

THE STEPS HOBOKEN IS TAKING TO RESHAPE DEVELOPMENT AMIDST RISING SEA LEVELS.

Flooding in Hoboken is not a recent phenomenon. In this picture from 1920, two men row through the city during a major flood. Photo credit: Hoboken Historical Museum.



In this 1811 map of the Hudson County area, early Hoboken is surrounded by marshlands. Image credit: David Rumsey Collection.

THE CITY OF Hoboken has come a long way since its early days as an island outcrop atop a tidal marsh along the Hudson River. By the end of the 19th century, and after many cubic yards of fill, Hoboken transformed itself into an industrial center and a major transportation hub for people and goods. In recent decades, after a decline in industry, the city has enjoyed a second transformation, this time from a blue-collar, industrial port town to a posh residential outpost of New York City and nearby employment centers in New Jersey. Hoboken remains well connected to New York by extensive passenger ferry, commuter rail, light rail service and bus. Population and employment surged in the 2000s and “the mile square city” today is densely occupied with 52,034 residents and 17,707 jobs.

RETROFITTING HOBOKEN FOR A WATERY FUTURE

In addition to short commutes to New York City and Jersey City, Hoboken's appeal draws from its reputation as what Walk Score⁶ calls a "walker's paradise," where the average resident can reach 21 restaurants, bars and coffee shops within a five-minute walk of his or her home. However, there are some challenges to this dynamic location; much of the present-day city is built atop reclaimed tidal marshes and two-thirds lies within FEMA flood hazard zones. Flooding from Superstorm Sandy forced many residents from their homes, but floods from regular rainstorms are also common: In the year following Sandy, Hoboken experienced four flash floods.⁷ This vulnerability will be exacerbated further by rising sea levels.

While Hoboken's water infrastructure is not the primary cause of the flooding, it makes things worse every time there is a full moon, high tide or a big rainstorm, and sometimes in between. Major upgrades and redesigns to water infrastructure are currently under way. The following stories illustrate the many ways water affects those living and working in Hoboken:

When Flooding Becomes a Way of Life: How businesses, residents and the city are responding to frequent flood events.

New Parks Provide Multiple Benefits for the Price of One: How a parking lot is being transformed to absorb rainwater, provide green space and make neighborhoods more livable.



Water Service Interruptions Challenge Businesses

and Commuters: What happens when a growing city has a drinking water system that in part predates the presidency of Abraham Lincoln?

Green Buildings Ease the Stress on Water and Sewer

Systems: How one successful developer has found a sweet spot in meeting the market demand for sustainability.

The combined threat of rising sea levels and an aging water system has the potential to diminish quality of life in Hoboken. However, the public and private sectors are responding with creative solutions that should enable the city to live, and thrive, with water.

WHEN FLOODING BECOMES A WAY OF LIFE

HOW BUSINESSES, RESIDENTS AND THE CITY ARE RESPONDING TO FREQUENT FLOOD EVENTS.

“**WE NEVER KNEW** about the extent of those floods until we started to move our office into the basement,” recalls Tom Chartier about Hurricane Irene. “Only then did we see what happens with the sewers when the water has nowhere to go.” As head of the local Hoboken Quality of Life Coalition, Tom comes into contact with many people and stories. When Hurricane Irene hit, Tom had just begun the process of framing out his basement. Following the storm and the cleanup, he was able to finish the renovation. A year later, the flooding from Sandy forced Tom to rehabilitate his basement a

second time. But he was in a better situation than many of his neighbors. Tom made sure that his utilities were located above the basement. And, as a builder, he was able to make repairs and adjustments necessary to mitigate future floods, including installing a backflow preventer to prevent sewage backups and performing the regular maintenance needed to keep it operating at full capacity.

Flooding, as it turns out, exposes many quirks of the city’s water system. One family sustained only minor flooding during Sandy, taking 24 inches of water into its storage basement. But a few weeks after the floodwaters subsided, the same family suddenly found its basement filled with 27 inches of sewage. After \$50,000 in damages (and understandable frustration), workers discovered that the sewage backup was not the result of the public sewage collection system that runs under the streets, but rather a clog between a shared residential line that links two or more houses before entering the public system, likely installed prior to the advent of modern construction codes. To add insult to injury, according to this resident, on certain days when you’re outside, “you can smell the sewage.”

As Hoboken’s housing market has heated up and placed living space at a premium, many ground-level spaces that are in fact partly below grade have been converted



Hoboken’s topography lends itself to flooding. To the left, the New Jersey Palisades serve as a barrier along Hoboken’s western border, and the Hudson River waterfront is higher than the southwestern area of the city (circled), so water tends to pool there.

Image adapted by New Jersey Future from the New Jersey Office of Information Technology (NJGIT), Office of Geographic Information Systems (OGIS).



Like those of many of his neighbors, Tom Chartier's basement was hit hard by Hurricane Irene and Superstorm Sandy. While in Tom's case Hurricane Irene flooded an unfinished basement in the process of renovation (as seen in the picture), the subsequent repairs and renovations were almost completely washed away by Sandy. Photo credit: Tom Chartier.

into dwelling units. These “garden-level” apartments have the propensity to flood not just during a hurricane or superstorm, but also during a heavy rain or after a water main break. Repairs and rehabilitation can be costly, and insurance coverage is limited in basement spaces. It's no surprise that floods have started to change how people use their buildings, creating an incentive to limit basement and ground-floor spaces to uses such as storage, parking, minimally appointed lobbies, common areas and community rooms, that can withstand floodwaters without major damage.

The city is coordinating with government partners on a multi-pronged strategy to address these problems. City officials are contemplating amending the city's zoning and

building ordinances to make it easier for property owners to add a story on top of a building and then vacate the building's basement. The regional sewerage authority is installing flood pumps to relieve stormwater management issues in flood-prone areas. Federally-funded Sandy rebuilding efforts include a design competition, *Rebuild By Design*,⁸ that has proposed an ambitious four-part plan for Hoboken to “Resist, Delay, Store, and Discharge” water. As part of a cooperative effort between NJ Transit and the regional planning effort Together North Jersey, Hoboken has also developed a green-infrastructure strategic plan⁹ that, through the addition of more green space and permeable surfaces, will enable the city to capture more stormwater where it falls, before it flows into the city's sewer system.

NEW PARKS PROVIDE MULTIPLE BENEFITS FOR THE PRICE OF ONE

HOW A PARKING LOT IS BEING TRANSFORMED TO ABSORB RAINWATER, PROVIDE GREEN SPACE AND MAKE NEIGHBORHOODS MORE LIVABLE.



Southwest Park will be the city's first new park designed both to provide green space and to help mitigate flooding. According to the city's green-infrastructure strategy, such investments can capture 31.4 million gallons of stormwater per year.

TODAY, THE ONLY thing green about the parking lot on Jackson Street is a vinyl banner attached to the barbed wire fence announcing that the one-acre site will soon become the cornerstone of a planned six-acre park, designed to provide green space and mitigate flooding by absorbing a 10-year storm event, in one of the most flood-prone areas of Hoboken.

Local parent Zabrina Stoffel has been following this project with interest, attending the city's community workshops to provide input on the park design. She is one of Hoboken's many newcomers, a group that includes Millennials, families and Baby Boomers who have chosen to make the city their home. Zabrina wants what is best for her children and is unwilling to settle for lower standards simply because the city is old. She has been a vocal advocate for parks and open space that will not only provide recreational opportunities for her kids, but also reduce flooding. Like many of their neighbors in the wake of Superstorm Sandy, the Stoffels have experienced firsthand the problems associated with Hoboken's aging water infrastructure.

Zabrina's desire for a park that provides recreational green space and mitigates flooding were echoed by other participants at the first community workshop the City of Hoboken conducted, in December 2013. When asked to comment on pictures of potential park features, stakeholders expressed clear preferences for a green park, effective stormwater management, play areas and safe access. "It's interesting to me, people were not just talking about needing a playground for their kids, but instead were focused on buffers and water retention projects," says Zabrina, who also founded Project Play five years ago as part of an effort to replace old and dangerous playground equipment throughout Hoboken.



The city acquired this one-acre parking lot to turn into the first section of Southwest Park, which, when completed, will expand to six acres.

Participants in the park workshop were asked to post comments on an “inspiration board” about how they felt towards different amenities. The stormwater solution was well liked, while the athletic space received the comment “NO —impervious cover.”

Photo credits: City of Hoboken.



Zabrina does not believe that green infrastructure and recreation space must be mutually exclusive; she wants to make sure that recreation space can fit into any plans that the city has for green infrastructure.

To garner further input from residents, the city has posted for comment on its website four potential designs for the park --“Wetlands Woodlands Park,” “Playfield Park,” “Neighborhood Park” and “Market Plaza.”¹⁰”

While the final design for Southwest Park has yet to be selected, residents’ interest in flood mitigation matches the city’s plan to use the park as part of a larger effort to reduce the amount of rainwater entering the combined stormwater/wastewater system. The city’s Green

Infrastructure Strategic Plan evaluates the capacity of three potential parks, including Southwest Park, as well as several other techniques, to capture, store or treat a total of 31.4 million gallons of stormwater annually. According to City Assistant Business Administrator, Stephen Marks, “Green infrastructure is not a silver bullet, but it is part of a comprehensive solution.”

Construction of Southwest Park could begin as early as 2015.

WATER SERVICE INTERRUPTIONS CHALLENGE BUSINESSES AND COMMUTERS

WHAT HAPPENS WHEN A GROWING CITY HAS A DRINKING WATER SYSTEM THAT IN PART PREDATES THE PRESIDENCY OF ABRAHAM LINCOLN?

DISRUPTIONS TO THE water system create headaches for anyone who has been detoured because of a water main break, advised to boil water before using it or has taken a shower with less-than-full water pressure. But for those whose bottom line depends upon reliable water service, these service interruptions are more than just a headache. “Water is the main ingredient for everything,” says one Hoboken restaurateur. “Without it, we can’t open. It is necessary for us to make ice, cook food, serve fountain beverages and wash dishes.”

He represents just one of 278 restaurants, bars and coffee shops that Walk Score lists as being located in Hoboken, meaning that a water service interruption to his restaurant is also likely to force the closure of others nearby. In some cases, the location and severity of a water main break may be enough to prevent customers or employees from even reaching a restaurant.

Interruption of water service is also a major concern for the fire department. Hoboken is one of the most densely populated cities in the United States. Most of its building stock dates from the early 20th century through World War II and doesn’t include the most up-to-date fire suppression systems available, making them more dependent on the city’s ability to respond effectively to a fire.

Like the drinking water pipes in many New Jersey cities, Hoboken’s are old, and the records of the specific age, or condition, of all the pipes in the 41-mile system are incomplete. But United Water, which operates and



When crews repair water mains in Hoboken they record the manufacture date imprinted on the pipe and add that to their database. In addition to 1897, the dates 1857 and 1869 have been recorded. Photo credit: United Water.

maintains the system under contract to the city, updates its database whenever repairs uncover pipes with dates stamped on them. As part of the 2011 Hoboken Southwest Redevelopment Study, consultants noted that some of the pipes in that area date from 1857, 1869 and 1897, meaning that they could be anywhere from 117 to 157 years old.

Ironically, Hoboken’s revitalization has contributed to at least some of its recent water main breaks. A tangled maze of aging underground utilities, of which water is only one component, combined with the recent construction boom, has led to incidents where



Water main breaks force the closure of roads both during (top) and after (left) the event. The stresses on a water main from a service interruption and restoration are enough to trigger additional breaks along the line.

Photo credits: United Water.

contractors have inadvertently ruptured water main lines. These “strikes,” as they are called, cause a ripple effect on the surrounding system. Pipes that were already stressed as a result of their advanced age and deteriorating condition are pushed even further when the water is shut off to fix the affected line; the pressure changes resulting from the service interruption can be enough to cause additional main breaks.

It is not surprising, then, that since 2000 Hoboken has experienced an average of 20 water main breaks per year, according to United Water, the city’s water distributor. In 2013, the number reached 30, or 0.73 breaks per mile, up from an average of .49 breaks per mile per year. Representatives from United Water suggest this spike was the result of back-to-back main strikes in April and May that triggered a series of related breaks.

United Water views pipe age as the largest contributing factor to water main breaks in Hoboken. Under its current contract with the city, United Water invests \$350,000 per year in general maintenance, including annual cleaning and lining of pipes. However, the company is questioning the cost-effectiveness of the latter compared to replacement with new pipes, especially for smaller lines. Pipe replacement and other capital improvements are the responsibility of the city.

Hoboken’s Assistant Business Administrator, Stephen Marks understands that new residents, many of whom were raised in areas where the water infrastructure is newer and needs less intensive maintenance, bring with them raised expectations about reliability and dependability. These expectations are putting increased pressure on the city to upgrade the performance of an aging system.

GREEN BUILDINGS EASE THE STRESS ON WATER AND SEWER SYSTEMS

HOW ONE SUCCESSFUL DEVELOPER
HAS FOUND A SWEET SPOT IN MEETING
THE MARKET DEMAND FOR
SUSTAINABILITY.

*Matt Testa, construction director
for Bijou Properties, believes
that the company's tenants are
receptive to the sustainable
lifestyle its buildings offer,
which translates into lower
turnover and exceptional
care for the buildings.*

Photo credit: Bijou Properties.



The green roof atop the Garden Street Residences serves to reduce the amount of rainwater that would enter the city's combined sewer system while providing a valuable amenity for residents. Photo credit: Bijou Properties.

“**YOU START WITH** the fixtures,” says Matt Testa, construction director for Bijou Properties as he introduces his company’s portfolio. Matt is referring to the U.S. Green Building Council’s LEED green building program for the design, construction, maintenance and operations of high-performance green buildings,¹¹ in which water conservation guidelines require water-conserving fixtures to be installed before any “points” are awarded in that category. Less water used by a sink, shower or toilet means less water needed per person from the city’s water mains, and less water flowing into the city’s combined sewer system, reducing combined sewer overflows, flooding and backups.



Matt showcases the company’s efforts with a visit to the Garden Street Residences, a retrofit of a factory building once used to process coconuts for Almond Joy and Mounds candy bars. Redeveloped into 30 residences, the Garden Street Residences building incorporates enough green features to have earned LEED Gold certification. Interior water fixtures reduce water use by 23 percent compared to regular fixtures, and the building has a 6,000-sq.-ft. green roof that detains about 68,500 gallons of rainfall annually from entering the city’s sewer system while also lowering energy costs for residents. The building has been well received by customers:

Above left: Bijou’s Garden Street Residences earned LEED Gold certification from the U.S. Green Building Council’s green building program, both because residents use 23 percent less water due to low-flow fixtures and because the building’s green roof captures 68,500 gallons of stormwater to sustain plant life. Photo credit: Bijou Properties.

Despite the fact that it opened during the 2009 real estate slowdown, all 30 units were sold by 2013.

This property is just one of Bijou Properties’ growing portfolio. Three existing buildings pack in innovative features to ensure a low impact on the environment, and two more buildings are under construction. With the exception of Bijou’s first property, named the Hostess Building because it had previously been a Hostess cupcake factory, all of his buildings have received high ratings from LEED.¹²

The North Hudson Sewerage Authority requires larger-scale development projects in Hoboken to incorporate stormwater-detention capabilities as a condition of approval to connect to the system. As a result, Bijou’s projects also include underground stormwater holding tanks that collect up to one inch of rainwater at a time and release it slowly into the combined sewer system after the threat of overflows has passed.

But Bijou’s efforts do not stop at water conservation and detention. For its projects to attain a LEED rating at the Gold or Platinum level, they must incorporate many sustainable elements, such as space-saving (and air quality-improving) automated parking garages, natural and reclaimed building materials, enhanced indoor air-infiltration systems, on-site power generation plants, and renewable energy systems. Other amenities go beyond the buildings themselves: There is a weekly farmer’s market in Bijou’s Garden Street Mews; Bijou’s upcoming 900 Monroe project will have access to the adjacent light rail station and a nearby Zipcar rental.

While LEED-certified buildings may cost more to construct, Bijou’s portfolio showcases a successful business model that taps into market demand for a healthy, environmentally friendly way of life. Residents are using their wallets to show appreciation for the steps taken to ensure a safe and healthy living setting. For Hoboken, not only do more residents mean more customers to patronize local businesses, but these residents are trying to be easier on the environment by reducing their impacts on air, energy and of course the city’s aging and fickle water infrastructure.

Above right: Water fixtures in this building not only reduce the amount of water used but produce corresponding reductions in sewage flows. Photo credit: Bijou Properties.

Notes

CAMDEN

- 1 Whitman, Walt. *Leaves of Grass*. 1900.
- 2 Camden SMART. "Camden SMART 2014 Trailer." YouTube video, 2:09. Posted by "Camden Smart," January 29, 2014. <https://www.youtube.com/watch?v=rULgne7stg4>
- 3 DeNardo, Mike. "Admiral Wilson Boulevard Floods Despite Costly Drainage Project." KYW Newsradio 1060, April 19, 2011. Accessed April 9, 2014. <http://philadelphia.cbslocal.com/2011/04/19/admiral-wilson-boulevard-floods-despite-costly-drainage-project/>
- 4 Delaware Valley Regional Planning Commission. *US 30 Corridor Study: Camden County, New Jersey*. Delaware Valley Regional Planning Commission, July 2002. Accessed April 9, 2014. <http://www.dvrpc.org/reports/02028.pdf>
- 5 The terms infiltration and inflow refer to the unintended entry of water into a sanitary sewer line through defects in the line, and can come from rainwater that is absorbed into the soil either from above or from the water table below.

HOBOKEN

- 6 Walk Score ranks neighborhoods and municipalities on a scale of 0-100 depending upon as-the-crow-flies proximity to everyday amenities such as restaurants, grocery stores, schools and parks. Hoboken's Walk Score is 95, which puts it at the top of Walk Score's list for small cities (population 50,000-100,000). The average Walk Score of New Jersey's 61 largest municipalities is 59.
- 7 OMA, Royal HaskoningDHV, Balmori Associates and HR&A Advisors. "Resist, Delay, Store, Discharge: A Comprehensive Strategy for Hoboken." Plan presented at the Hoboken City Council Meeting as part of the Rebuild By Design initiative, March 5, 2014.
- 8 Rebuild by Design. "Resist, Delay, Store, Discharge: a comprehensive strategy for Hoboken." Accessed April 16, 2014. <http://www.rebuildbydesign.org/project/comprehensive-strategy/>
- 9 Together North Jersey. "Hoboken Green Infrastructure Strategic Plan." Accessed April 16, 2014. http://togethernorthjersey.com/wp-content/uploads/2014/04/20140404_Hoboken-Report_sm.pdf
- 10 City of Hoboken. "Southwest Park Design Concepts." Accessed April 16, 2014. <http://www.hobokennj.org/content/wp-content/uploads/2013/10/SW-Park-4-Design->
- 11 LEED (Leadership in Energy and Environmental Design) Certification is the U.S. Green Building Council's audit-based system that awards points to green buildings based on the number of sustainable actions taken. Certifications start with Basic and move up through Silver, Gold and Platinum.
- 12 The Hostess Building is not without its share of environment-sustaining features: It boasts a 20,000-sq.-ft. green roof, the first of its kind in Hoboken. [Concepts.pdf](#)

JERSEY CITY

- 13 Hackensack Riverkeeper. "The Truth About CSOs." YouTube video, 7:26. Posted by "Hackensack Riverkeeper," November 26, 2013. <https://www.youtube.com/watch?v=wBY3idYRkbw>
- 14 ioby. "About ioby." Accessed April 8, 2014. <http://www.ioby.org/about>.

PASSAIC

- 15 Williams, William Carlos. *In the American Grain*. 1925. Reprint, New York: New Directions, 2009.
- 16 Beale, David T., Karin Platt, Robert B. Nicholas, John P. Leidy, and John Kolesar, Director. *Pollution Control on the Passaic River*. Princeton, New Jersey: Center for the Analysis of Public Issues, 1972.
- 17 National Park Service. "Lowell National Historic Park (1978-2008): 30 Years of Preservation and Innovation for Future Generations." Accessed April 11, 2014. http://www.nps.gov/lowe/parkmgmt/upload/NPS_30th%20-%20small.pdf. Similar to Paterson, Lowell was developed in the early 19th century as a planned industrial community for the production of textiles. Following a decline similar to Paterson's, parts of Lowell were declared a National Historic Park in 1978, becoming the nation's first urban national park. However, success did not happen overnight; the restoration and revitalization of Lowell has continued to the present. Thirty years later, in 2008, 3,850,000 square feet or 77 percent of the historic mills have been rehabilitated, attracting nearly 700,000 visitors annually
- 18 Hamilton Partnership for Paterson. "Mill Mile –Paterson Great Falls National Park." YouTube video, 1:35. Posted by "HamiltonPartnership," April 23, 2013. https://www.youtube.com/watch?v=owlZ_L1R-bE
- 19 Passaic Valley Water Commission. "2012 Water Quality Report." Accessed April 8, 2014. http://www.pvwc.com/water%20quality/PVWC_1605002_2013CCR_2012WQReport.pdf
- 20 The PVWC Consumer Confidence Report reads: "Lead: Passaic Valley Water Commission PWS ID NJ1605002 exceeded the lead action level during the July 1 - December 31, 2012, monitoring period. Customers were notified about this in the lead brochure that was mailed out in December 2012. Additional information is provided elsewhere in this report regarding steps you can take to reduce your exposure to lead in drinking water and how to obtain additional copies of this report and a copy of the lead brochure."
- 21 The PVWC Consumer Confidence Report details action being taken: "PVWC is moving forward with design and construction of satellite corrosion control treatment systems to reduce the potential of lead dissolving into the water. These treatment systems are being phased in as part of the reservoir improvement project where each phase will provide treatment to specific areas of the distribution system. Once the reservoir improvement project

is completed and the uncovered finished water reservoirs are replaced by covered storage tanks, the entire service area will receive corrosion control treatment. In addition, PVWC continues implementing a multi-faceted lead public awareness and education program.”

22 According to the USGS Stream Gauge in Little Falls, N.J. (immediately upstream of Paterson), of the 25 largest recorded floods in the past century, 11 occurred in the past 25 years, with nine being considered major floods (at least two feet over flood stage), and two being considered moderate floods (at least one foot over flood stage).

23 Malinconico, Joe. “Paterson ready to approve 11 buyouts on city’s north side.” Paterson Press, May 27, 2013. Accessed April 9, 2014. <http://www.northjersey.com/news/paterson-ready-to-approve-11-flood-buyouts-on-city-s-north-side-1.565713>

24 Passaic County Department of Planning and Economic Development, with assistance from Parsons Brinckerhoff. “Moving Passaic County: Transportation Element of the Passaic County Master Plan.” Accessed April 16, 2014. <http://www.passaiccountynj.org/DocumentCenter/View/126>

ABOUT NEW JERSEY FUTURE



Founded in 1987, New Jersey Future is an independent not-for-profit organization, working for better development and quality growth in the Garden State. New Jersey Future focuses on promoting smart growth and advancing implementation of the State Development and Redevelopment Plan by conducting research and analysis on key issues, building consensus for broad solutions, hosting events to educate and inform, and implementing plans on the local level to build stronger, more resilient communities.

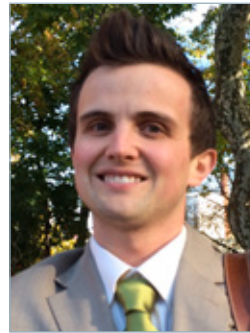
ABOUT THE AUTHORS



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Chris Sturm directs New Jersey Future's policy development and advocacy across a host of issues including state and regional planning, sustainable infrastructure, and incentives for compact, equitable development.

She spearheaded the adoption of legislation authorizing better cluster development tools, and is frequently quoted in the media. Chris serves as a trustee for the Council on Affordable Housing and the Environment, and is a member of the Clean Water Council of New Jersey and the New Jersey Climate Adaptation Alliance. Her career experience includes serving as the assistant director of the Capital City Redevelopment Corporation, as well as working for the MSM Regional Council (now PlanSmart NJ), the Eagleton Institute, and the Office of State Planning. She holds a master's degree in public affairs from the Woodrow Wilson School at Princeton University, where she concentrated in urban and regional planning.



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Nick focuses on policy and planning initiatives ranging from research to on-the-ground implementation, focusing on issues including water and natural resources, sustainable infrastructure and ways to develop compact, livable communities.

Prior to joining New Jersey Future, he served as the community and natural resource planner for Pike County, Pennsylvania, where he monitored implementation of the county open space plan, provided planning assistance to local municipalities, coordinated the county's shale gas task force and communicated with print and televised media on planning projects. Recently Nick was selected to participate as a member of the Environmental Leadership Program's Eastern Regional Fellowship Class of 2014.