

Water Crisis In Flint Michigan – A Case Study

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ABSTRACT

This case study is designed to provide detailed information about the water crisis in Flint, Michigan brought on by a series of decisions that could have been researched better prior to enactment. The results were catastrophic to the citizens that public officials were sworn to protect. This case study will provide university classes with information to use while analyzing the causes and decisions that lead to the Flint Water Crisis. This study is not designed to provide all information, but to supplement class research in order to determine what happened and what should have happened. Available research offers numerous issues and plenty of blame, but no definitive answers.

Keywords: Water; Flint Michigan; Lead Contamination; Case Study; Economic Impact; Water Crisis

INTRODUCTION

This case study on the water crisis in Flint Michigan is designed for graduate and undergraduate courses in strategy, management, finance, and can be used in other disciplines. The case covers a wide range of issues that can be analyzed and updated in a classroom setting. The case is ongoing and will provide new information for years.

It is generally accepted that in the United States of America, no one should have to worry about the quality of water that they drink. However, more and more, this is not the case and it is becoming alarming in many communities. In the case of Camden Ohio, residents enjoyed low cost and excellent quality in their drinking water until a company piled road salt too close to the wells that supplied the village. When residents awoke to dark smelly water, everything changed. People do not realize how much water is a part of their everyday life until access is denied or removed. This issue was a problem for a village of approximately 22,000 citizens that presented the citizens of Camden with few options and none of them cheap (Forrer, Mannix, Zimmerman, 2013). A problem for a village is a disaster for a city of approximately 102,000 citizens like Flint, Michigan. This case study is about the water issues faced by Flint and the problems involved while attempting to correct the situation. As noted earlier, water issues are facing numerous municipalities and the answers to future issues may lie with continuous analysis of the Flint, Michigan Water Crisis.

Water is an essential part of a person's life and a much needed resource. A water system is a system that consists of hydrologic and hydraulic components that provide a water supply to a populated area. Water is taken from a raw water source, which includes lakes and rivers, then is sent through a water purification system which is regulated by the Environmental Protection Agency (EPA). Since the water systems are regulated, or supposed to be, there is no reason for a water crisis such as the one that affected Flint.

Flint Michigan is a city nestled along the Flint River approximately 60 miles northwest of Detroit. The city is comprised of neighborhoods grouped around its four cardinal sides. The north and portions of the south sectors of the city are mainly African American. A significant part of the low-income south sector of Flint was from southern states that moved to Michigan for jobs. The east side is the most prosperous area and is the location of the cultural center,

Mott Estate Community College, and the trendy east village. The sector referred to as “State Streets” is a low-income rental area located on the east side. The west sector includes the historic Woodcroft neighborhood and is mostly home to engineers and automotive executives (Flint, MI., Nd).

According to Sanburn (2016a), the city of Flint Michigan purchased water from Detroit for more than half a century. However, that changed when the Detroit city council voted to move their source of water to the Flint River in April of 2014. According to Carmody (2016) the water crisis in Flint begins with the pollution of the Flint River. Flint has been plagued with economic problems, political issues and a long record of environmental disasters caused by the automobile industry, chemicals, coal, and agriculture for over a century. Consequently, the Flint River is eight times higher in chlorine than Detroit’s water and Flint’s aging infrastructure made it risky to assume safe water could be transported to residents. The case study outlines decisions resulting in quantities of lead leaking into the new drinking source selected by the council. Additionally, chlorine in the river caused corrosion and a chemical reaction that contaminated drinking water utilized by homes and businesses. Decisions discussed speculated that not treating the aging water pipes allowed chemicals such as orthophosphate and resulted in a change the odor, color, and taste in the water serving Flint (Sanburn, 2016b). A brief analysis of events provides enough information for academia to continue examination of this very serious event.

Timeline and Literature

It is virtually impossible to list everything that happened leading to the Flint Water Crisis or predict future actions. This case will be ongoing for years before a reasonable conclusion is made on what happened and who is to blame. Because of this crisis, legal and health issues will be a way of life in Flint for years to come. Unfortunately, this scenario will be played out in other communities as water becomes more scarce and expensive. The following chart depicts a version of the timeline for the crisis in Flint. This timeline is as inclusive as possible, but the case covers so many aspects of management that it is impossible to list everything that happened in this crisis. This case study presents challenges for several fields of study to continue this research.

Table 1 is an overview of the timeline for the Flint Water Crisis. As depicted in the timeline, this case study is centered on the successes and failures of the decision-making processes. Several decisions made by government officials contributed to the problems experienced by Flint. Prior to the crisis, financial issues led to the Governor of Michigan appointing an emergency manager to lead Flint out of a fiscal deficit that was created by past decisions.

To help Flint through the crisis, the State of Michigan assigned Darnell Earley as the new emergency manager when the current manager, Michael Brown, resigned. The charge of the emergency manager was to reduce expense and increase revenues to bring the city back to financial solvency. In April 2013, the utility department was one area that the emergency manager felt could make an immediate difference. The initial decision to move from water provided by Detroit Water and Sewer Department (DWSD) to a new water authority Karegnondi Water Authority (KWA) in April of 2014 became the beginning of several issues for the citizens of Flint Michigan. KWA was originally formed in 2010 to provide water from a cheaper source of Lake Huron, but the Flint River was selected by the City of Flint instead. This was a major change as the city successfully received water from the Detroit River and treated by DWSD for years (Adams, 2014). It was determined by the new manager that the DWSD option was too expensive and the Flint River was a closer source.

There are regulations that must be followed in order to provide a water supply to a populated area. The EPA or United States Environmental Protection Agency supervises and sets the national drinking water standards for each water system that is used in the United States. (Pennington, 2017). This a federal regulated system. Underneath the EPA are state standards that must follow the EPA’s rules and guidelines. Cities and counties also follow the EPA guidelines as they add rules and standards. Each agency can add rules and guidelines to make sure their communities are protected to the fullest.

The Safe Drinking Water Act (SDWA) is federally mandated and state implemented to ensure that there are specific standards for water treatment. This procedure protects the underground water sources along with the surface waters to make sure that water systems meet the requirements of the EPA. When it is determined that water system violates regulations, the EPA notifies the state and the water system management, provides advice and assistance to make sure compliance is reestablished. Non-compliance can result in a civil lawsuit initiated in order to regain the compliance (Chrysler, 2016).

Table 1. Timeline for the Flint Water Crisis. Created by authors.

Timeline Dates	Timeline for the Flint Water Crisis
	Flint receives water from Detroit Water & Sewage (DWSD)
2010	Karegnondi Water Authority (KWA) forms to provide affordable water
July 2011	Rowe Engineering report indicates that water is cheaper and safer from the Lake Huron
November 2011	Michigan Governor Snyder appoints Michael Brown as Emergency Manager in Flint
May 2012	Ed Kurtz appointed as Emergency Manager for Flint
March 2013	Dan Wyant, DEQ Director, warns Andy Dillion, Treasurer, of potential elevated levels of Trihalomethanes (THM in Flint River
March 2013	Flint City Council votes (7-1) to purchase water from KWA
April 2013	Detroit terminates agreement to provide water to Flint effective in one year.
June 2013	Emergency Manager Ed Kurtz decides to use Flint River
November 2013	Darnell Earley assigned as Emergency Manager
April 2014	Water Treatment Supervisor Mike Glasgow sends email to DEQ warning Flint is not ready to switch.
April 2014	KWA switched water source from Detroit River to Flint River.
August/Sep 2014	Boil water notices issued by City of Flint
October 2014	Flint residents begin to complain. GM finds rust & corrosion.
January 2015	Excess Trihalomethanes (THM) detected in Flint Water
February 2015	Michigan Governor approves \$2 Million and Miguel del Toral warns of possible Lead issues.
June 2015	Miguel del Toral noted that the lack of corrosion control created a public health hazard
August 2015	Report from Virginia Tech reports elevated lead in water. Report from Hurley Medical Center reports elevated lead in children
September 2015	Flint releases health advisory
October 2015	County Commissioners declare health emergency
October 2015	Flint disconnects from the Flint River and reconnects to the Detroit River
December 2015	Mayor declares State of Emergency
December 2015	Communications Manager Brad Wurfel & DEQ Director Dan Wyant Resign
January 2016	National Guard activated
January 2016	President declares State of Emergency
February 2016	\$30 Million is allocated by the Michigan Legislature for Flint Water Bills
March 2016	The Flint Water Advisory Task Force Report is released placing blame on several agencies.
March 2016	Congressional Committee on Oversight & Governments Reform begins hearings
April 2016	Detroit Water & Sewer Dept. (DWSD) terminated their service agreement with KWA
April 2016	Michigan AG announces charges against one Flint WTP employee and two DEQ employees.
May 2016	Michigan AG files civil suit against several companies.
June 2016	Center for Disease Control releases report confirming higher Lead levels in children
July 2016	Six more employees of DHHS & DEQ charged in Flint Water case.
September 2016	Governor creates Public Health Advisory Commission and Cabinet Position.
December 2016	More employees of DHHS & DEQ charged in Flint Water case.

Management Changes

Based on article in Absolute Michigan (2011), the recommendation for the state of Michigan to assume management of the city of Flint was initially made due to difficult financial issues such as cash flow shortages and other deficiencies.

Under the leadership of the State of Michigan, Flint was projected to reduce its deficit from \$15 million in 2010 to \$7 million in 2011. Michael Brown, the newly appointed emergency manager was well aware that decreasing the deficit was not going to be an easy task. However, with leadership and solid decision-making, it was deemed possible.

The Flint Water Advisory Task Force (FWTF) final report listed several critical issues regarding State-Appointed Emergency Managers. Table 2 describes the major issues.

Table 2. Flint Water Advisory Task Force (FWTF) report on State-Appointed Emergency Managers.

FWTF Findings: State-Appointed Emergency Managers	
1	Elected officials should have been making decisions, not State-appointed emergency managers.
2	The return to DWSD (as demanded by citizens and Flint officials) was blocked due to a loan and agreement with the Treasury department.
3	Due to the actions of emergency managers and MDEQ, responsibility for the crisis was placed on the state.
4	Emergency managers are often not qualified to deal with non-financial issues.
5	The State of Michigan’s emergency management laws need revised to deal with non-financial issues.

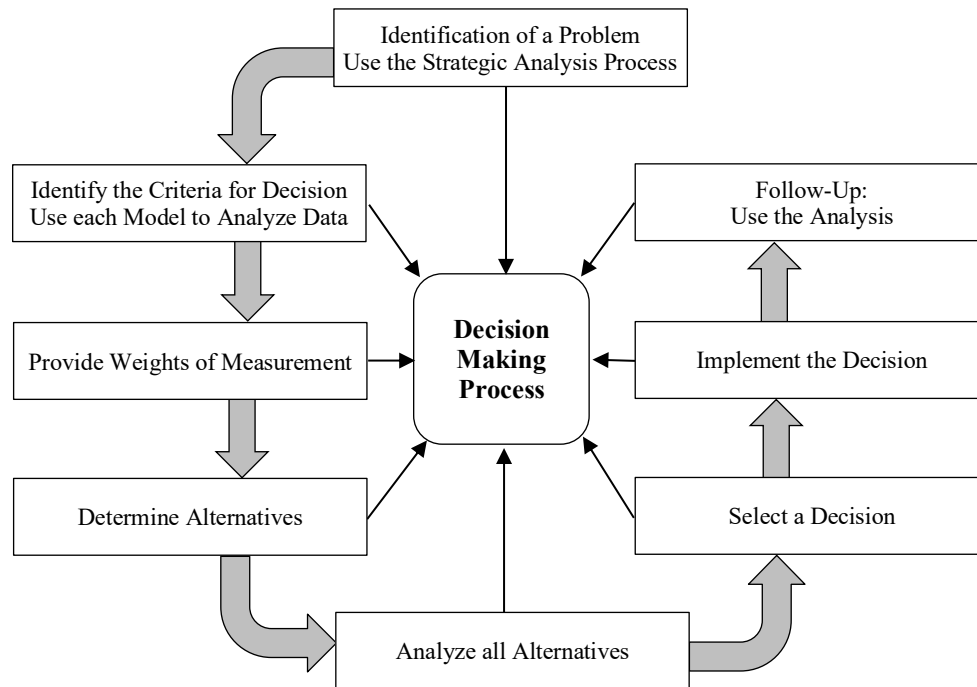
Source: Staff, State of Michigan (2016, March 21). Flint Water Task Force (FWTF) Final Report. Retrieved from: https://www.michigan.gov/documents/snyder/FWATF_FINAL_REPORT_21March2016_517805_7.pdf

Fonger’s (2016a) article described exchanges between city officials and other administrators within the Detroit governing body concerning the impending termination of the water supplied to Flint by Detroit. The issue arose from the decision by Flint, to seek an alternative method of supplying water to its jurisdiction. The existing contract between Flint, and Detroit, is a 50-year contract which contained a clause that allowed either party to break it with a one year notice. Flint planned to build a pipeline to supply water to their jurisdiction within a time-frame of approximately 30 months. The plan called for the city to utilize Lake Huron as their water source. Based on on-going issues, a collaborative meeting between Flint and DWSD was held to determine the best solution (Fonger, 2016a). Due to on-going tension between the governing bodies of Flint and county officials with DWSD about the supply water and cost, Andy Dillon, the state treasurer, gave the new emergency manager Ed Kurtz authorization to contract future water purchases with KWA (Fonger, 2016b). KWA decided it would use the Flint River as their source of water.

To finalize the transition from DWSD to KWA, Kurtz initiated talks that would be beneficial to both organizations. Kurtz negotiated sales of infrastructure (pipeline) used by DWSD to KWA. During the negotiation DWSD officials attempted to recoup past investment costs tied to the water system. The inability of Flint and Detroit to come to a mutual agreement over cost, led to Flint’s disconnection from Michigan’s largest water supplier earlier than anticipated. The thought process of many, is that Flint decided to leave DWSD because of high cost. However, throughout the collaborative process, DWSD countered on several occasions. DWSD offered a reduction of up to 50% of what Flint previously paid. With Kurtz in the position of emergency manager and the decision-making process, it is widely believed that Flint would contract with KWA and DWSD stood no chance of winning the contract (Gross, 2016).

This case is based on a series of decisions made at virtually every level of government. As this case indicates, there are sometimes unintended consequences to decisions. Figure 1 below demonstrates a common decision-making process. It will be up to readers to determine if any form of an established decision-making process was followed.

Figure 1. Common Decision-Making Process. Created by authors.



In March 2013, a 7 to 1 vote by the Flint City Council ended the practice of purchasing water from Detroit and joining KWA and bringing water from Lake Huron. However, as a result of Detroit raising rates, the city of Flint separated early from Detroit water supply to connect to the yet to be completed Karegnondi Water Authority (KWA). At the time, the Flint City Council did not vote to connect to the Flint River; the decision was made by the emergency manager at the time, Ed Kurtz. In April 2014, a state agent signed a permit that gave the city permission to use the Flint River for water (The Center for Michigan, 2016a).

Consequently, in April of 2013 DWSB terminated its contract to provide water to Flint based on the City's new agreement with KWA. The City of Flint made the decision to begin using the Flint River in April of 2014. Detroit Water & Sewer Department agreed to terminate their longstanding contract, but agreed to cover any gaps in service at a price to be determined when necessary (Adams, 2014).

According to Longley (2011), a report by the city identified three options considered the most cost-effective for resolution of the water crisis in Flint. The three options included: 1) a renegotiated contract with the City of Detroit, 2) the construction of a new pipeline, and 3) water treatment from the Flint River. When analyzed, the most cost-effective alternative for the city appears to be a \$300 million water pipeline ensuring that the city would own control of its water. This option is based on a study done by Rowe Engineering. The Rowe study determined that, over time, drawing water from Lake Huron will be cheaper than purchasing water from Detroit. The report identified that purchasing water from Detroit was the most expensive option. The Rowe study deemed that using the Flint River would be ineffective for a variety of reasons. The most prevalent was cost as the Flint River option required approximately \$50 million to upgrade the City's water plant in addition to other \$10 million in infrastructure upgrades. Nevertheless, the Flint River remained in consideration due to the fact that the river could provide the natural resource without neglecting the environmental requirements from the state. As noted from the very beginning, this crisis is a result of decisions made at various levels of government.

Table 3. List of many of the key players involved in the Flint Water Crisis

Flint Water Crisis - Key Players	
City of Flint Michigan	
Mayor Karen Weaver	Flint Michigan Mayor
Brig. Gen. Michael C. McDaniel	Retired Brigadier General
Michael Brown	Flint Emergency Manager (2010)
Ed Kurtz	Flint Emergency Manager (2011)
Darnell Early	Flint Emergency Manager (2013)
Mike Glasgow	Flint City Utility Director
State of Michigan	
Governor Rick Snyder	Michigan Governor
Andy Dillion	Michigan State Treasurer
FWTF	Flint Water Task Force (FWTF).
Environmental Protection Agency (EPA)	
Mark Pollins	EPA Water Enforcement Division Director
Miguel Del Toral	EPA Regulations Manager
Gina McCarthy	EPA Administrator
Michigan Department Of Environmental Quality (MDEQ)	
Brad Wurfel	MDEQ Communications Manager
Dan Want	MDEQ Director
Keith Creagh	MDEQ Director
Dr. Marc Edwards	Virginia Tech University Professor
Lee-Anne Walters	Flint Michigan Family
Michigan Department of Health	Genesee County Michigan Health Department
KWA	Karengnondi Water Authority
DWSD	Detroit Water & Sewer Department
Michigan Department of Health & Human Services (MDHHS)	
House Oversight and Government Reform Committee	

Literature available is unclear as to who was the decisive force behind the water crisis in Flint. Table 3 lists many of the key decision makers involved in the process and discussed throughout this case study. It must be noted that June 2103 documents created by city employees and the state emergency manager indicate an intent of obtaining water from the Flint River before separating from Detroit's water system. Consequently, other documents revealed by the Governor indicate that Flint notified the Department of Environmental Quality concerning the intent to operate the Flint Water Treatment Plant and use water from the Flint River (Adams, 2014).

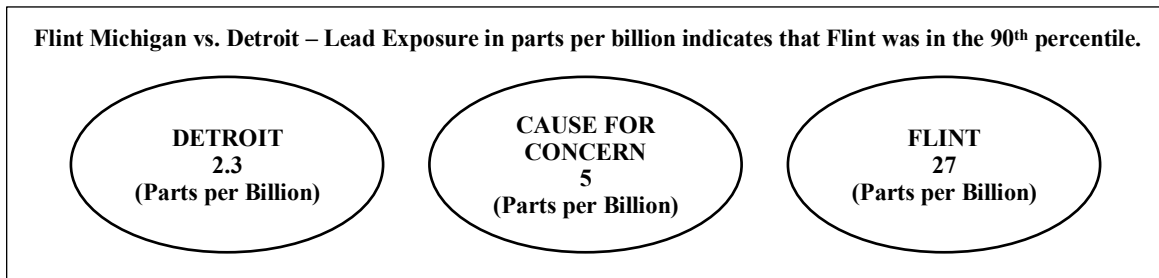
Using the Flint River was one of several decisions leading to problems experienced by Flint. As noted before, financial issues led to the Michigan Governor to appoint an emergency manager to lead Flint out of a fiscal deficit that was created by past decisions. The charge of the emergency manager was to reduce expenses and increase revenues to bring the city back to financial solvency. In April 2013, the utility department was selected as one area that the emergency manager felt an immediate savings could be obtained (Adams, 2014).

Exposure to Lead

Lead is a soft metal that is usually found when mixed with acidic water in pipes, fittings and metal joints. It is resistant to corrosion and can lead to acute or chronic toxicity. Lead is more likely to cause damage in kids than it is in adults. Additionally, lead causes damage to any part of the body but mostly attacks the red blood cells. There are many side effects to lead poisoning. These include headaches, vomiting, loss of appetite, weight loss, behavioral problems, muscle and joint weakness and also seizures. Children who have lead poisoning must be hospitalized to ensure that the medication is taken properly and that the effects of the medication is working (Owczarski, 2016).

A significant event in the Flint Water Crisis occurred in late 2014 when the Lee-Anne Walters family noticed unusual health issues and called Virginia Tech professor Dr. Marc Edwards. Upon testing the Walters family water and discovering high levels of lead, Dr. Edwards brought a team of Virginia Tech researchers to Flint. Dr. Walters brought national attention to the water issue through his water study (website: <http://flintwaterstudy.org>). It is not insignificant that Dr. Edwards self-funded the initial stages of this research due to his passion for helping those affected (Kozlowski, 2016).

Figure 2. Lead contamination estimates in Flint Michigan. Created by authors.



Source: 2015 Study of 271 homes in Flint Michigan by Virginia Tech University. Retrieved from: <http://flintwaterstudy.org/wp-content/uploads/2016/01/DHHS-MDEQ-FLINT-LEAD-COMMUNICATIONS-PLANS.pdf>

As per Figure 2, it was determined that there was a high level of lead in the drinking water at the homes in Flint Michigan. This study of 271 indicated that although the lead level at the water source was initially acceptable, this changed when water was delivered to the citizens of Flint through the water distribution system (Owczarski, 2016). Much of the publicity was centered on a few families, but this crisis affected the entire city. Additionally, the long-term effects will continue for generations. The crisis was huge and was not specifically caused by the end of a contract with Detroit to provide water. Decisions made by a series of officials combined with fiscal, environmental, and political issues lead to problems for the citizens of Flint (Egan, 2015, p.1). What exactly happened and who is to blame is yet to be determined although this case study provides information for analysis and the determination of fault.

From the very beginning, the age of the infrastructure and the possibility of lead exposure was considered. Throughout the change process, government officials worked to minimize the impact on its citizens. In September of 2015, the City of Flint requested that affected citizens install water filters and flush water pipes to limit exposure to lead. The process of issuing a water advisory as a public service ensures that citizens understand the severity of the situation and it is a prerequisite in the request for federal aid. It is estimated that approximately half of the residents in Flint are served by lead pipes, but the City could not identify all of the residences or businesses that were affected (Fonger, 2015b).

On October 1, 2015, Genesee County Michigan issued a public health emergency declaration informing Flint residents about the dangers of lead contamination. The City of Flint followed with a state of emergency on December 15th, 2015 followed closely by Genesee County on January 5th, 2016 and the Governor of Michigan on January 12th. The state of emergency declared this emergency man made and informed citizens of steps that could be taken to reduce exposure. The order also listed locations that provide water testing devices, bottled water, cartridges, and other items that will help in the crisis (State of Emergency, City of Flint, 2015). On January 14th, 2016 President Obama declared the Flint Michigan Water Crisis a state of emergency.

The Flint Water Advisory Task Force (FWTF) final report listed several critical issues regarding the Michigan Department of Health and Human Services (MDHHS) and the Genesee County Health Department (GCHD). Table 4 describes the major issues.

Table 4. Flint Water Advisory Task Force (FWTF) report on MDHHS & GCHD

FWTF Findings: Michigan Department of Health and Human Services (MDHHS)	
1	The crisis was extended due to MDHHS not properly analyzing its own data and not working with other agencies or sharing results with key players.
2	MDHHS bears primary responsibility for a lack of timely follow-up on lead poisoning issues.
3	Lead poisoning issues will be an issue for the next 15-20 years at a considerable cost.
4	Lead contamination is under-reported due to too few screenings for children ages 1 to 2 as recommended.
5	The lead issue was not properly addressed due to the lack of coordination between MDHHS & MDEQ.
6	Communication and coordination lacked between state and local health officials during the outbreak of Legionellosis cases in 2014 and 2015.
FWTF Findings: Genesee County Health Department (GCHD)	
1	Coordination between Flint, MDHHS, & GCHD was inadequate to prevent this crisis.
2	Inadequate resources caused substandard follow-up on lead contaminated children.
3	The public was not notified about the outbreak of Legionellosis in a timely manner by MDHHS and GCHD.

Source: Staff, State of Michigan (2016). Flint Water Task Force (FWTF) Final Report. Retrieved from: https://www.michigan.gov/documents/snyder/FWATF_FINAL_REPORT_21March2016_517805_7.pdf

Another decision-making opportunity occurred when Flint officials decided that rather than proactively update the infrastructure before the water supply change, they would make changes after the move to the Flint River. Consequently, Flint city officials didn't apply for a construction permit until October 2015 and work didn't begin until November 9th. In essence, it is believed that city officials facilitated a 19-month exposure of its residents to cancer-causing carcinogens based on budgetary priorities. Another questionable decision was the March 2014 single bid contract approval to help prepare the water treatment plant for operation. The Michigan Department of Environmental Quality (MDEQ) official, Stephen Busch, assured city officials and residents that the city was going above minimum health standards as the Flint River water supply transition was occurring. It is alleged that MDEQ failed to act to protect the public health and emergency managers made key decisions that contributed to the crisis (Sanburn, 2016).

Fonger (2016a) establishes that the consequences of using Flint River water weren't yet fully quantifiable and that distributing the river water ahead of adequate upgrades to plant infrastructure and training processes would be premature and against the advice of the utility department management. On April 17, 2014, or eight days before the Flint River began supplying customers, Flint City Utility Director Mike Glasgow sent an email identifying this risk and formally voiced his objection to the Michigan Department of Environmental Quality (MDEQ) (Fonger, 2016a). Unfortunately, it is alleged that MDEQ failed to proactively regulate the treatment of the Flint River water and subsequent illnesses from lead poisoning and the nine deaths from Legionnaires disease within the city facilitated an investigation. The eighteen-month experiment was proposed as a short-term solution to supply water to Flint while the KWA pipeline was complete. This humanized experiment resulted in a widespread exposure to bacteria and carcinogens for innocent people indicating a regulatory failure at the state, local, and federal levels.

Making Corrections

The Flint Water Advisory Task Force (FWTF) appointed by Governor Snyder issued a 116-page report of the findings of the Flint Water Crisis. This report that was issued in March 2016 stated that state employees were to blame and that many reported problems (Axelrod, 2016). Accountability to a fiscally driven decision that resulted in the risk to countless lives will be partially assessed based on the findings of the Flint Water Task Force (FWTF). The FWTF report indicates that key decisions made by emergency managers contributed to the water crisis including, but not limited to, the move to the Flint River and slow decisions concerning reconnecting to DWSD (Sanburn, 2016). In the FWTF summary statement, the group concludes the MDEQ did not enforce drinking water regulations. Additionally, Michigan Department of Health & Human Services (MDHHS) did not act in a timely manner to protect Flint's citizens, and the United States Environmental Protection Agency (EPA) did not enforce the Safe Drinking Water Act and the Lead and Copper Rule (Staff, 2016). Among the results from the FWTF were:

- Inadequate decision-making at all levels. This is especially true with the decision to utilize the Flint River.
- Inadequate training and preparation at all levels to implement decisions such as operation of the Flint Water Treatment Plant and using the Flint River.
- The Safe Drinking Water Act was violated by inadequate testing and monitoring.
- Disregard of evidence of issues with Lead contamination and corrosion.

- Disregard and dismissal for citizen concerns.
- Delays in action and lack of coordination at all levels.
- Emergency Managers are not equipped for non-financial issues (Staff, 2016).

Findings of the FWTF are discussed in several tables concentrating on findings about each agency involved. Table 5 discusses finding on MDEQ. The most significant is that responsibility for the crisis was placed squarely on this agency.

Table 5. FWTF findings for MDEQ.

FWTF Findings: Michigan Department of Environmental Quality (MDEQ)	
1	Water contamination in Flint was the fault of MDEQ.
2	Cultural issues in the organization clouds MDEQ's ability to serve the public.
3	Lead in the water was missed by MDEQ allowing residents to be contaminated for an extended period.
4	Due to staff apathy, MDEQ waited months to accept the EPA's guidelines on lead in Flint's water.
5	MDEQ was slow to investigate the fact that Legionellosis cases were caused by the Flint River water source.

Source: Staff, State of Michigan (2016). Flint Water Task Force (FWTF) Final Report. Retrieved from: https://www.michigan.gov/documents/snyder/FWATF_FINAL_REPORT_21March2016_517805_7.pdf

In early 2016, Michigan Governor Rick Snyder (2016) apologized for the water crisis. In addition, he addressed the events that took place in order to use the water from the Flint River. A couple local actions were identified as significant: 1) Flint City Council voted in March 2013 to change services from the Detroit Water and Sewerage Department (DWSD) to the Karegnondi Water Authority (KWA), and 2) a local water authority's decision to build a water pipeline from Lake Huron. This action has been identified as the beginning of the crisis (The Center for Michigan, 2016). Additionally, the June 2013 decision by the City of Flint to use the corrosive Flint River as a water resource for the residents was a huge factor in the crisis. Snyder indicated that Detroit sent a "letter of termination" to Flint after knowing Flint's council vote. In this letter, Detroit gave one year to Flint on the existing contract. However, it did not mean that Flint could not get the water from Detroit after that date, nor did it indicate that a negotiation between Flint and Detroit could not continue to allow Flint to negotiate a new contract until the city could connect to a suitable source. The fact that Flint received the "letter of termination," indicates that Flint had no other choice than use the water from the Flint River. In fact, Flint decided to disconnect from Detroit to cut costs by using water from the River while waiting on the pipeline was completed (The Center for Michigan, 2016).

There are many who feel that the Environmental Protection Agency (EPA) is partially to blame for not warning Flint of the dangers faced due to the decision to move to the Flint River. However, the Regulations Manager of the EPA, Miguel Del Toral, issued a warning in June of 2015 that transmission pipes were contaminating drinking water in Flint. In January of 2016, Mr. Del Toral expressed dismay that the warning was not acted upon. Mr. Del Toral questioned the adequacy of the procedure utilized for testing by DEQ to determine if lead appeared in the drinking water (Fonger, 2016a). According to EPA Administrator Gina McCarthy: "The agency had insufficient information to understand the potential scope of the lead problem until more than a year after the water supply was switched from the Detroit Water system to the corrosive Flint River and emphasized the incomplete and confusing information that the agency received from Michigan" (Palleschi, 2016). The FWTF addressed the EPA as listed in Table 6.

Table 6. FWTF findings for the United States EPA

FWTF Findings: United States Environmental Protection Agency (EPA)	
1	The EPA failed to exercise its authority.
2	The EPA did not ensure that MDEQ maintained adequate standards.
3	The EPA deferred to MDEQ in the area of corrosion control when it should have taken charge of the situation.
4	The EPA covered for MDEQ by explaining the LCR when no explanation was required of needed.

Source: Staff, State of Michigan (2016). Flint Water Task Force (FWTF) Final Report. Retrieved from: https://www.michigan.gov/documents/snyder/FWATF_FINAL_REPORT_21March2016_517805_7.pdf

When the emergency declaration for the water lead issue in Flint, Michigan ceased in August 2016, studies demonstrated that approximately 57 percent of the residences with levels of lead in the water was improving. In addition to the optimistic news, the republicans' investigation faulted the Environmental Protection Agency and Michigan state officials for the disaster. Moreover, in December 10, 2016, the U.S. Congress approved \$170 million

to assist with the lead cases in Flint's water (Carmody, 2017). There was also a push from democrats to expedite and enhance current proposals for funding the project water source by installing new pipe lines to over 18 thousand homes and business in the city of Flint and also providing funding on medical surveillance and exposure of lead to the residents of Flint. The state of Michigan requires long term maintenance with federal interaction and yearly testing to ensure the standards are current (Spangler, 2016a). The Michigan Governor's office was addressed in the FWTF findings as indicated in Table 7.

Table 7. FWTF findings for Michigan Governor's office

FWTF Findings: Michigan Governor's Office	
1	Responsibility for executive branch decisions are with the Governor's office. (<i>The buck stops here</i>)
2	The Governor's office relied on inadequate data provided by mostly MDEQ & MDHHS.
3	The Governor's office continued to rely on this data even when evidence proved it incorrect.
4	Suggestions by the Governor's staff to return to DWSD was ignored and should have been evaluated.
5	The Flint crisis demonstrates the results of relying of only a few sources for information or advice.
6	Public statements from the Governor's office have been inappropriate.

Source: Staff, State of Michigan (2016). Flint Water Task Force (FWTF) Final Report. Retrieved from: https://www.michigan.gov/documents/snyder/FWATF_FINAL_REPORT_21March2016_517805_7.pdf

Oosting (2017) indicates that the city finally undertook the project of replacing the water pipes. The city has replaced 800 pipes and plans to replace all the pipes by the end of 2019. In addition, the lead levels have decreased "below the federal action level of 15 parts per billion in the most recent six-month test period with 90 percent of samples testing at 12 ppb from July 1 through the end of 2016." The city recognizes the improvement with the water crisis; however, they consider that more work needs to be done in order to be "all clear" from the issue according to current Flint Mayor Karen Weaver and Flint advisor retired Brig. Gen. Michael C. McDaniel. In addition to that statement, McDaniel desires is to see the lead levels below 10 parts per billion (PPB).

The Flint Water Crisis is the water utility case with the highest profile. One of the most significant findings was that there is an ongoing lack of communication with the community and government officials. One issue that needs to be addressed is the "Watchdog Media" as explained in an article by Chavez, Perez, Tunney, & Nunez (2017). Simply stated is the need for information that is being reported to governmental officials should be given to the public. This appeared to be the case with the Flint Water Crisis. Information and tests were being completed, but the vital information was not being properly reported. General Motors (GM) Flint plant's corroded pipes in their water systems was affecting their production of parts for cars. In this case without much testing water was then taken from the Flint River and used in the manufacturing process. This could have been avoided with oversight. "The case of the water crisis in Flint, Michigan, may demonstrate failures in the both the media watchdog function and governmental institutions over the period leading up to the exposure of lead leaching into the homes of the city's water" (Chavez et al. 2017). The FWTF addressed the City of Flint as indicated in Table 8.

Table 8. FWTF findings for city of Flint Michigan

FWTF Findings: City of Flint	
1	Flint Utility operations was not qualified to assume the new responsibilities of the transfer of water services.
2	The Flint Water Treatment Plant (WTP) or the distribution system was not adequate for the transfer.
3	LCR requirements were not followed by the Flint WTP staff to control corrosions and treat lead contamination.
4	JDEQ failed to provide adequate guidance and staff at Flint's WTF acted without adequate guidance.
5	Lack of guidance from MDEQ allowed poor adherence to critical regulations.
6	Flint citizens and elected officials could not intervene due to the emergency management situation.

Source: Staff, State of Michigan (2016). Flint Water Task Force (FWTF) Final Report. Retrieved from: https://www.michigan.gov/documents/snyder/FWATF_FINAL_REPORT_21March2016_517805_7.pdf

According to Brad Wurfel, spokesman for MDEQ, hospitals in Genesee County experienced a rise in Legionnaire's disease. Wurfel reported that 40 cases were reported within small time frame. Wurfel stated "The increase of the illnesses closely corresponds with the time frame of the switch to Flint River water." (Anderson, Egan, & Dolan 2016).

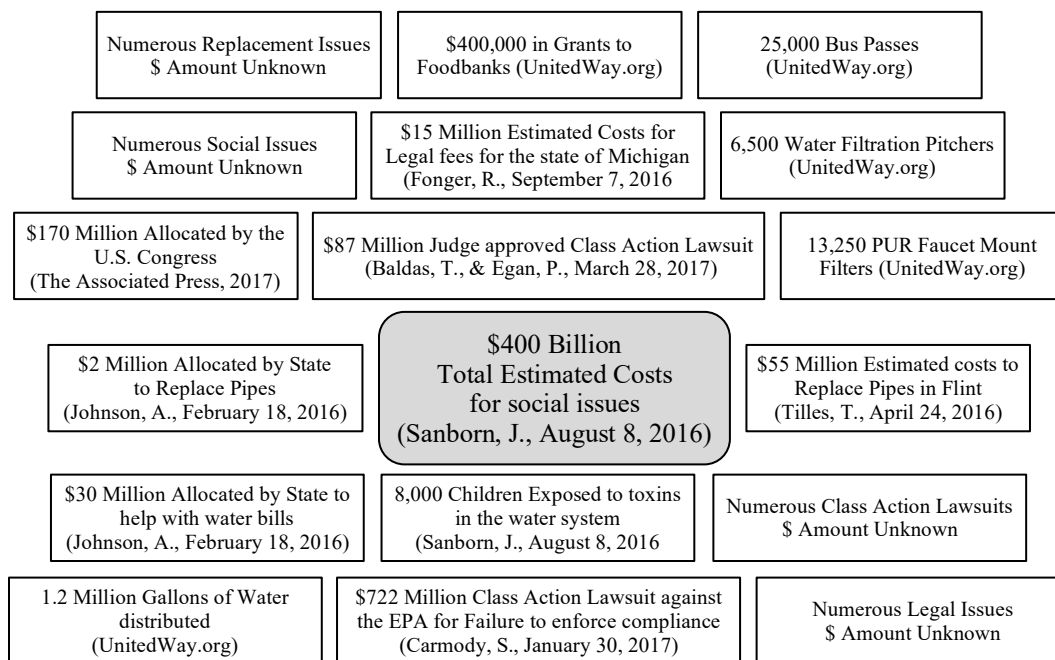
This information was reported to government officials and MDEQ was charged with the responsibility to should handle all of the health issues resulting from the Flint crisis. In December of 2015 both Dan Wyant, Director of MDEQ and Brad Wurfel, Communications Manager of MDEQ, resigned due to pressure from the unresolved issues of lead

being in the Flint River. Wyant indicated that “the proper protocol was used for a water provider using a new source, but the federal Lead and Copper rule has a particular provision for communities over 50,000 people. This rule states that the system operator must continue treating with full corrosion control even as they test the water” (Kennedy, 2016). Therefore, proper treatment was not accomplished based on the information that the Flint community had over 100,000 people using this water. In February 2016, Governor Rick Snyder approved \$2 million to replace pipes that are lead contaminated. The money will come in the form of a grant. The Michigan State Legislature also approved \$30 million to help businesses and citizens pay water bills accumulated during the period of contamination (Johnson, 2016).

Legal Action and Costs

On February 2, 2016 Michigan Gov. Rick Snyder proposed that an additional \$30 million would be added to next year’s fiscal budget to pay Flint residents’ water bills for water rendered unusable by the water issue (Laine, 2016). February 4, 2016, the Michigan Senate approved \$30 million to reimburse Flint residents for water rendered undrinkable due to lead-contamination. However, rather than follow Gov. Snyder’s proposal, the Senate decided to act more quickly. The Senate approved a measure that would insert the \$30 million into the current year’s budget rather than next year’s fiscal budget, which would take effect on Oct 1, (Lawler, 2016). On Feb. 26, 2016, Gov. Rick Snyder signed Senate Bill 136, the \$30 million budget supplemental (Gov. Snyder, 2016).

Figure 3. Costs keep growing in the Flint Michigan Water Crisis



According to Sanborn (2016c), the social costs to the Flint crisis is continuing to expand with an estimate of the total costs exceeding \$400 billion. Figure 3 shows just a fraction of the social costs that continue to plague the city of Flint and those trying to help. The costs are staggering. The monetary costs for the 8,000 children exposed to toxins is still unknown and this does not take into account the physical issues still facing the community. New social costs are arising monthly that must be considered.

The rising social costs are compounded by the costs to physically correct the situation. According to the Mayor of Lansing Michigan where the city replaced pipes as part of a preventive maintenance program, the cost will be 3 to 4 thousand dollars per household and could cost the city of Flint approximately \$55 million (Gillies, 2016). In an article by Fonger (2016b.), it is noted that the legal fees for the state of Michigan have already exceeded \$15 million mostly to defend actions by state officials.

In early 2017, a federal judge approved an \$87 million class action lawsuit to replace pipes in Flint Michigan. The Judge ordered that an additional \$10 million set aside in case more money is needed to complete the project (Baldas & Egan, 2017). Additionally, a \$722 million class action lawsuit was filed against the Environmental Protection Agency (EPA) for failure to enforce compliance on city officials leading to the water crisis (Carmody, 2017).

The following table outlines many of the ongoing legal issues associated with the Flint Water Crisis. Legal action is continuing to grow as new suits are filed. This table is not meant to be inclusive as it is virtually impossible to capture all of the legal activity involved in this issue. However, the table (Table 9) provides a sampling of many of the legal issues faced by the State of Michigan and Flint.

Table 9. Listing of the legal issues surrounding the Flint Michigan Water Crisis. (Compiled by authors)

DATE	Legal Issue/Comments	Charged
January 2016	Lawsuit – National Resources Defense Council (NRDC), American Civil Liberties Union (ACLU) – alleged violation of the SDWA (American Civil Liberties Union of Michigan, 2016).	Pending
March 2016	US Congressional Committee on Oversight and Government Reform – Held hearings to determine responsibility (Hearing...., 2016).	Pending
April 2016	Charges filed – Michigan AG files charges against three workers: Stephen Busch – Coordinator of DEQ Office of Drinking Water and Municipal Assistance, Mike Prysby – Michigan Department of Environmental Quality official, & Mike Glasgow - Flint Laboratory and Water Quality Supervisor. The three were charged in relationship with tweaking evidence, misleading officials, and contributing in the contamination of the water system (Dolan, Egan, & Anderson, 2016).	Pending
May 2016	Class Action Lawsuit – National Association for the Advancement of Colored People (NAACP) & others – Treatment of the Flint River by state and local officials and by engineering firms (NAACP, 2016).	Pending
May 2016	No Contest Plea – Michael Glasgow, Flint laboratory and water quality supervisor, please no contest to charge of willful neglect of duty (Egan, 2016).	Results were two potential felonies dropped, retirement, and an agreement to cooperate with the investigation.
June 2016	Lawsuit – State of Michigan files lawsuit against several engineering firms involved in treatment of the Flint River (Office of the State of Michigan Attorney General Bill Schuette, 2016).	Pending
July 2016	Charges Filed –Corinne Miller, Nancy Peeler, & Robert Scott – Michigan Department of Health & Human Services. Liane Shekter, Patricia Cook, Adam Rosenthal, & - Michigan Department of Environmental Quality. All charged with various counts of neglect of duty in regards to Flint Water Crisis (Allen, 2016).	Pending
September 2016	No Contest Plea – Corinne Miller, former Director of Disease Control at DHHS, plead no contest to charge of willful neglect of duty (Egan, 2016).	Results were two potential felonies dropped, retirement, and an agreement to cooperate with the investigation.
March 2017	Lawsuit – Filed earlier to help residents fix contaminated water pipes (Baldas & Egan, 2017).	Judge approves \$87 Million dollars from State of Michigan to pay for residents to replace contaminated water pipes.
June 2017	Involuntary Manslaughter Charges – Based on an outbreak of Legionnaires disease attributed to twelve deaths in 2014 & 2015. Nick Lyon, Michigan HHS Director, Darnell Earley, former State Emergency Manager, Howard Croft, former Flint Water Department Manager, Liane Shekter-Smith, Michigan Department of Environmental Quality, Stephen Busch, Office of Drinking Water District Supervisor (Maher, 2017; Egan & Anderson, 2017).	Pending
June 2017	Obstruction of Justice Charges – Based on charges of lying to a police officer. Eden Wells, Chief Medical Executive (Egan & Anderson, 2017).	Pending

New Developments

An article by CNN (Ganim, 2017) explains that 15 people have been criminally charged for the Flint Michigan water case. The list includes Nick Lyon, director of Michigan Department of Health and Human Services, and, Darnell Earley, former Flint Emergency Manager. In addition, Dr. Eden Wells, another high-ranking state health department official and multiple low-ranking officials, face involuntary manslaughter. Nevertheless, the rumors that the Governor and the State will be held accountable with the rationale they are liable for this calamity. To be exact, there are 12 deaths related to the ordeal on top of the other 80 people who are ill as a result of the crisis; the victims' illnesses are related to lead poisoning and legionnaires disease which is a respiratory bacterial infection spread out via water source.

There are many who believe that Flint is an example of institutional racism that still occurs today in the United States. To better understand Flint's Water Crisis, we need to briefly review the perceived racism experienced by Flint. In 1996, Flint was perceived to encourage overcrowding and charging more at a minimum for rent and land sales in the inner city. At the same time, the suburban area surrounding Flint had no restrictions on the minimum price for housing (Demashkieh et al., 2017). Flint was also accused of segregation due to minority real estate brokers being refused membership to the Flint Board of Realtors. Additionally, it was perceived that lobbyist worked with mortgage lenders to ensure that minority individuals would not become property appraisers. The perception was that unwritten rules stopped minorities from purchasing homes in selected areas, even if they had the financial capabilities (Demashkieh et al., 2017).

To this point, Flint's Water Crisis was not a proven act of discrimination, but possibly the result of institutional racism and an implicit bias. The policies that were developed and implemented clearly caused the water crisis (Demashkieh et al., 2017). Citizens of Flint complained approximately 18 months, but were ignored by state officials. The question that the Michigan Civil Rights asks repeatedly on their report of Flint is, "Would this water crisis have occurred in Birmingham, Ann Arbor, or East Grand Rapids? There are those who feel that the answer is no. (Demashkieh et al., 2017)."

As this case study is written, new developments are occurring weekly. Former emergency managers Darnell Earley and Gerald Ambrose were indicted with multiple charges for conduct while they were working in Flint. Two former members of Flint's Department of Public Works, Howard Croft and Daugherty Johnson, were also charged with felonies in relation to conduct on the job. When charged with the health of the public, performance of duty is a serious issue (Sanborn, 2016a). There were so many unethical injustices in Flint Michigan that the residents may never fully trust their officials again. The long-term effects of this crisis may never be fully known. Along with the cost of fixing all of the water system, officials must consider the cost of legal fees, lawsuits and settlements. This story of government unfairness and citizen outrage is far from over.

This case study follows events as they unfold over a two-year period and attempts to provide the reader with facts as they happened. However, there are numerous stories not told by this case study and should provide a class with opportunities to expand or broaden the scope of this research. Flint Michigan is in the spotlight for lead contamination and a series of missteps by government officials as outlined in this case study. However, Flint probably won't be the last city with water issues as the United States faces aging utility pipes all over the nation. Also, the Flint case will not go away for a long time. This case is a great start for a class to examine the information provided and update current revelations. Aspects of this case will be litigated and debated for years.

There are numerous questions that arise when trying to determine how this crisis occurred and who is to blame.

Question 1 - What can the government do differently to safeguard the water supply?

Question 2 - What training could have prevented this or any water crisis?

Question 3 – Who is ultimately responsible for the Flint crisis?

Question 4 - Why did it take so long to help the Flint Michigan residents?

Question 5 – How can the decision making process be improved?

Question 6 – Are there other systems in the United States in the same position as Flint?

Question 7 – What is the financial impact?

Question 8 – From a cultural and social aspect, what is the impact of this crisis on Flint?

Question 9 – What strategic initiatives would have prevented this crisis?

Question 10 – The case discussed the decision making process. Define decision making theory and explain how it pertains to this case?

AUTHOR'S NOTE

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REFERENCES

- Absolute Michigan (2011). Dig Michigan. Emergency Manager Michael Brown takes over in Flint. Retrieved from: <http://absolutemichigan.com/michigan/emergency-manager-michael-brown-takes-over-in-flint/>
- Adams, D. (2014, Apr 25). Closing the valve on history: Flint cuts water flow from Detroit after nearly 50 years. Retrieved from: *Mlive.com*. http://www.mlive.com/news/flint/index.ssf/2014/04/closing_the_valve_on_history_f.html
- Allen, R. (2016, Jul 30). Six state employees criminally charged in Flint Water Crisis. *Detroit Free Press*. Retrieved from: <http://www.freep.com/story/news/local/michigan/flint-water-crisis/2016/07/29/6-state-employees-criminally-charged-flint-water-crisis/87697834/>
- American Civil Liberties Union of Michigan (2016, Jan 27). Groups file federal lawsuit to secure safe drinking water in Flint. <http://www.aclumich.org/article/groups-file-federal-lawsuit-secure-safe-drinking-water-flint>
- Anderson, E., Egan, P., & Dolan, M. (2016, Feb 26). Snyder's staff was told last year of legionnaires' uptick in flint. *Detroit Free Press* Retrieved from: <https://hodges.idm.oclc.org/login?url=https://search-proquest-com.hodges.idm.oclc.org/docview/1768194552?accountid=40795>
- Axelrod, J. (2016). Michigan task force blames officials across agencies for Flint Water Crisis. *American City & County Exclusive Insight*, 1. Retrieved from: <http://americacityandcounty.com/operations-management/michigan-task-force-blames-officials-across-agencies-flint-water-crisis>
- Baldas, T., & Egan, P. (2017, Mar 28). Judge oks \$87M settlement in Flint water lawsuit. USA Today. *USA Today*. Retrieved from: <https://www.usatoday.com/story/news/nation-now/2017/03/28/flint-water-lawsuit-settlement-okd/99741360/?hootPostID=c69dc7e77befc697428bb239f13e32f2>
- Carmody, T. (2016). How the Flint River got so toxic. *The Verge*. Retrieved from: <https://www.theverge.com/2016/2/26/11117022/flint-michigan-water-crisis-lead-pollution-history>
- Carmody, S. (2017, Jan 30). EPA target of latest Flint Water Crisis class-action lawsuit. WUOM-FM. *MichiganRadio.org*. Retrieved from: <http://michiganradio.org/post/epa-target-latest-flint-water-crisis-class-action-lawsuit>
- Chavez, M., Perez, M., Tunney, C., & Nunez, S. (2017). Accountability and transparency diluted in the Flint Water Crisis: A case of institutional implosion. *Revistanorteamerica.com*. Retrieved from: <http://www.revistanorteamerica.unam.mx/index.php/nam/article/view/275>
- Chrysler, D. (2016, May). Flint: The role of law in protecting a community's health during financial crisis. *The Network for Public Health Law*. Retrieved from: https://www.networkforphl.org/_asset/4cj6qs/Webinar-the-Flint-Water-Crisis-5-18-16.pdf
- Demashkieh, R., Haque, M., Hunt, D., Lee Tarver, L., Reyes Kopack, L., Resio, R., & Voss, B. (2017). Systemic racism through the lens of Flint, Michigan Civil Rights Commission. The Michigan Civil Rights Commission, Flint. Retrieved from: <http://aquadoc.typepad.com/waterwired/2017/02/report-the-flint-water-crisis-systemic-racism-through-the-lens-of-flint.html>
- Dolan, M., Egan, P., & Anderson, E. (2016, Apr 21). AG Bill Schuette: Flint water charges just the beginning. *Detroit Free Press*. Retrieved from: <http://www.freep.com/story/news/local/michigan/flint-water-crisis/2016/04/20/2-mdcq-employees-city-employee-charged-flint-water-crisis/83272760/>

- Egan, P. (2015, Nov 21). Flint water mystery: How was decision made? *Detroit Free Press*. <http://www.freep.com/story/news/politics/2015/11/21/snyders-top-aide-talked-flint-water-supply-alternatives/76037130/>
- Egan, P., & Anderson, E. (2017, Jun 15). Officials face manslaughter charges over Flint: 12 died in Michigan after water polluted. *Florida Today, Sec C, page 1, Melbourne FL*. Retrieved from: <http://www.floridatoday.com/story/news/nation-now/2017/06/14/flint-michigan-prosecutions/396195001/>
- Egan, P. (2016, Dec 19). Michigan AG Bill Schuette: More charges Tuesday in Flint water case. Retrieved from: <http://www.freep.com/story/news/local/michigan/flint-water-crisis/2016/12/19/michigan-ag-bill-schuette-more-charges-tuesday-flint-water-case/95624818/>
- Flint, MI. (n.d.). Welcome to Flint, Michigan. *Reddit.com*. Retrieved from: https://www.reddit.com/r/flint/comments/6iepuo/welcome_to_flint_michigan/
- Fonger, R. (2015, Sep 25). Flint makes lead advisory official, suggests water filters and flushing. *Mlive.com*. Retrieved from: http://www.mlive.com/news/flint/index.ssf/2015/09/flint_makes_lead_advisory_offi.html
- Fonger, R. (2016a, Jan 21). EPA official 'stunned' by failure to treat Flint water for lead leaching. *Mlive.com*. Retrieved from: https://www.mlive.com/news/flint/index.ssf/2016/01/epa_official_says_he_was.html
- Fonger, R. (2016b, Feb 12). Flint water supervisor warned state of problems before switch. *Mlive.com*. Retrieved from: http://www.mlive.com/news/flint/index.ssf/2016/02/flint_water_supervisor_warned.html
- Fonger, R. (2017, Sep 7). Flint Water Crisis legal bills top \$15M with far to go in criminal cases. *Mlive.com*. Retrieved by: http://www.mlive.com/news/flint/index.ssf/2017/09/flint_water_crisis_legal_bills.html
- Forrer, D., Mannix A., & Zimmerman, M., (2013, Jan). Water issues that affect affordability and safety in a community – The Camden Ohio experience. *Journal of Business Case Studies*. 9, 1. Retrieved from: [http://www.professorforrer.com/Research_Data/Papers/LV12-131_Forrer-Maddix-Zimmerman\(2012\).pdf](http://www.professorforrer.com/Research_Data/Papers/LV12-131_Forrer-Maddix-Zimmerman(2012).pdf)
- Ganim, S. (2017, Jun). Michigan officials charged in Flint Legionnaires' outbreak. *CNN.Com*. Retrieved from: https://www.google.com/search?q=michigan+officials+charged+in+flint+legionnaires%27+outbreak&rlz=1C1SKPL_enUS429&oq=michigan+officials+&aqs=chrome.4.0j69i57j0l4.15212j1j7&sourceid=chrome&ie=UTF-8
- Gillies, T. (2016, Apr 24). Flint's crisis can be fixed with \$55M in new pipes: Lansing mayor. *CNBC*. Retrieved from: <https://www.cnn.com/2016/04/22/flints-crisis-can-be-fixed-with-55m-in-new-pipes-lansing-mayor.html>
- Governor Snyder, R. (2016, Feb 26). Flint residents will soon receive credits on water used for drinking, cooking and bathing from \$30 million reimbursement plan. In *Michigan.gov*. Retrieved August 14, 2017. *Michigan.gov*. Retrieved from: <http://www.michigan.gov/snyder/0,4668,7-277--377711--,00.html>
- Gross, A. (2016, Jan 25). New emails reveal the switch to the Flint River was not about saving money. *Detroit Metro Times*. Retrieved from: <https://www.metrotimes.com/news-hits/archives/2016/01/25/news-reveal-the-switch-to-the-flint-river-was-not-about-saving-money>
- Hearing – Flint, Michigan Drinking Water Contamination (2016, Mar 17) *C-Span*, <http://www.c-span.org/video/?406540-1/hearing-flint-michign-water-contamination>
- Johnson, A. (2016, Feb 18). Michigan Governor Rick Snyder's offers Flint \$2 million more to clean up water. *Michigan.gov*. Retrieved from: <http://www.nbcnews.com/storyline/flint-water-crisis/michigan-gov-rick-snyder-offers-flint-2-million-more-clean-n521066>
- Kennedy, M. (2016). Lead-laced water in flint: A step-by-step look at the makings of a crisis. *Washington: NPR*. Retrieved from: <http://www.npr.org/sections/thetwo-way/2016/04/20/465545378/lead-laced-water-in-flint-a-step-by-step-look-at-the-makings-of-a-crisis>
- Kozlowski, K. (2016, Jan 23). Virginia Tech expert helped expose Flint Water Crisis. *The Detroit News*. Retrieved from: <http://www.detroitnews.com/story/news/politics/2016/01/23/virginia-tech-expert-helped-expose-flint-water-crisis/79251004/>
- Lawler, E. (2016, Feb 4). Michigan Senate approves \$30M to pay Flint residents' water bills. In *mlive.com/news*. Retrieved from: http://www.mlive.com/news/index.ssf/2016/02/michigan_senate_approves_30m_t.html
- Laine, C. (2016, Feb 3). Gov. Snyder proposes funding for water bills in Flint. In *wnem.com*. Retrieved August 14, 2017. Retrieved from: <http://www.azfamily.com/story/31129933/gov-snyder-proposes-funding-for-water-bills-in-flint>
- Longley, K. (2011). Report: Buying in to new water pipeline from Lake Huron cheaper from Flint drinking water than treating river water. *Mlive.com*. Retrieved from: http://www.mlive.com/news/flint/index.ssf/2011/09/water_treatment.html
- Maher, K. (2017, Jun 15). Five officials charged in Flint Water Case. *The Wall Street Journal, Section A, page 3*. Retrieved from: <https://www.wsj.com/articles/three-officials-to-face-criminal-charges-over-flint-water-crisis-1461166410>
- National Association for the Advancement of Colored People (NAACP). (May 18, 2016). NAACP files lawsuit over Flint Water Crisis. *NAACP.com*. Retrieved from: <http://www.naacp.org/press/entry/naacp-files-lawsuit-over-flint-water-crisis>
- Office of the State of Michigan Attorney General Bill Schuette (2016, June 22). Schuette files civil suit against Viola and LAN for role in Flint water poisoning. *Michigan.gov*. Retrieved from: http://www.michigan.gov/ag/0,4534,7-164-46849_47203-387198--,00.html
- Oosting, J. (2017). Flint: "All clear" for drinking water tears away. *The Detroit News*. Retrieved from <http://www.detroitnews.com/story/news/michigan/flint-water-crisis/2017/03/07/flint-water-conference/98862674>
- Owczarski, M. (2016, Apr 12). Flint Water still not safe to drink, says Virginia Tech Professor. *Virginia Tech News*. Retrieved from: <https://vtnews.vt.edu/articles/2016/04/engineering-flintresults.html>

- Palleschi, A. (2016). Michigan report finds EPA failed to exercise SDWA authority in flint. *InsideEPA.Com's Daily Briefing*. Retrieved from: <https://hodes.idm.oclc.org/login?url=https://search-proquest-com.hodges.idm.oclc.org/docview/1775605976?accountid=40795>
- Pennington, D. (2017, Feb). When Things Went wrong with the Water: A Public Health Catastrophe. *Western Michigan University*. Retrieved from: <https://www.theguardian.com/environment/2016/jan/16/flints-water-crisis-what-went-wrong>.
- Sanburn, J. (2016a, Dec 20). Flint emergency managers criminally charged in the city's water crisis. *Time.com*. Retrieved from: <http://www.time.com/4607810/flint-water-crisis-criminal-emergency-managers/?iid=sr-link1>
- Sanburn, J. (2016b). Flint's Water Crisis explained in 3GIFs. *Time*. Retrieved from: <http://time.com/4191864/flint-water-crisis-lead-contaminated-michigan/>
- Sanburn, J. (2016c, Aug 8). Flint Water Crisis may cost the city over \$400 million in social costs alone. *Time.com*. Retrieved from: <http://time.com/4441471/flint-water-lead-poisoning-costs/>
- Sanburn, J. (2016d, Mar 23). Series of government failures. *Brookings.edu*. Retrieved from: <https://www.brookings.edu/series/market-and-government-failures/>
- Spangler, T. (2016a). Congress approves at least \$120M for Flint water fix. Dec. 10, 2016. *Detroit Free Press*. Retrieved from <http://www.freep.com/story/news/local/michigan/flint-water-crisis/2016/12/10/congress-flint-water-funding/95243816/>
- Spangler, T. (2016b, Dec 16). State, EPA share blame for Flint, congressional panel says. *Detroit Free Press*: Retrieved from: <http://www.freep.com/story/news/local/michigan/flint-water-crisis/2016/12/16/state-epa-share-blame-flint-congressional-panel-says/95521672/>. Retrieved November 1, 2017.
- Staff, State of Michigan (2016, Mar 21). Flint Water Task Force (FWTF) Final Report. *Michigan.gov*. Retrieved from https://www.michigan.gov/documents/snyder/FWATF_FINAL_REPORT_21March2016_517805_7.pdf
- State of Emergency, City of Flint (2015, Dec 14). State of Emergency declared in the City of Flint. *CityofFlint.com*. Retrieved from: <http://www.cityofflint.com/state-of-emergency.....>
- The Associated Press (2017). A timeline of the water crisis in Flint, Michigan. *WTOP*. Retrieved from: <https://wtop.com/government/2017/06/a-timeline-of-the-water-crisis-in-flint-michigan-5/>

