Sanitary Sewer Overflow Management Using Geomembranes-One City's Sucesses and Challenges

Felon R. Wilson, P.E.[1]

[1]Seaman Corporation, Wooster Ohio USA; fwilson@seamancorp.com

This presentation discusses a case history where geomembranes help solve municipal infrastructure and environmental concerns regarding the abatement of Sanitary Sewer Overflows (SSO). Because the flow controls between Sanitary Sewers and Storm Sewers are often violated and the overflows can occur from either system, overflows containing municipal wastewater are often described as SSO or as CSO (Combined Sewer Overflows). Figure 1 is a photo of the result of wet weather flow entering a municipal sewage collection system, illustrated by the overflowing of a sanitary sewer manhole.

Figure 1. Sanitary Sewer Overflow

Prevention of SSO's is done by eliminating the wet weather flow, increasing system capacity, storing flow, or a combination of methods. Alternatives include extensive collection system remediation to prevent the overflows. Increasing system capacity involves replacement of underground infrastructure and/or increasing the capacity of wastewater treatment processes. Inline storage is usually accomplished by hardshell tanks (above or below ground) or inline open storage. Inline open storage typically implies impoundments with various secure lining alternatives.

This presentation details the analysis and decision process used by the city of Tulsa, OK in their decision to use inline open storage, lined with geomembranes for detention of SSO, often designated as Flow Equalization Basins (FEB's). Their system employs FEB's in a number of locations.

SSO storage impoundments must detain high volumes of very dilute municipal wastewater for short periods of times ranging typically from hours to several days. After the rain event, the wastewater is pumped or drained back into the collection system, or directly to the Water

Resource Recovery Facility (WRRF) for treatment. Tulsa's design engineers elected to use open impoundments with no cover in order to minimize pumping issues and allow for cleaning. Many of the concerns with exposed geomembrane covers also applied to these long term exposed impoundment liners. Two large geomembrane lined impoundments were installed at the end of the collection system, at the Haikey Creek Wastewater Treatment Plant. The first installation in 2012 was an existing geomembrane lined impoundment which required replacement due to several factors. The second was an expansion, duplicating the containment features of the first impoundment while over doubling the storage capacity.

Cost data is provided comparing the cost of these open impoundments vs. using hard shell storage at other municipal locations. Special engineered controls were employed to compensate for anticipated back pressure on a geomembrane impoundment which is typically empty.

The selected geomembrane was the XR-5®, manufactured by Seaman Corporation. By utilizing an exposed geomembrane with extremely low thermal Expansion characteristics, cleaning the basins is only required on a periodic basis. Tulsa employed specialized backflow systems that eliminated fresh water use but provided a designed system to clean the exposed geomembranes. Keeping the geomembrane system clean and thus minimizing odors from residuals was a very important factor in the geomembrane selection both at these installations and at all SSO storage sites nationwide, both hard shell and open storage.

Because the Tulsa system utilizes some SSO open storage facilities that are concrete lined, operational comparisons are provided with exposed geomembrane-lined impoundments. The operating Flow Equalization Basins (FEB's) are shown in Figure 2.

Figure 2. Haikey Creek WWTP Geomembrane Lined Flow Equalization Basins