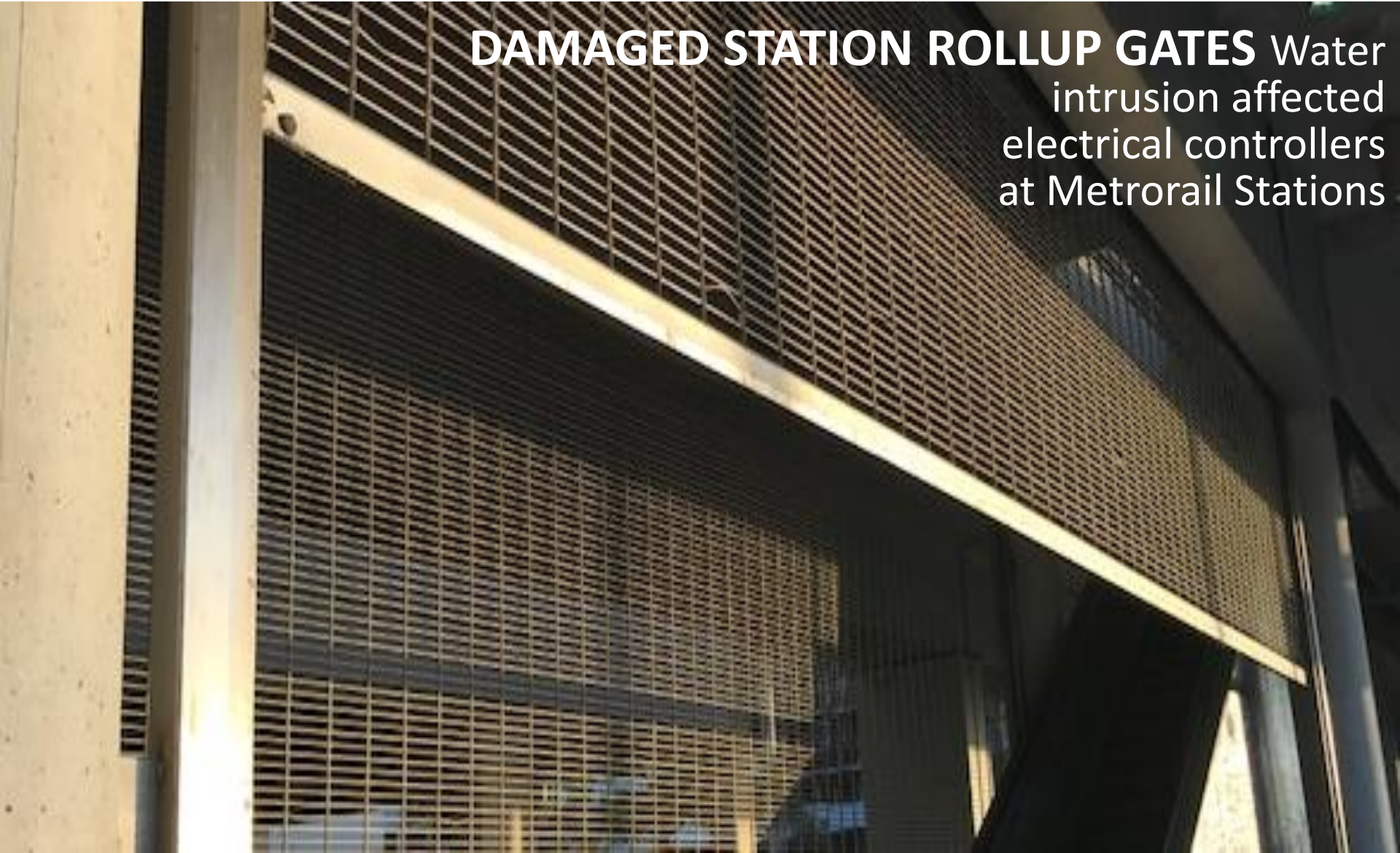
# DAMAGED METRORAIL SIGNS SYSTEMS

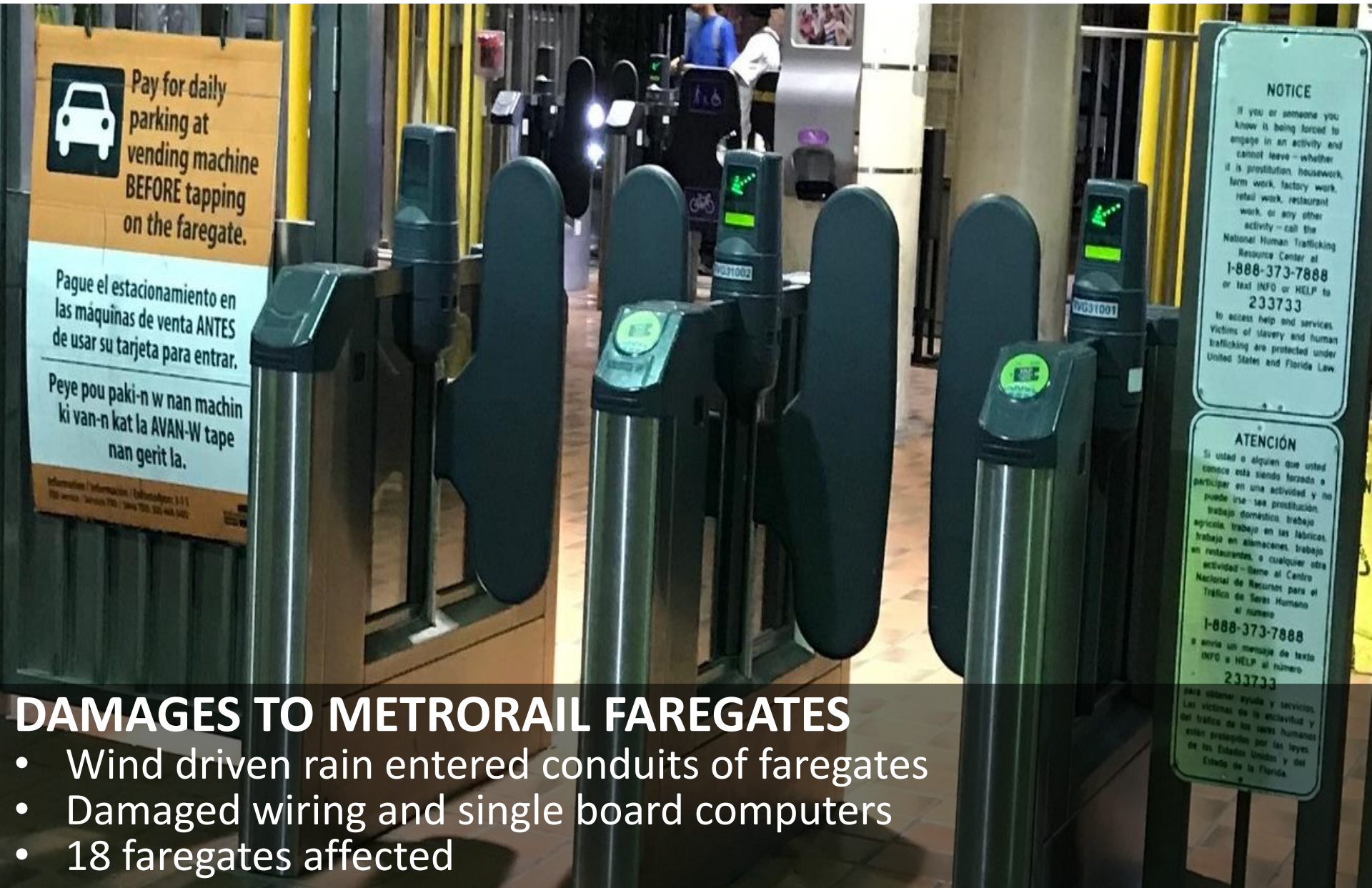
- Platform signs knocked down by winds
- Static sign panels blown off windscreens
- No mechanical connection



**DAMAGED ROLLUP  
METRORAIL GATES**

**DAMAGED STATION ROLLUP GATES** Water intrusion affected electrical controllers at Metrorail Stations





## DAMAGES TO METRORAIL FAREGATES

- Wind driven rain entered conduits of faregates
- Damaged wiring and single board computers
- 18 faregates affected

# CONSTRUCTION DEBRIS

From adjacent construction projects



# METRORAIL INFRASTRUCTURE

## STORM WINDS AND WATER DAMAGES

### DAMAGED CEILINGS AT METRORAIL STATIONS

Southbound Trains ↑



### DAMAGED ELECTRIC ESCALATORS

Slipping handrails & water logged controls



# DAMAGES TO CANOPIES ON BUSWAY SHELTERS

## BUSWAY PHASE 1

Canopies on Busway were shredded by storm winds.



## BUS INFRASTRUCTURE

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### BUS STOP AMENITIES

- ❓ Canopies destroyed by storm winds
- ❓ **Lesson learned** during previous hurricanes:
  - Different canopy roof material incorporated in Busway Phase 2 & Phase 3

SW 128 STREET

**DAMAGES TO CANOPIES OF  
SHELTERS**

Busway Phase 1

# DOWNED TREES DAMAGES & DEBRIS ON ROADWAYS

Debris removal  
Street & sidewalk sweeping  
Canal inspections  
Drainage cleaning





### **DOWNED TREES & DAMAGED ROADWAY STREET LIGHTING**

Approx. 650 (5%) of County roadway lights damaged &  
130 street light pole knockdowns

### WIND DAMAGED OCCURRED IN MULTIPLE WAYS – WIND DRIVEN RAIN

- ❑ Wind driven rain penetrated conduits and damaged electronic controls of LED light systems
- ❑ LED drivers damaged





## TRAFFIC SIGNALS & SIGNS

Only 24% of traffic signals were operating after storm  
15,000 damaged traffic signs



### PARKING LOTS

- ❓ Downed trees in parking lots made them unusable, additionally the downed trees damages the site lighting systems

# LESSONS LEARNED FROM HURRICANE EXPERIENCES

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## ❓ TRANSIT STATIONS & TERMINALS

- Secure all loose items
- Tie down all fixtures (including cameras and digital signage/displays)
- Remove all removable items

## ❓ ON THE STREETS

- Clean all storm drains to prevent flooding occurring at the ground level of rail stations
- Use map provided by EOC to identify flooding vulnerable areas and store all equipment in high-lying areas

## ❓ STORAGE & SUPPLY

- Create stock of bus parts and equipment for quick mechanical repairs
- Get generators and backup systems ready
- Create a stock of batteries for traffic signals

## ❓ CENTRALIZED & DIRECT COMMUNICATION

- Establish strong communication with key personnel
- Have clear understanding of agency's hurricane manual
- Understand and prepare for residual effects



# LESSONS LEARNED FROM HURRICANE EXPERIENCES

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## ❓ INFRASTRUCTURE & ENGINEERING

- Increase crane regulations in the areas adjacent to public transportation corridors by the Agencies Having Jurisdiction (AHJ) to ensure that crane setups comply with all weight and wind requirements of the area
- **Damage Assessment**
  - Use advanced technology for remote movement and strain gauges at the most susceptible areas of our systems

## ❓ DAMAGE ASSESSMENT & RECOVERY EFFORTS

- Use emerging technology assess infrastructure damages, **streamline and expedite recovery efforts**:
  - Use of drones for assessing damages at inaccessible roadways and facilities
  - Mobile app applications and other technology-based solutions for in-field inspections