

# Leveraging the Science of Water and Sustainability: Achieving Public Health Benefits with PVC Pipe Underground Infrastructure

*By Mayor John Marchand, City of Livermore, CA*

In our nation, mayors face many challenges and find themselves relying on the skills and advice of others while also drawing on their own knowledge and expertise. I am honored to be part of The US Conference of Mayor’s Water Council where our experience and expertise can be shared mayor to mayor.

As mayors, our bottom line has always been public health and safety. I spent my career as a drinking water chemist so one of my top priorities has always been water quality. Water is the most fundamental compound for life to exist. Prior to becoming a mayor, I spent 40 years dealing with water quality issues. As a result, I have gained an expertise in one of our most pressing public health issues - Water Quality. The standard, to which I held myself and encouraged others, was to “Strive for perfection, settle for excellence.”

## Science and Sustainability

Livermore with a population of 84,000, values science and is the home of two national science laboratories. Teams from the Lawrence Livermore National Laboratory and the Flerov Institute in Russia created a new chemical element livermorium, which places the city’s name in the periodic table. Livermore also prides itself on sustainability by maintaining services

and planning for growth. It even boasts a world record of a 110+ year old 4-watt light bulb, called the Centennial Light, which has been burning continuously since 1901.

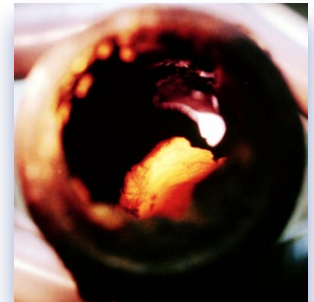
We also invest in sustainability in our underground water infrastructure. Our water system consists of 175.5 miles of potable pipe, 18.6 miles of recycled pipe and 296 miles of sewer pipe, 2,758 valves, 1,578 hydrants, and 376 other appurtenances such as air release and blow-off valves.

Based upon water industry standards, we do a great job of treating the water. However, we cannot forget about water quality once the water leaves the plant. The underground pipe material which makes up the distribution system that carries water to our homes and families, is also very important

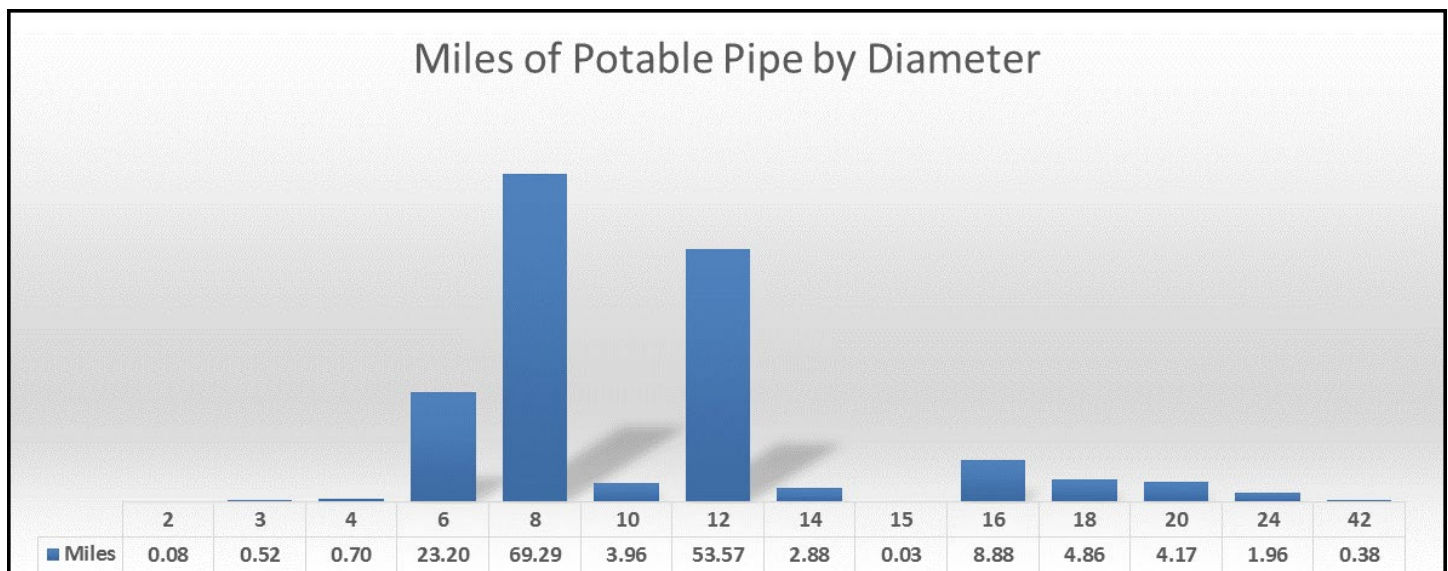
## Water Science: Iron Pipe Corrosion and Lead Leaching

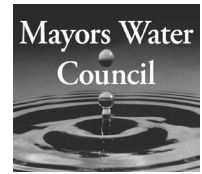
Water quality is a critical issue facing the nation today. We

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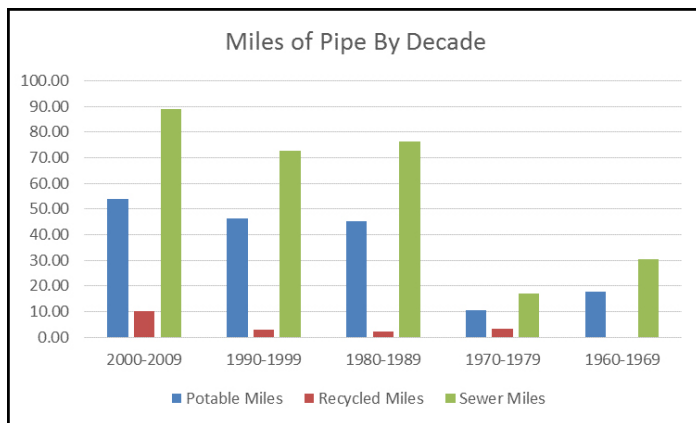
**Tubercle formation in iron pipe. Photo by John Marchand**





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are experiencing the increasing wave of aging water infrastructure challenges with water main breaks, water loss and replacement costs. This occurs as iron pipes corrode and fail. Corrosion and pipe failures not only increase costs but also degrade our water quality.



The water quality crisis in Michigan highlights the fact that insufficiently treated source water can corrode iron pipes, add discoloring sediments and also leach lead into the system.

The internal roughness of iron and cement pipe increases overtime with corrosion and tuberculation. The sediment build up can reduce water flow, cause discoloration, and develop a breeding ground for bacteria, tastes and odors. It can be difficult and costly to mitigate this issue.

In Livermore, the only time something is “good enough” is when it is done right. Using PVC pipe is one of the ways that we preserve and maintain water quality. Like most cities, our potable water system pipe diameter is predominantly between 6” and 12”, making up 86% of the water distribution system and 90% of the sewer system.

PVC pipe makes up 57% (99 miles) of our potable system that brings both cost savings to our existing customers and facilitates lower developer fees. This has supported economic growth over the last three decades.

We cannot sacrifice our water quality, so we must select the best material: We are replacing the hazardous asbestos-cement pipe (ACP) that makes up 35.5% of the potable system. Our recycled water pipe is 80% PVC purple pipe, a system that has been very valuable under the State of California’s drought mandatory water reduction of 25%. Our sewer system of 296 miles is vitrified clay pipe (VCP) 57% and PVC 35%.

**Our Job as Mayors**

As I have made the shift from field and lab work to the

Material	Expected Life (years)
CI (cast iron)	60
ACP	100
Steel	60
PVC	100
RCP (reinforced concrete pipe)	60
PVC Lined RCP	100
VCP (vitrified clay pipe)	50
VCP (8-11")	65
VCP (12-15")	75
VCP (>15")	100
AC (asbestos cement)	100
Truss (thermoplastic composite)	100
DI (ductile iron)	50
ABS (thermoplastic resin)	75
HDPE Slipline	75

**Table from the City of Livermore Water Resources Division November 2012 Collection System Pilot Asset Management Plan**

boardroom and to the mayor’s office, my role and responsibilities have changed. The mayor’s role is focused on developing policy versus implementing policy. The budget process is how we can drive initiatives.

When I was elected mayor, I told my department managers, it is my job to get you the tools that you need to do your job. It is your job to tell me what tools you need. We need to ensure we give people the tools and funding they need to get the job done right. This includes training, equipment and professional development. We also need to remove every obstacle preventing them from doing their job well. We need to realize that the investment in our water quality includes rigorous water testing, inspection and routine maintenance of our underground infrastructure to ensure that our investment does not come back to the city as a liability.

Our goal is to achieve the planned life expectancy of our assets. Good infrastructure asset management plans, business case evaluations and life cycle costing will help us achieve environmental benefits and cost savings.

**Advantages of PVC Pipe**

Upon closer investigation, our Public Works Department realized that most, if not all, of our failures were old steel or

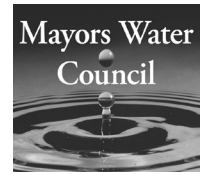
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# Mayors Water Council

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cast iron pipes that had failed from corrosion due to soil conditions or failure of cathodic protection. Since those concerns are eliminated with PVC and it is comparable in useful life, it made sense to make the switch on all of our internal projects. We also found that many developers due to its ease of installation preferred PVC. Because it's lighter and easier to work with, it reduces costs. Recognizing the long-term benefits, the City rewrote the standards for pipe installations to use PVC pipe. The quality of the pipe and the expected longevity will also result in fewer interruptions in service. In fact, Livermore has not experienced a PVC pipe failure since we switched over to using it in the 1990's. Furthermore, this reduction in leaks and breaks has resulted in additional conservation of our precious water resources; all the more important during California's recurring droughts.

The use of PVC will also allow the City to increase water pressure to the residents by an average of 25 lbs., further improving quality of life and increasing fire-fighting safety.



**Discolored water from iron sediments re-suspended from mainflushing. Photo by John Marchand**

### Benefits

- PVC is much lighter, making it cheaper to install.
- Relative initial low cost and low maintenance
- No need for cathodic protection systems
- Improved water quality in the distribution system.
- PVC has a conservative life expectancy of at least 100 years.
- PVC pipe is non-corrosive. The quality of the water delivered to the residents does not degrade as may happen with other pipe materials.

### Inspire with Passion

We need to urge our communities to build a science based, high water quality sustainable system.

We serve in public office so that our communities can be a better place. We lead by example, ask people for input, give them credit and let them know they are appreciated. If we demonstrate our own passion, we can instill into the city's workforce a passion for what they do and they also will be motivated in achieving high standards with integrity. As members of the community and public servants work together, we can achieve excellence in our cities and enjoy the benefits of sustainable and healthy living.

### Biography

Mayor John Marchand has worked on water quality issues for over 40 years. He worked as a water quality chemist for over thirty years. He served as a board member and president with the Zone 7 Water Agency for 15 years. He also had the privilege of being the Chairman of the System Water Quality Committee and the Water Quality Division for the California/Nevada Section of the American Water Works Association. Mayor Marchand is the co-author of three books on water quality and water sampling techniques. He was elected Mayor of Livermore, California in 2011 and is a member of the U.S. Conference of Mayors Water Task Force.



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