

# Gas System Restoration and Remediation: Post Katrina

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# Agenda

1. Overview of ENOI Gas System
2. Impact of Katrina
3. Restoration Progress

# Overview of ENOI Gas System

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# Gas System

- Servicing Orleans Parish for 100+ years
- 30 miles of gas transmission
- 14 interconnects provide supply
- 1,495 miles of distribution mains
- 1,028 miles of services
- 144,000 customers
- Initial construction was cast iron
- Replacements and additions were with steel, and limited use of plastic in more recent times

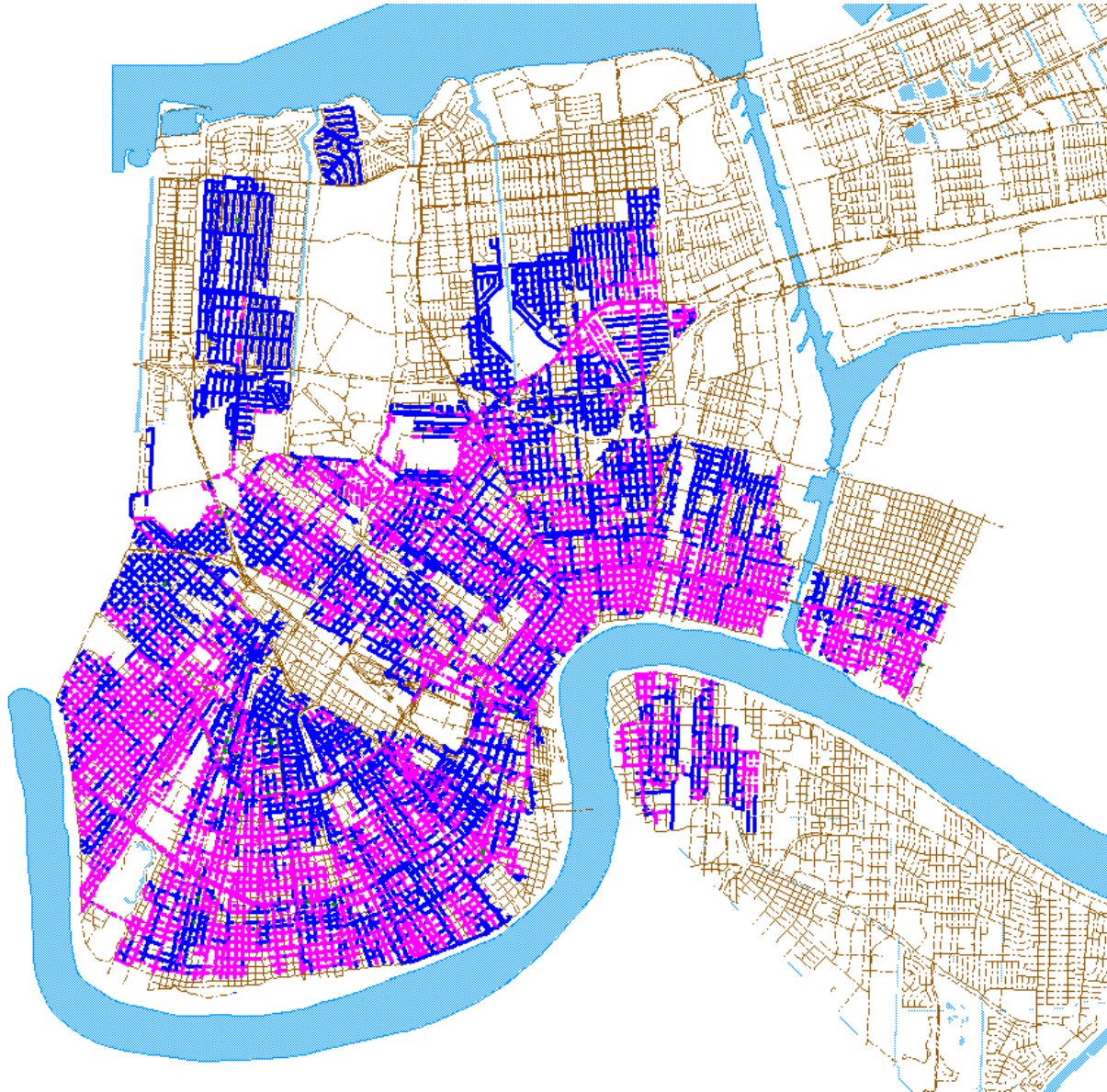
# Gas System (Continued)

- Low pressure portion referred to as utilization pressure (UP)
  - 7 inches water column, operating pressure
  - 0.25 pounds per square inch
- System originally constructed used town gas
- Operated at lower pressures
- Migrated to natural gas in late 1920s
- Newer portions are high pressure
  - 90 pounds pressure, operating pressure

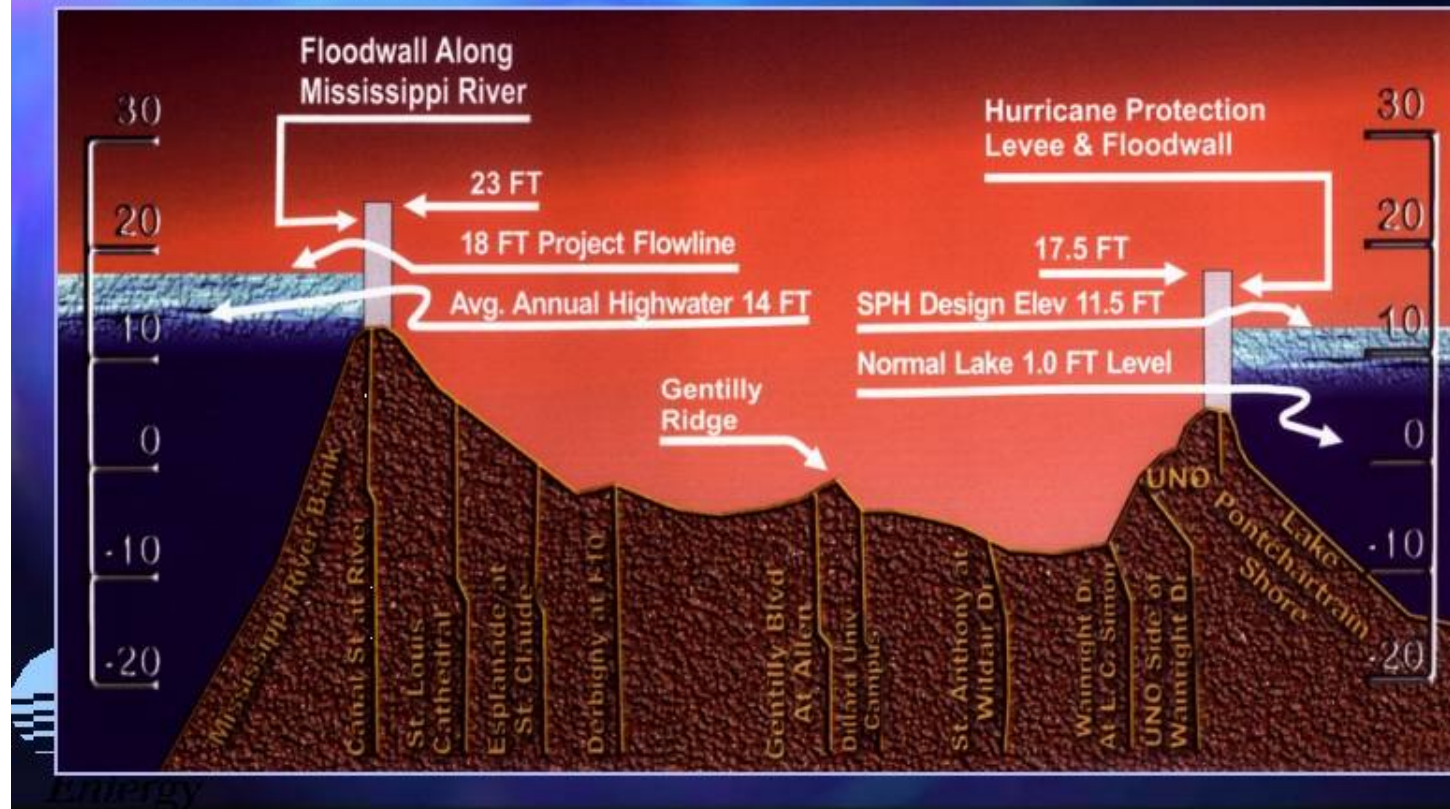
# Overview of ENOI Gas System

	System Mileage
HP Steel	700
HP/UP Plastic	145
Low Pressure, Utilization Pressure	650
Cast Iron	324
Steel	326
<b>Totals</b>	<b>1,495</b>

# Low Pressure - Cast Iron and Steel



# City of New Orleans Ground Elevations From Canal St. at the Mississippi River To the Lakefront at U.N.O.

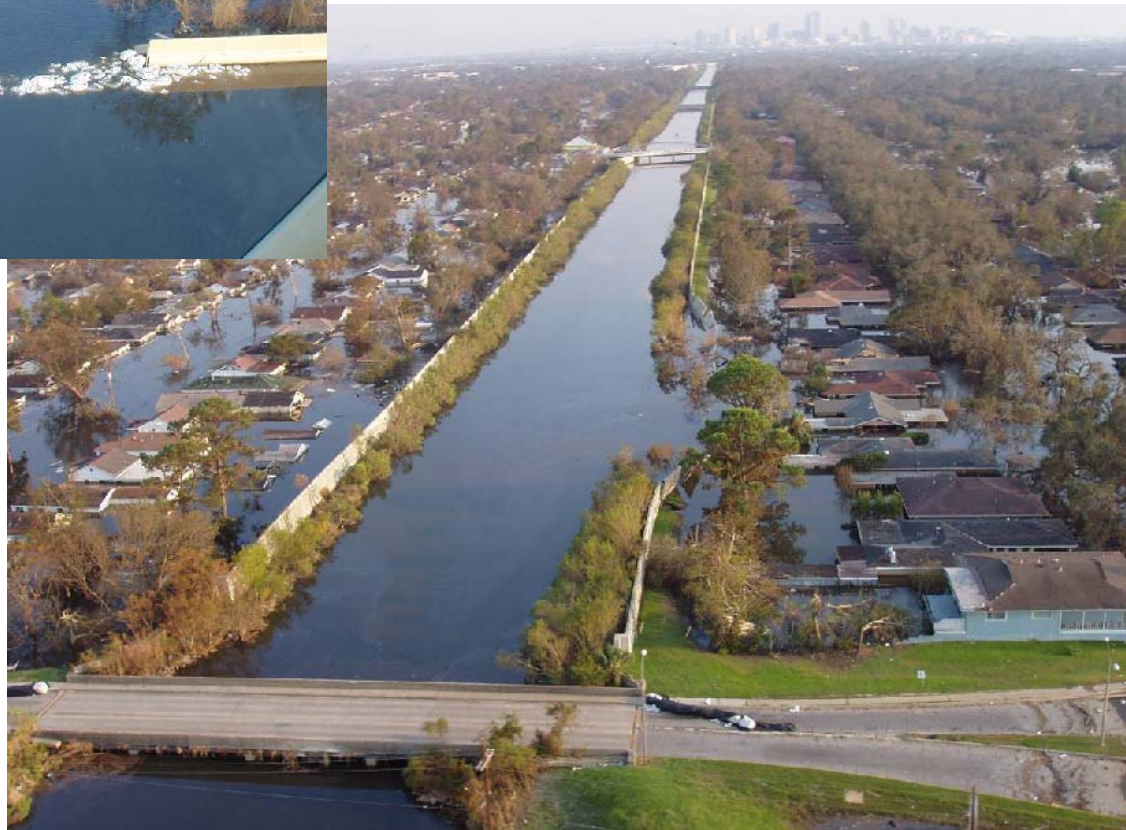




# Impact of Katrina

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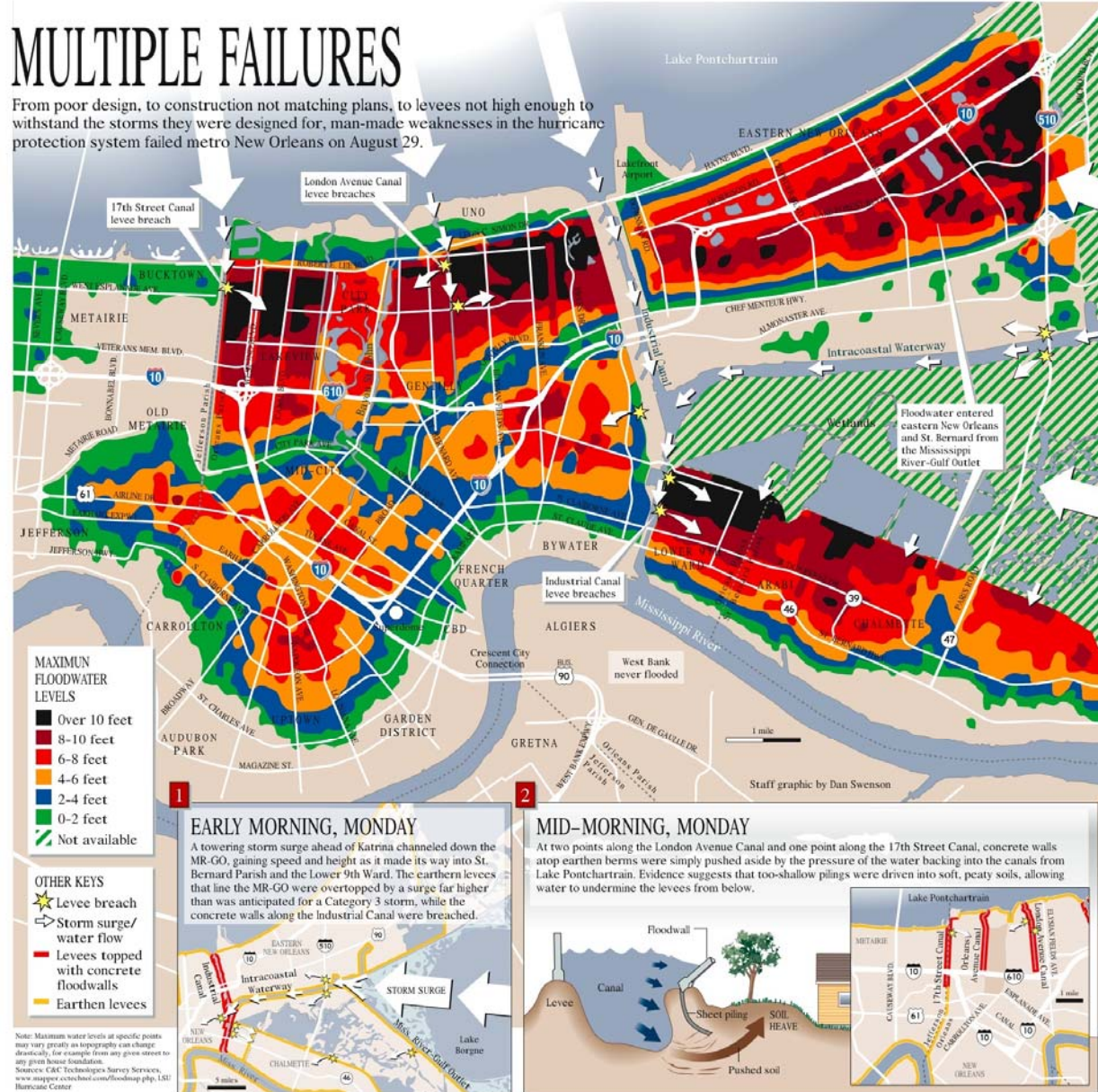
# Levee Breaks





# MULTIPLE FAILURES

From poor design, to construction not matching plans, to levees not high enough to withstand the storms they were designed for, man-made weaknesses in the hurricane protection system failed metro New Orleans on August 29.



Note: Maximum water levels at specific points may vary greatly as topography can change drastically, for example from any given street to any given house foundation.  
Sources: CAC Technology's Survey Services, www.mappers.com/floodmap.php, USGS Hurricane Center





## Risers From Damaged Houses Release Natural Gas





## Lakeview Area Remains Under Water for Weeks





## Risers From Damaged Houses Release Natural Gas



# Extensive Flooding











# Impact of Katrina

- Areas with severe flooding
- 108,731 houses had over 4 feet of water





# Release of Water Upon Removal of Tap



# How Did Water Get Into The Gas System?

- Damaged facilities
  - Meters
  - Service lines
  - Mains
  - Customer fuel lines
- Not Just Water
  - Silt and Debris





# Damaged Meter Set



# Damaged Meter Set



# Extent of Pipeline Flooding

	System Mileage	Mileage Flooded
HP Steel	700	310
HP/UP Plastic	145	{35}
Low Pressure, Utilization Pressure	650	534
Cast Iron	324	257
Steel	326	277
<b>Totals</b>	<b>1,495</b>	<b>844</b>



## **Extent of Flooding - How Much Water Infiltrated?**

- 534 Miles of UP Flooded
- Average line size of 6 inches
- Volume in one mile of 6 inch is approximately 7,750 gallons
- If full - 4.14 million gallons of water
- If half full - 2.07 million gallons

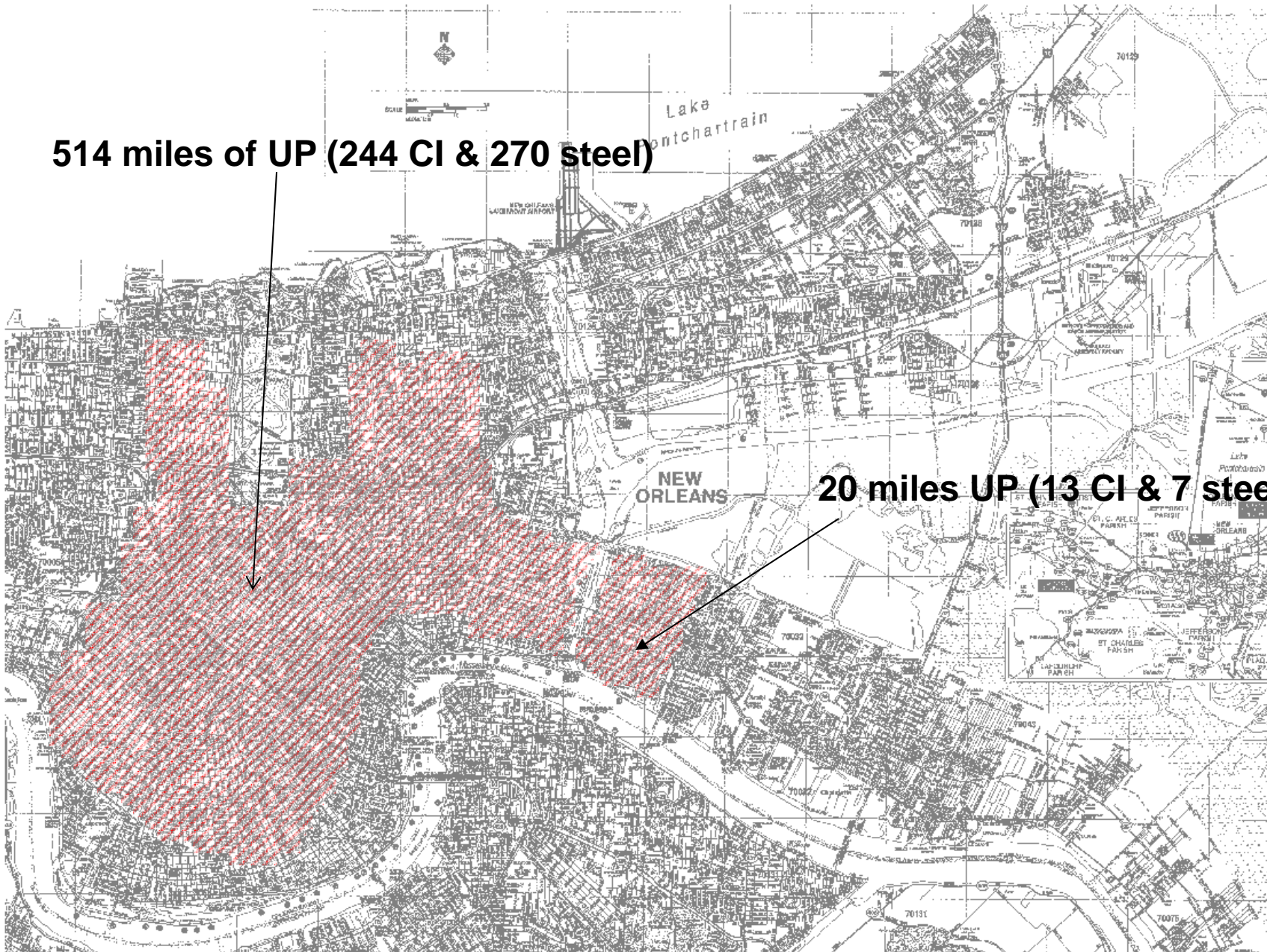
## **Extent of Flooding and Restoration - UP System (millions of gallons)**

<b>Volume - Full Basis</b>	<b>4.14</b>
<b>Volume - Half-Full Basis</b>	<b>2.07</b>
<b>Volume of Water Removed - December 15</b>	<b>2.23</b>
<b>Volume of Water Removed - January 1</b>	<b>2.68</b>

UP Flooded

**514 miles of UP (244 CI & 270 steel)**

**20 miles UP (13 CI & 7 steel)**

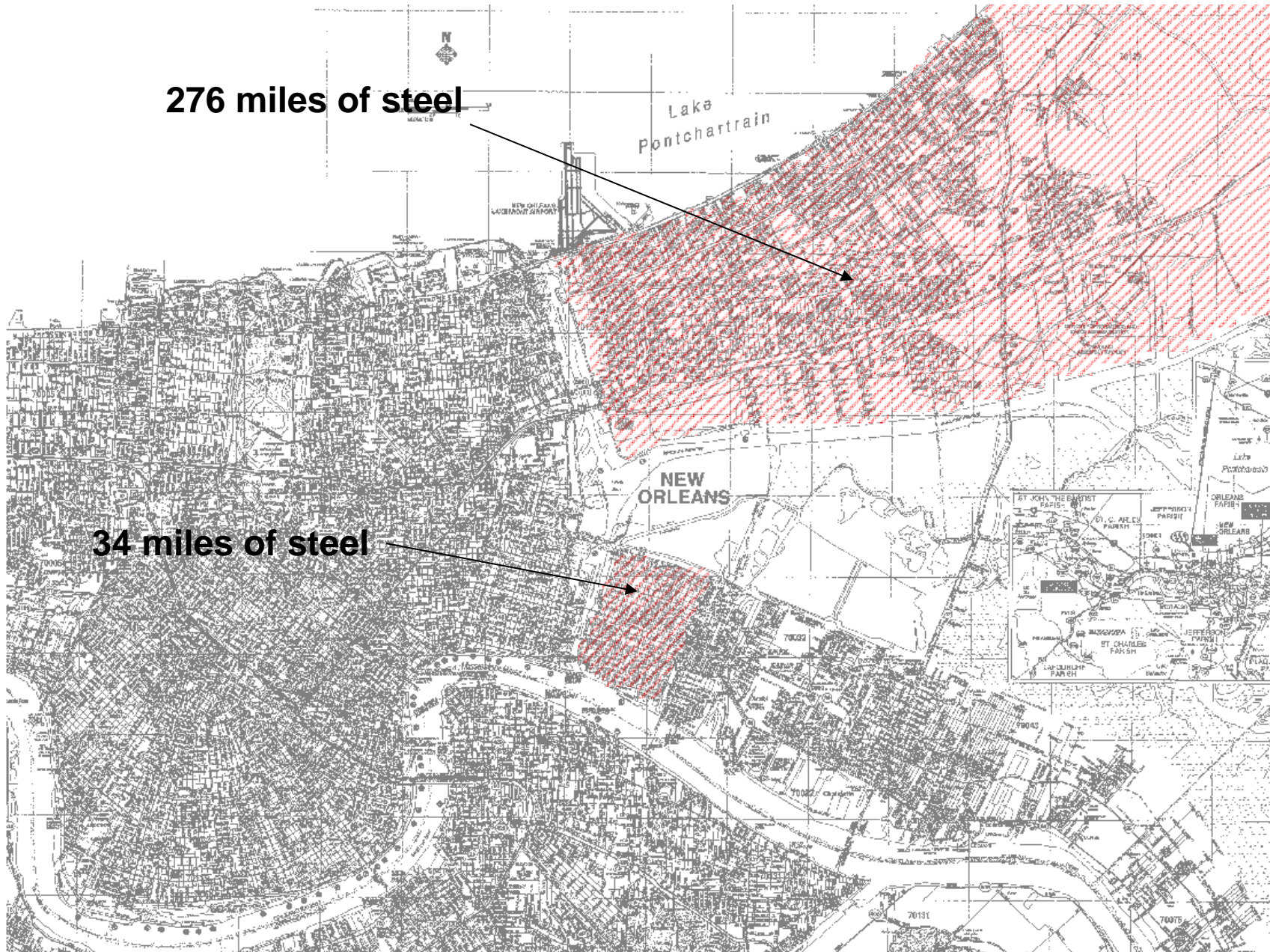




HP Flooded

276 miles of steel

34 miles of steel



# Restoration Progress

## Base Restoration

# Restoration Process

- **Assessment of Damage**
- **Securing System**
- **De-Watering**
- **Restoring Customers**

# Barge Used For Assessment





## Helicopters and GPS Used to Identify Leak Locations





# Diver Entering Water





## Diver Securing A Leak





## Diver Isolating Valves



# Segmenting The System





# Segmenting The System

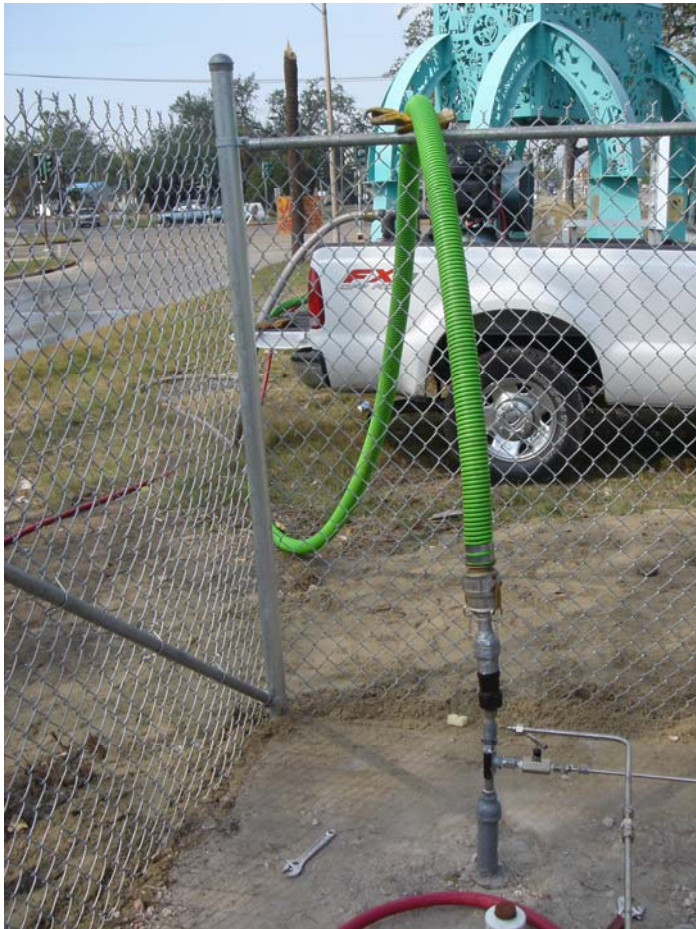


# Dewatering - Part of Routine Operations Pre-Katrina

- Thousands of low points throughout the parish
- Water pumped from siphons
- Rainwater
- 1,442 pre-Katrina



# Dewatering - Post Katrina

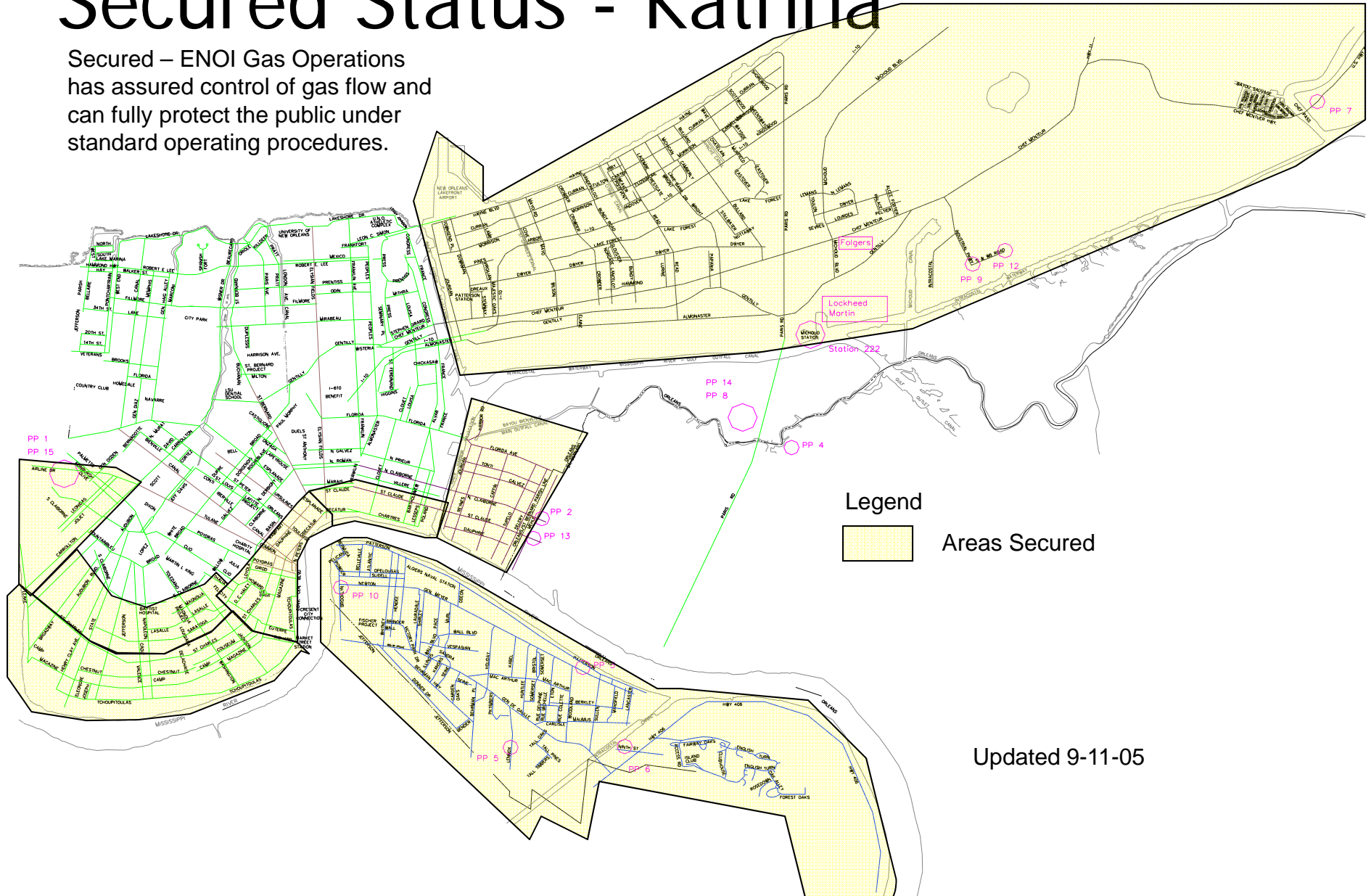


- Tremendous volume of water
- Brackish water - salts
- 589 siphons added post-Katrina



# New Orleans Gas Operations Secured Status - Katrina

Secured – ENOI Gas Operations has assured control of gas flow and can fully protect the public under standard operating procedures.



Legend

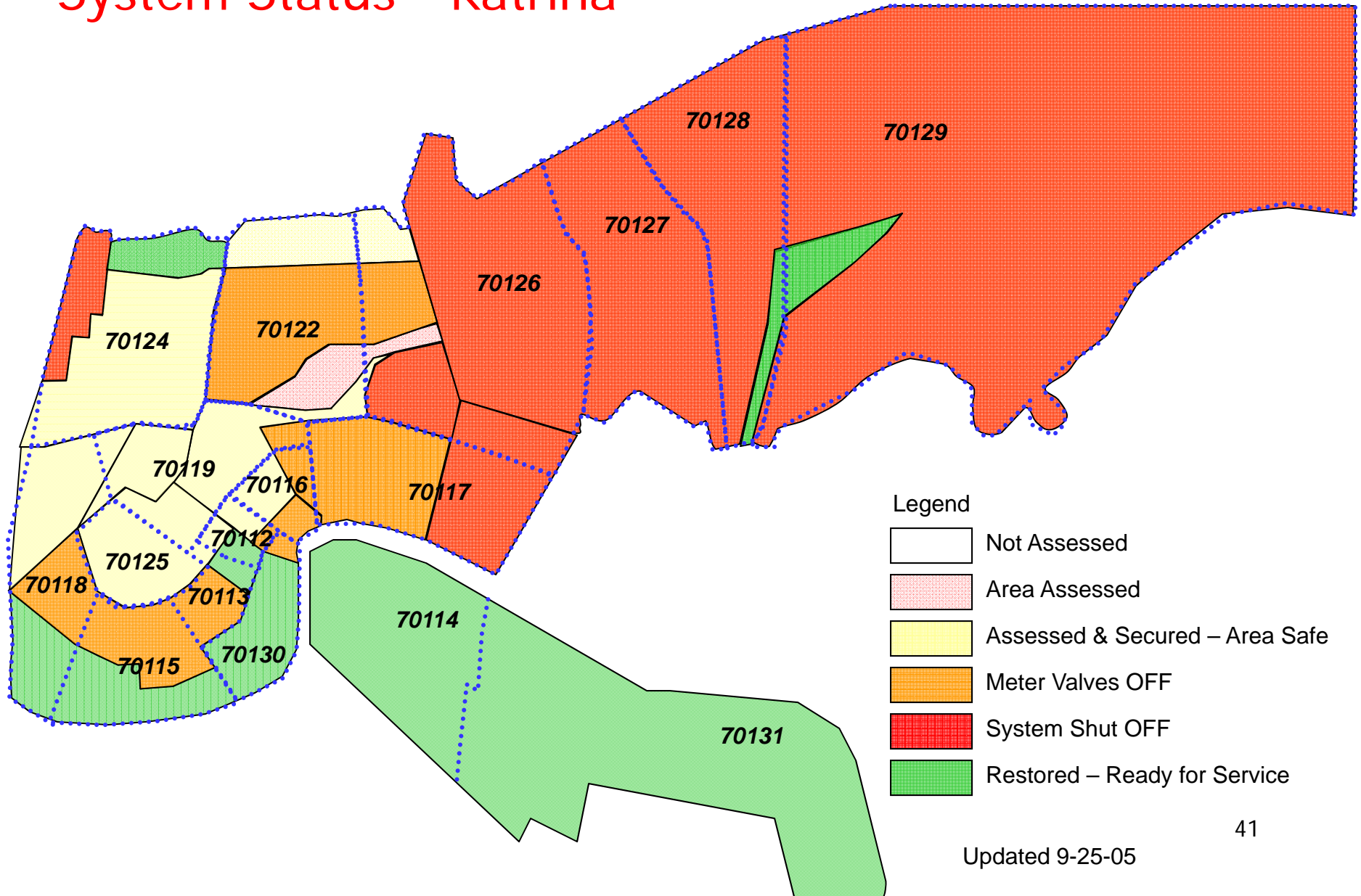


Areas Secured

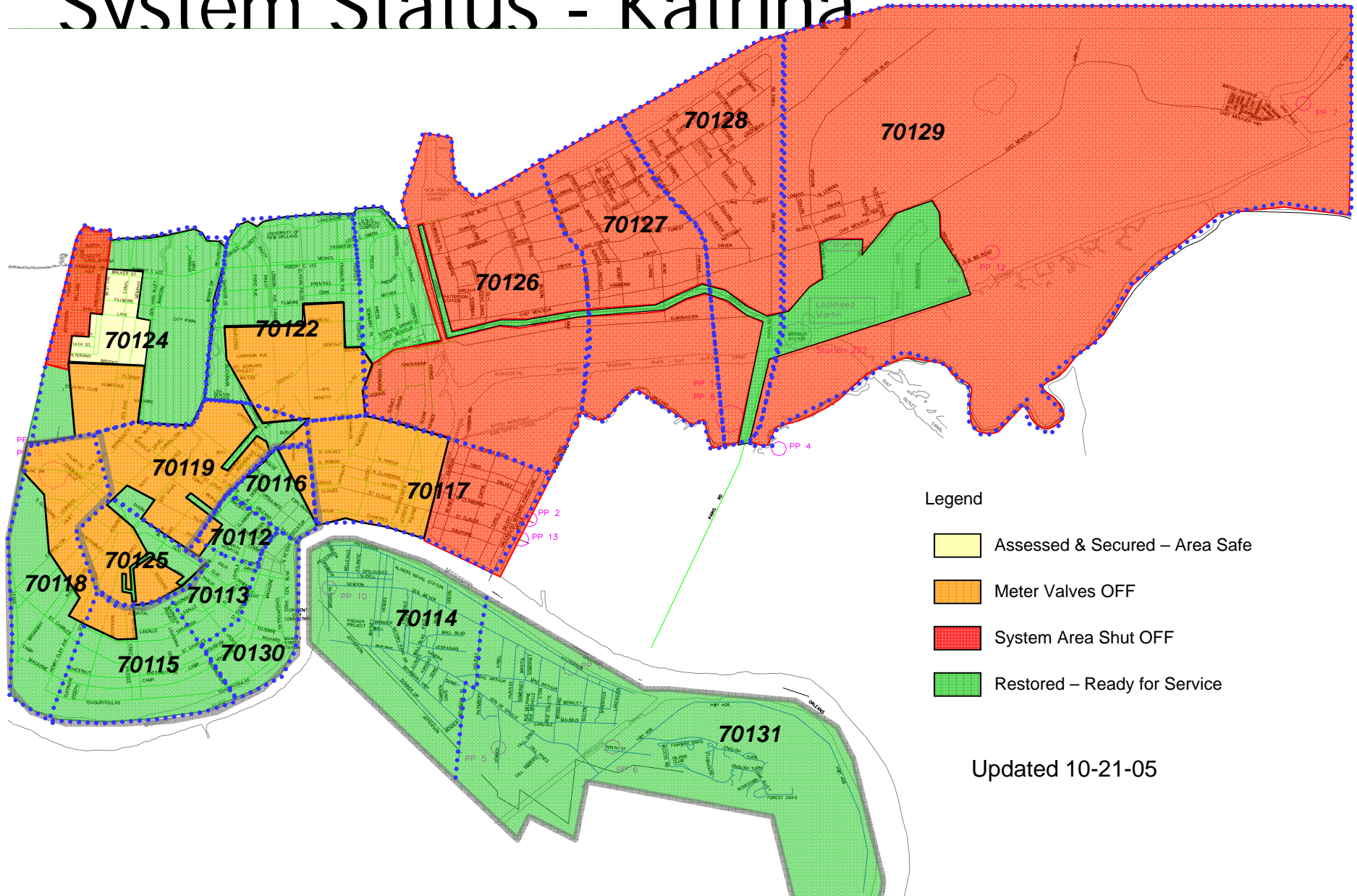
Updated 9-11-05



# New Orleans Gas Operations System Status - Katrina

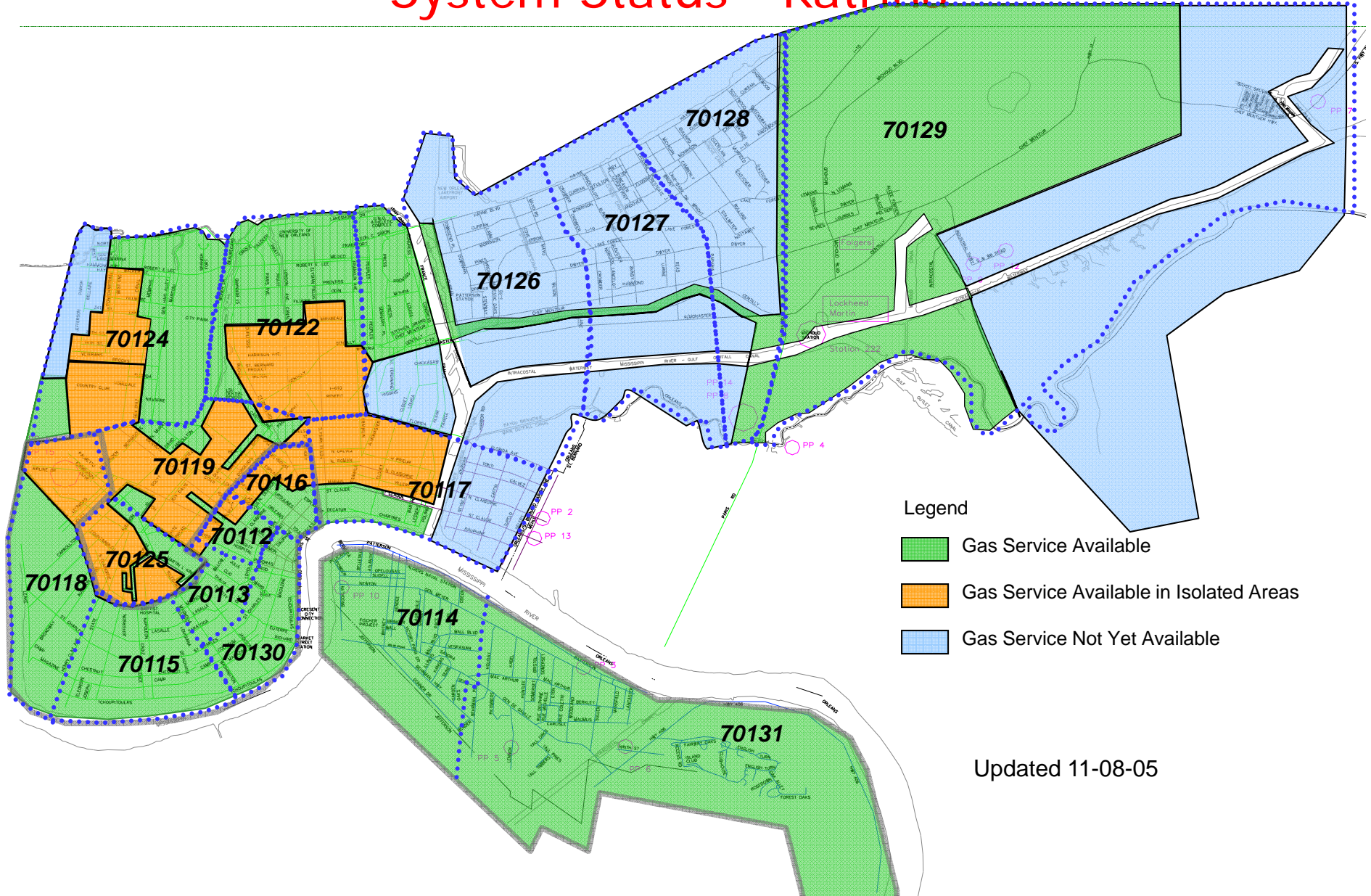


# New Orleans Gas Operations System Status - Katrina

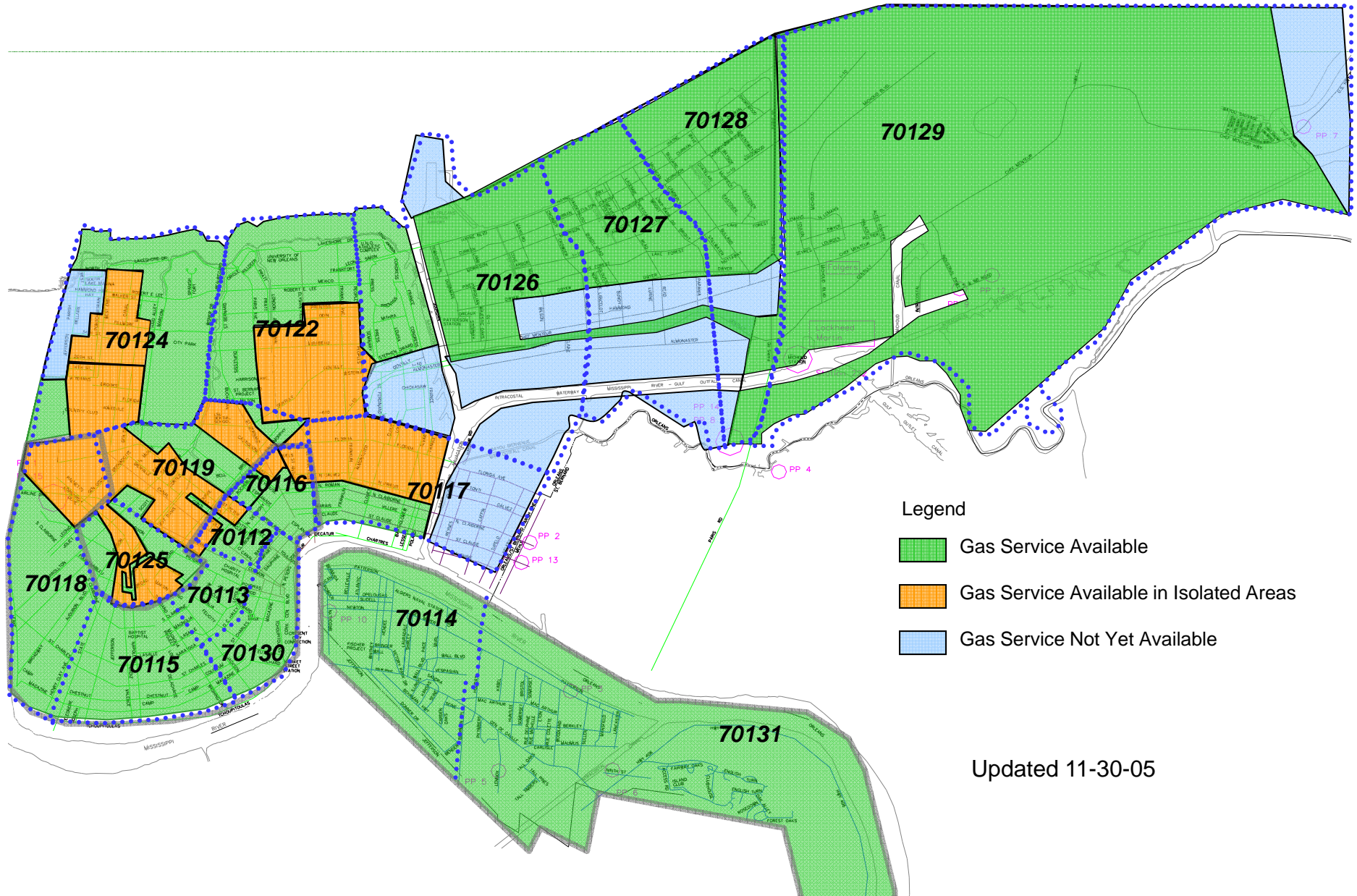




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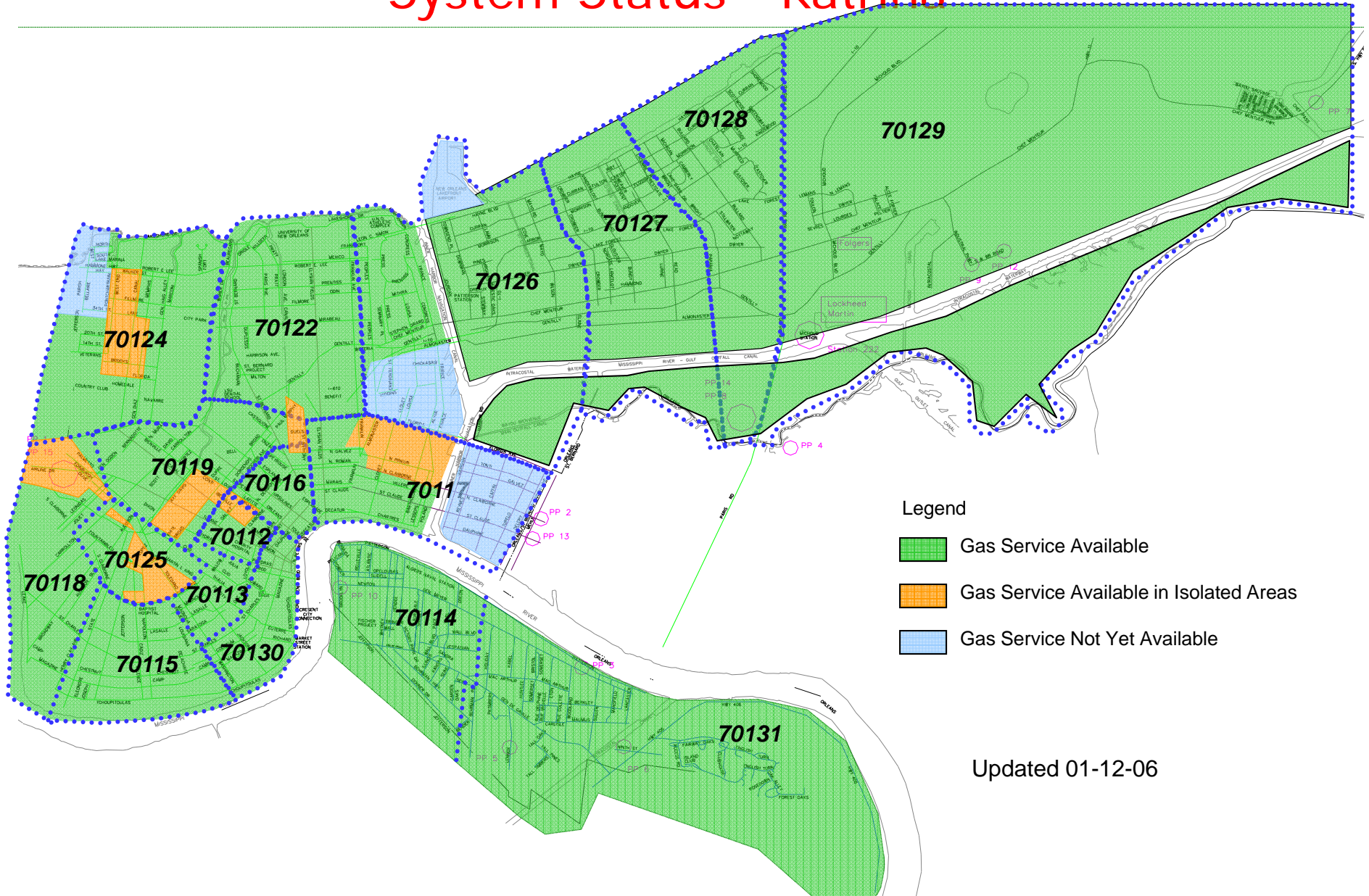


# New Orleans Gas System Status – Katrina








# New Orleans Gas Operations System Status - Katrina



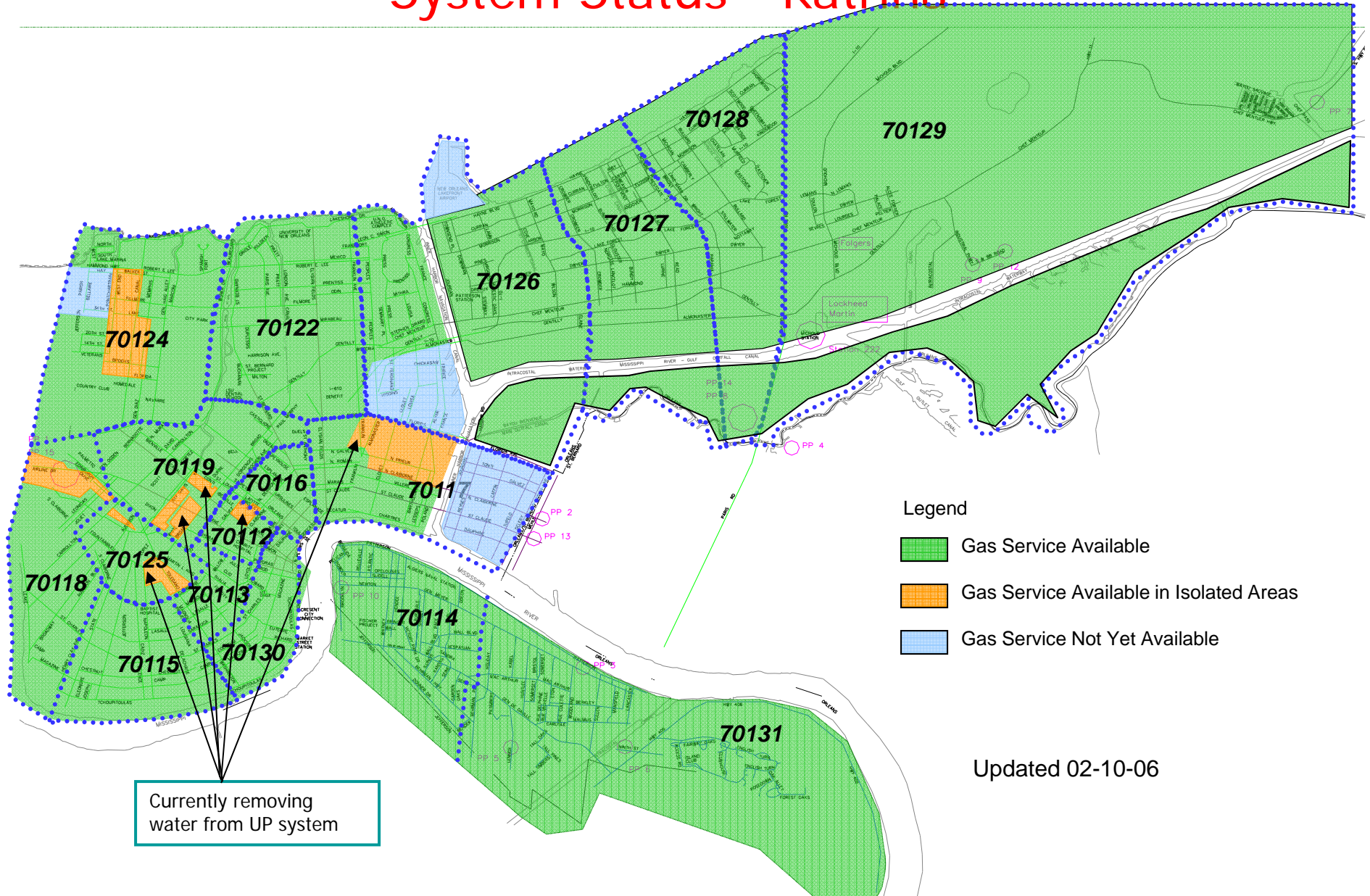
## Legend

-  Gas Service Available
-  Gas Service Available in Isolated Areas
-  Gas Service Not Yet Available

Updated 01-12-06

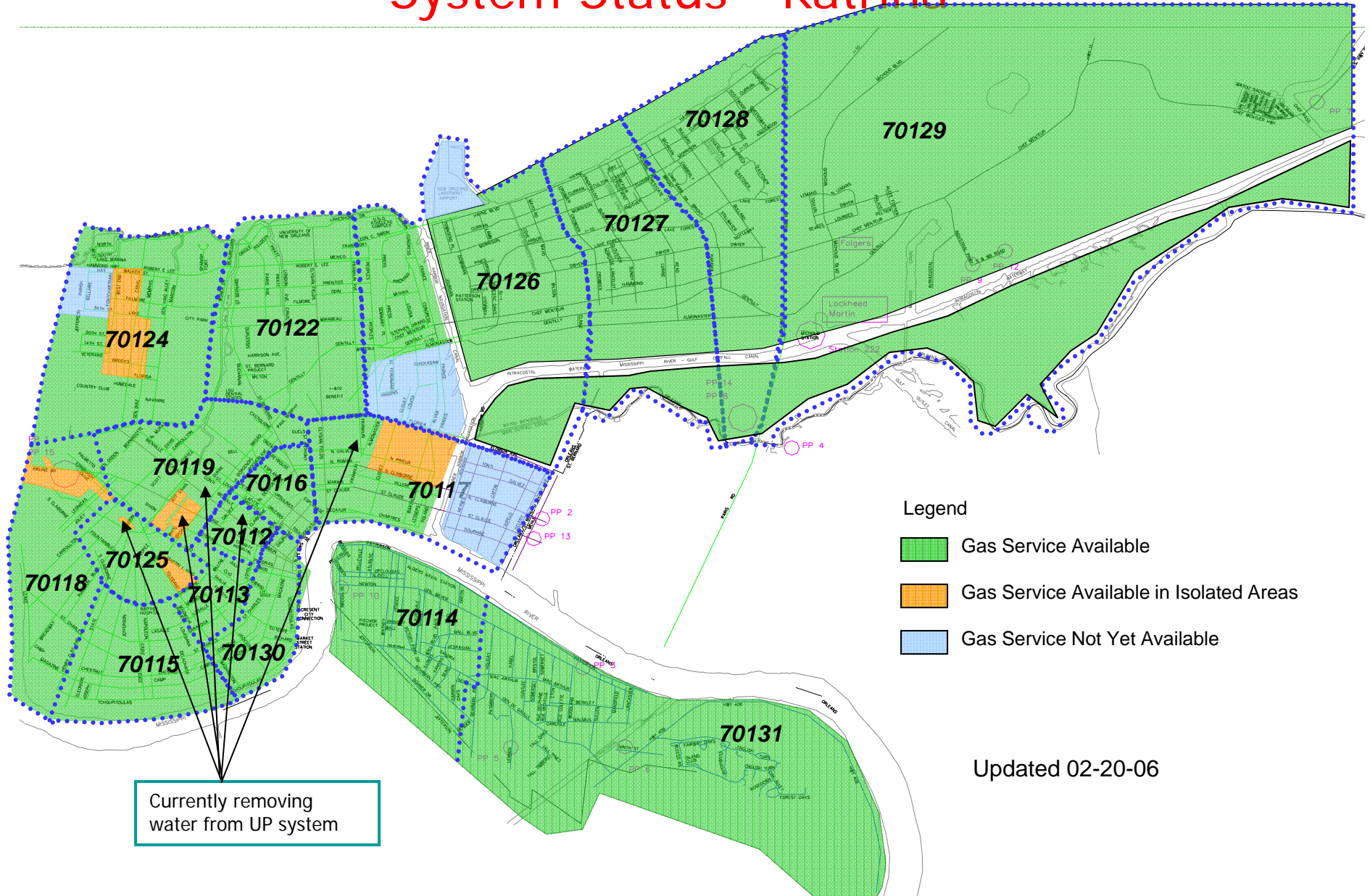


# New Orleans Gas Operations System Status - Katrina





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