

K plus 10; K minus 90 - Part 1 of 2

By: Charles W. Nelson, P.E.

August 29, 2015 marked the tenth anniversary of Hurricane Katrina, and the event received much well-deserved recognition, memorialization and discussion regarding the recovery of New Orleans and coastal Louisiana and Mississippi. What few people may know is that on September 29, 2015, we also commemorated the 100th anniversary of a hurricane similar in size, track and impact to Hurricane Katrina. That storm hit New Orleans from a similar direction, and with an intensity that was similar to the devastating Hurricane Katrina. The geographic, demographic, hydraulic and geologic circumstances of New Orleans in 1915 and New Orleans in 2005 and 2015 deserve attention, and are the focus of this article.

Concerning Hurricane Katrina, there are numerous reports from New Orleans' local media at the time of the storm that chronicled in detail the breaches of the flood protection system of levees and flood walls surrounding the city.

For the 1915 hurricane, which occurred before the routine of naming storms, somewhat similar reports are available from archives of the press at that time. A report by the General Superintendent of the Sewerage and Water Board of New Orleans at the time of the 1915 hurricane, Mr. George G. Earl, is very interesting and provides some insight into a compari-

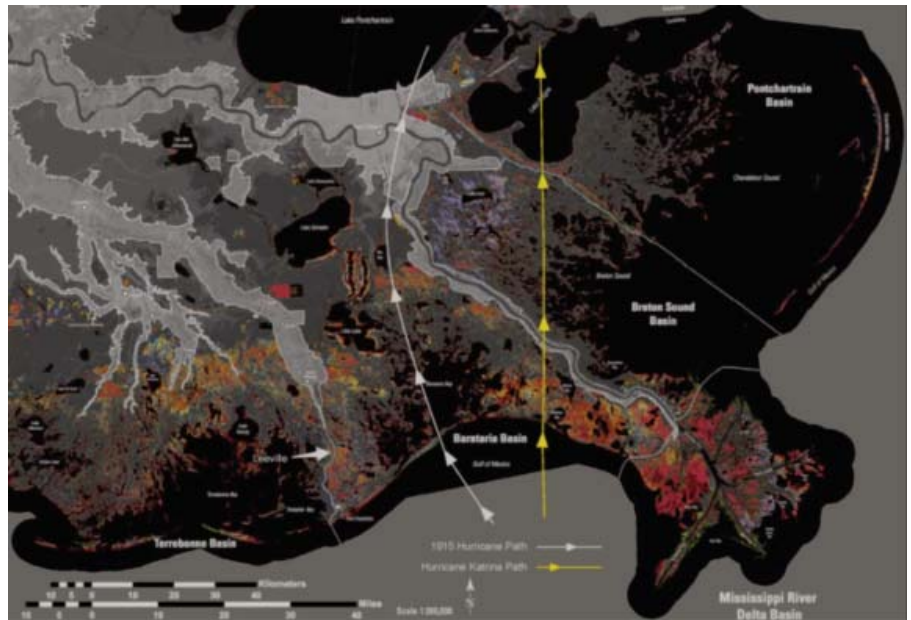


Figure 1 - Map of Hurricane Katrina and Hurricane of 1915 Paths


son of the two storms that occurred 90 years apart. This is especially interesting to current readers of a document produced by engineers primarily for an engineering audience.

The track of Hurricane Katrina (2005) and the hurricane of 1915 are shown superimposed on the same coastal area map shown in Figure 1. Also shown on the illustration is the land loss between New Orleans and the Gulf of Mexico, from Corps of Engineers data from 1932-2009.

Reports quantify the total land loss for coastal Louisiana at 1900 square miles. Much of this has occurred in the coastal zone now rec-

ognized as a major hurricane protection feature for New Orleans.

What immediately struck this author is that Mr. Earl reported in writing to his “President and Members, Sewerage and Water Board of New Orleans” on October 14, 1915, just two weeks after the storm that was the topic of his report. Although it is recalled that our company was able to re-open our St. Charles Avenue office six days after Katrina, it seems remarkable that Mr. Earl, in such an earlier time, with such simpler communications means (no cell phone, no e-mail, etc.) was able to accumulate the data and communicate to his board


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the city of New Orleans during Katrina, sustained winds were less than 100 mph, indicating lesser conditions than the 1915 storm.

During the 1915 event, the New Orleans drainage system depended upon seven electric motor-driven pump stations located approximately two miles north of the curving crescent of the Mississippi River. These had been recently put in service after a 1903-1915 construction period authorized in 1896. Several of these pumping stations were at low-lying points in the city's topography, in some writings referred to as the "back swamp" and nearer to the French Quarter, "back of town."

Mr. Earl's report documents the water

level as (See Figure 2):

Mr. Earl reported that the Lake Pontchartrain water level was approximately 2.7 feet above sea level, which can easily be expected during a hurricane approaching New Orleans from the east or south, when counter-clockwise rotating winds push a surge of water into the Lake.

The reason for Mr. Earl reporting pump station and Lake conditions at 10:50 on September 29th is that this was the point at which pumps at stations 1, 3, and 7 stopped operating, with those at station 6 stopping a few minutes later. Interestingly, he described the occurrence thus: "the pumps...went out of step." Such terminology suggests operators who had grown up in the days of horse-drawn transportation, and possibly the days of the steam age. In

Station Number	1	2	3	5	6	7
Suction Bay Water level (nominal mean sea level)	-5.8	-6.5	-6.3	-4.8	-8.7	-7.3

Figure 2

the evolution and impact of the events of the storm that he and the city of New Orleans survived.

Mr. Earl's report documents that the U.S. Weather Bureau reported sus-

level on the suction side of each of the six operating pump stations at 10:50 a.m. on the morning of the storm. He uses Cairo

any event, the cause for the system to go "out of step" was due to short circuits in the overhead transmission lines feeding each station from the central power plant located in a section of town known as "Carrollton," approximately 5 miles upriver from Canal Street, which marks the heart of downtown. Not only were the Sewerage and Water Board's power lines run overhead, there were also other utilities with lines running near them, all of which were affected by trees being blown over or limbs touching the lines. On the day of the storm, power to all pumping stations was shut down at about 5 p.m., the boilers were checked for operability, and the "Chief Engineer ordered the men to the basement for safety." At that time, Lake Pontchartrain's level was fluctuating between 3.7 and 4.9 ft above sea level, and the suction bay water levels at the pump stations were: (See Figure 3).

On the day following the storm, Sewerage and Water Board crews, along with Orleans Levee Board and city crews, began repairs to the damaged power system.

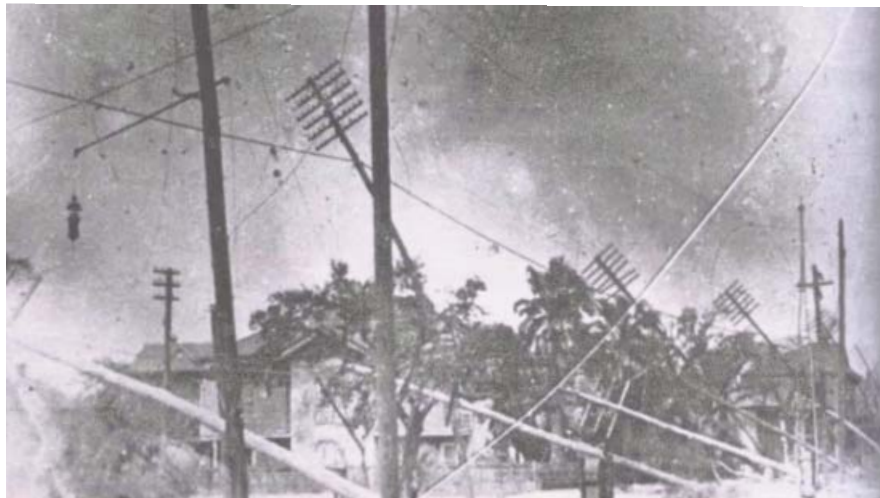
The report says, referring to Station 3,

Station Number	1	2	3	5	6	7
Suction Bay Water level (nominal sea level)	0.7	-0.3	0.3	-2.7	-0.1	-1.3

Figure 3

tained winds of 80 mph, gusting to 130, between 5:00 and 5:30 p.m. on the afternoon of the storm, with a lull in wind about 6:00 p.m. and a reversal of wind direction thereafter. Those of our readers who have been through a hurricane can identify with experiencing the "eye" of the storm. For Katrina, those choosing to stay, or left behind by circumstance, all experienced a similar growth in wind speed, then the moderation and reversal of the cyclonic movement of the storm. Records show, however, that within

Datum, which was the custom at the time, and this must have been "Old Cairo," since the re-calibration to "New Cairo" did not occur as an official benchmark until 1929. In any event, correcting to a more useful term for discussion here, an approximate layman's interpretation of the data shows the suction bay elevations relative to sea



Damage to Power Lines



Newspaper report of damage from 1915 hurricane. The estimated 500 deaths mentioned was later reported to be 280, with perhaps 12 of these being in the city proper. Several dozen lives were lost on Chef Menteur island, and a similar number on Lake Maurepaus.

which had been re-started at 12:30 p.m. that day, "current had to be taken off this line, however, at 3:12 p.m. in order to enable linemen to clear lines going to Stations No. 6 and 7 of the tangle of wires of the electric light, telephone and telegraph companies..." It goes on to say that by 7:20 p.m. power was restored to Stations 6 and 3, and "two large pumps were started at each of those stations."

Thus is recorded one of the serious deficiencies of the early drainage system - the delivery of power to the pumps during a storm, when that power is most needed. Interestingly, Mr. Earl addresses prior discussion of burying power lines running to the pumps: "We have often had the suggestion that underground cables would avoid line troubles of the character occasioned by this storm." After brief discussion, he refers to the prohibitive cost and anticipated difficulty of maintaining such a buried system as reasons for not supporting the idea. As experience was gained over time, such an underground system was indeed installed during the 1940s, and its reliability has been well proven in subsequent years, including during Hurricane Katrina in 2005.

Regarding the overall performance of the drainage pump system during the 1915 storm, Mr. Earl wrote:

"Not being responsible in any way

for the original adoption of the general system now in use, I can say, without hesitation, that I know of no other system that could have been adopted which would have given better service during the hurricane or remain in service longer or gotten back in service more promptly than the system here in use, and especially of none which can be more economically or satisfactorily operated."

Besides the performance of the pumping system and power system supporting it, Mr. Earl reported on the overflow of levees and the interruption of potable water delivery, which were also significant phenomena affecting the livability of New Orleans after such a storm. He reported "small overflows of various levees," including "three... in the locality of various pumping stations which were taken care of by Sewerage and Water Board contractors working in the neighborhood." He mentions that the Orleans Levee Board had recommended higher levees for their system, following a survey of some 45 miles of levees in that system. (It is not known if this was the total length of the system, or just the length surveyed). Reportedly, the lake level of 4.9 feet above nominal sea level was at or "slightly" above the crown of the levees, per Mr. Earl's report:

"On Thursday morning the lake level

still maintained its maximum elevation, and there were numerous points along the various navigation and drainage outfall canals and on the rear protection levees where lake water was entering the city in large amounts. The overflow from these sources, added to the average of about 7 1/4 inches of rainfall, was a most discouraging feature of this day's development, and added materially to the delay in getting parts of the city free of water."

Mr. Earl completes this section of his report endorsing the Orleans Levee Board plan to "looking toward more substantial and higher levees for the protection of the city against lake tides." He also stated the Sewerage and Water Board had plans to build (or modify already built?) pumping stations to operate with a maximum water elevation of 9.7 feet above nominal sea level on their discharge side.

Regarding potable water, which was and is a major responsibility of the Sewerage and Water Board of New Orleans, Mr. Earl's report included that "falling walls in several cases caused the breaking of water mains, or of large connections, or of fire hydrants...and the water consumption rate was more than doubled, resulting in a slight reduction of pressure in New Orleans, and for a short time a considerable reduction in Algiers." For those readers not familiar with New Orleans neighborhoods, Algiers is on the west bank of the Mississippi River, which is about 1900 ft wide and over 100ft deep at the location of the supply line from the Carrollton water plant, which is itself miles from Algiers. The engineering accomplishment of supplying fresh water to the "other side of the river" in the early 1900's should be looked into further. As a note, Mr. Earl stated the fortune of having only an 8 inch potable water line broken by a falling church steeple as being the largest break in the system. He noted "A break in a larger main, or in a main in a locality where prompt discovery and closure would have been far more difficult, could easily have occurred and might have given very serious trouble."

(For readers interested in the full 16 page report prepared by George Earl, it can be found on the internet.)

Our next issue of the Consultant will continue the comparison of the 1915 and 2005 storms.

October Rebuild - 2015



Robin Young and Bill Landry



NELSON New Orleans employees had another successful year assisting the New Orleans Preservation Resource Center with the October Rebuild project. The company has participated in this program for over 18 continuous years with the assistance of dedicated House Captains Bill Landry and Anthony Beard and many dedicated employees who volunteer each year. The Preservation Resource Center presented the Company with a commemorative Shotgun House Sculpture celebrating our 18 year participation.

5-10-15 Year Service Anniversaries - New Orleans and Houston Offices



New Orleans Office 15 Year Anniversaries
Robert Toca, Richie Melancon, John Robinson



Houston Office Service Anniversaries
l to r: Charlie Corr, 10 years, Robert Griffin (E&I Engineering Manager), Brian Chauvin, 15 years, Kent Davis (Mechanical & Process Engineering Manager) and Steve Carlson, 10 years.



New Orleans Office 10 Year Anniversaries
Back Row l to r: Mark Neeb, Ron Walker, Pam Dominique, Bill Holshouser, Michelle Jones, Ted Cybin, Front Row l to r; Kenny Hertz, Martin Patterson, Laurie Wood and Steve Mailhos



New Orleans Office 5 Year Anniversary
David Losch

2015 Recognition Dinner



35 Years
Steve Johns, David Stewart, Barry Wilson



30 Years
Rob Denman and Mary Dauzat



25 Years
l to r Ernie Orgeron, Randy Chatagnier, Tony Hoffman, Rene Delaune and Buddy Grinder



25 Years
Michael Daussin and Jim Lane



Ken Nelson presenting the recognition awards

SERVICE ANNIVERSARIES - 2015

Thank you to the following employees who have continued to offer their loyalty and talent to our company and clients. Your dedication allows NELSON to deliver the caliber of service to our clients for which we all strive. We congratulate you.

35 Years

Anthony E. Catalanotto
Stephen O. Johns
David R. Stewart
Barry L. Wilson

30 Years

Mary L. Dauzat
Robert D. Denman

25 Years

Robert D. Chandler
Randy P. Chatagnier
Michael T. Daussin
Rene F. Delaune
Irvin Grinder III
Anthony D. Hoffman
Edward O. Merchan
Ernest J. Orgeron, III
Barry J. Valence

15 Years

Anthony W. Beard
Brian D. Chauvin
Richie A. Melancon
John T. Robinson
Gloria J. Schultz
Robert P. Stoddard
Robert A. Toca

10 Years

Stephen W. Carlson
Charles C. Corr
Tadeusz Cybin
Pamela M. Dominique
Ross S. Harris
Kenneth B. Hertz
William H. Holshouser
Michael R. James
Michelle R. Jones
Richard G. Lawson

Steven P. Mailhos
Campbell C. Mcfarland
Kelly D. Miller
Mark R. Neeb
Martin W. Patterson
Wense Savala, Jr.
Son A. Truong
Ronald L. Walker
Elizabeth A. Wood
Laurel S. Wood

5 Years

Steven J. Besson
David R. Losch



Nelson New Orleans Employees participated in the 4th Annual Saints Kickoff Run presented by Chevron. Joining the “Who Dat Team” were l to r; Martin Patterson, Dave Wilkinson, Randall Biciste, Derrick Millet, Kara Hensley, Bill Landry, Tracey Gonzales, Holly Beaulieu, Melissa Logreco, Tonya Coleman, Kirk Boudreaux, Amber Boudreaux, Erin McCrossen, Michelle Jones, Leanne Geohegan, Michelle Maggiore, Kaitlin Tysinger, Megan Gohres, and Emily McCorkle



NELSON Houston Employees participated in the ConocoPhillips Warrior Sporting Clays Tournament. l to r; Kevin Houghton, Andy Morrison, Rene Boan and Robert Griffin