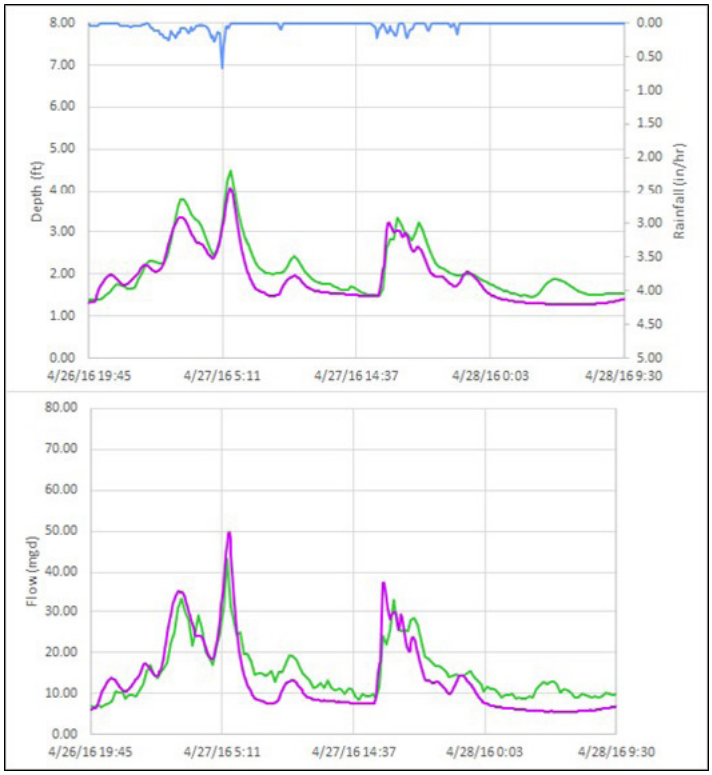
Sewer Collection System Model Value

In 2003, the City embarked on creating a computer model of its sewer collection system. The primary purpose was to support development of the (2009) CSO Long Term Control Plan (LTCP), by characterizing sewer system components, improving understanding of system operations, and identifying cost effective controls. The model was used to develop the original LTCP in 2009 and for LTCP updates in 2014 and 2021. The model informs CSO project designs by identifying concerns and constraints. As the model evolves, changes to the sewer system are continually incorporated. This allows the team to identify cost-effective controls and answer complex questions.

The Sewer Collection
that experience
Project Management

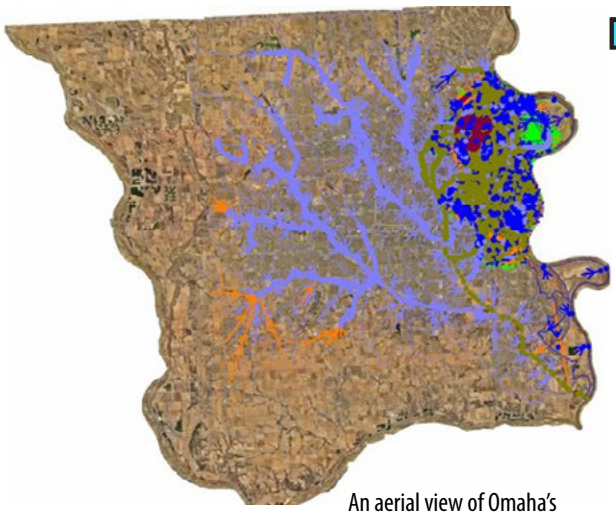


The chart above shows water depth (top) and flow (bottom). The model output is shown in purple; meter data is shown in green; and rainfall intensity is shown in blue. This shows how closely the model represents actual information and performs well.

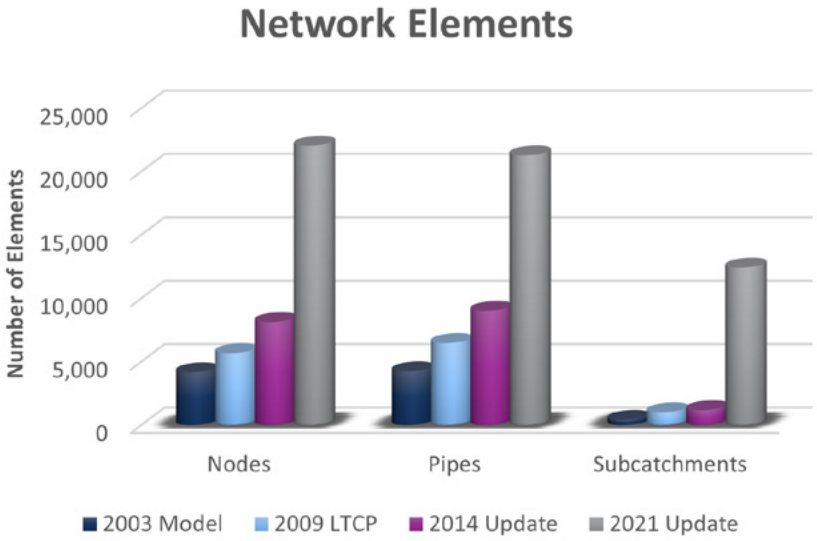
The City has recognized the tremendous potential of a reliable model to support data-driven decision-making. The CSO Program Management Team (PMT) ensures the model is maintained as the sewer system grows and changes. Knowing the model would be used to support a $2 billion Program, the City has invested over $8 Million since 2003 in developing, updating, and expanding the model to include flow and rainfall monitors and resulting data. This data helps validate and ensure model reliability.

The model's hydrologic component determines how rainfall turns into runoff during wet weather and where runoff enters the sewer system. That stormwater is added to sanitary flows generated by residential, commercial, and industrial users to make up the combined sewer flow. A hydraulic model component then determines how the flow moves through the sewer system as it encounters pumps, orifices, weirs, gates, and screens on its way to the City's two water resource recovery facilities for treatment.

The most basic model components—sometimes called network elements—are sewer pipes, "nodes" (primarily manholes) where the pipes intersect, and subcatchments



An aerial view of Omaha's model.



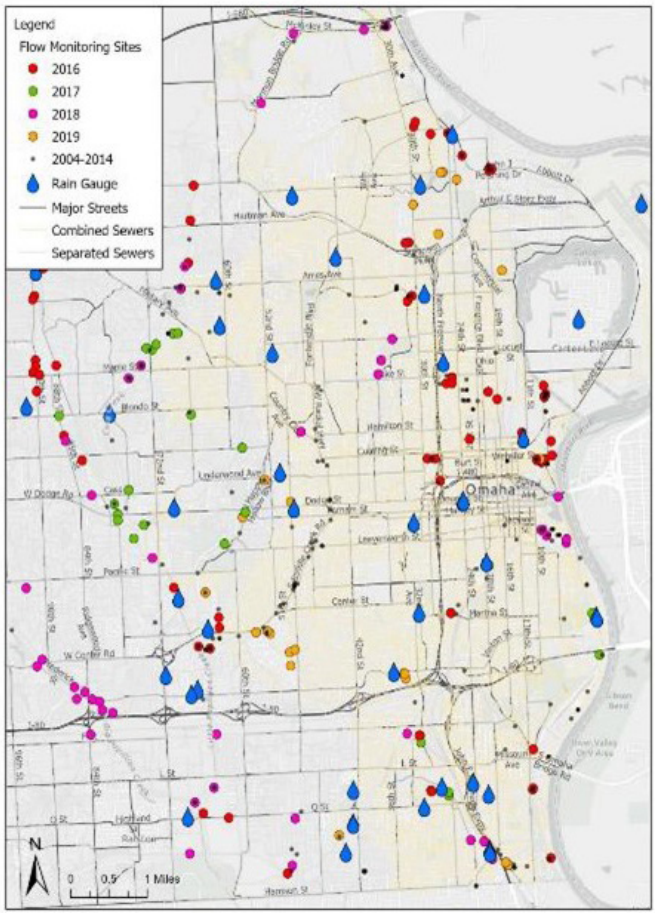
The City's model has valuable application beyond the CSO Program including a greater understanding of impacts from development, sewer rerouting, and sewer rehabilitation. It has also been used to identify cost of service, to recertify the levee, and to support fighting major floods in 2011 and 2019. It cost-effectively facilitates asking "What if…" to allow exploration of creative solutions.

System Model has been applied to areas of Omaha basement backups. Model results help the Team modify designs to prevent future backups.

that reflect neighborhood topography. The figure (above right) shows how the number of network elements has grown substantially as the model has increased in complexity. The model currently represents more than 800 miles of pipe in the City's sewer system.

The model has valuable application beyond the CSO Program. This includes a greater understanding of impacts from development, sewer rerouting, and sewer rehabilitation. The model is also helping to identify cost of service, to re-certify the levee, and to support fighting major floods in 2011 and 2019. The model allows project teams to cost-effectively ask "what if…" and explore creative solutions. When EPA officials requested assistance in 2019, the model was used to help smaller communities accomplish CSO planning by providing results to validate EPA efforts and provide a CSO tool for small communities.

The sewer system model has been an important and effective tool in guiding City decision-makers to solutions that result in substantial improvements in the quality of local rivers and creeks, so residents can safely enjoy the environment in which they live.



Flow and rain monitoring locations