

BACKGROUND OF THE FRAIR LANE PILOT PROGRAM

The Peters Township Sanitary Authority (Authority) is proposing to undertake a Pilot Program in the Friar Lane Sewershed to gather data on Rain Derived Inflow & Infiltration (RDII) into the sewer system. RDII is groundwater that makes its way into the building sewer through defects in the sewer pipe.

Objective: To develop a comprehensive plan to equitably test private properties for, and to eliminate, RDII within sewersheds identified by engineering studies that contribute large amounts of groundwater into the sanitary sewer system.

Background: The Authority has aggressively implemented a sewer system rehabilitation program since 1997. The program's target has been to televise 24,000 feet of public sewer each year, and rehabilitate or replace 12,000 feet. The primary objective of this program is to reduce both infiltration and inflow. While there is convincing data that indicates that "background" infiltration is being eliminated, peak flow during significant rain events remain as great or greater than they were in 1996. Furthermore, flow monitoring of individual sewersheds before and after rehabilitation repeatedly indicates zero peak flow reduction. The sewer rehabilitation program has been a failure in regards to reducing peak rain-induced flow. Prior to 2006, dye testing of 272 homes in areas where sewers have been rehabilitated identified only two homes with downspouts connected to the sanitary sewer, further confirming that direct, illegal surface water connections to the sewer are not a significant part of the problem.

The available data very strongly indicates what the Authority has suspected for some time, that is, the vast majority of the water entering the sewer system during significant rain events originates in the private plumbing system below grade, which consists of the building sewer, and the building drain. We can only guess at this time which part of the plumbing system contributes more water, but it is almost a certainty if only one of the parts were sealed water tight, the water would migrate to defects in the other.¹

Area-Wide vs. Time of Sale Testing:

The Time of Sale (TOS) inspection program seems to be a fair and systematic method of conducting building sewer inspections. In this method, homes are only inspected when sold or conveyed to another owner. Generally funds are available from the proceeds of the sale to pay for repairs, if necessary. Also, the property can not be conveyed unless repairs are made. From the Authority standpoint, the TOS program would not make a dramatic and measurable decrease in I&I due to the sporadic location of properties and the number of inspections per year based on home sales. Older homes, and possible those with the worst problems, may not be sold or inspected due to older long-term residents staying in their home compared to new homes purchased by younger more mobile families.

Homes would be selected based on engineering studies with those sewersheds having the highest I&I selected first. From the Authority standpoint, the Area-wide testing is the only way to quantify results of the rehabilitation and the impact of I&I removal.²

Reference Sewershed Concept:

¹ PTSA Policy Development for Building Sewer/Building Drain Inspection Program

² Peters Township Targeted vs. Time of Sale Building Sewer Inspections

One of the most difficult tasks in evaluating I/I removal success, or lack thereof, is the number of unknown variables that need to be accounted for to be able to compare one rain event prior to rehabilitation with another rain event afterwards. One proposed alternative is to use the Reference Sewershed approach. The Reference Sewershed is a nearby sub-sewer system where no rehabilitated work is performed. If flow monitoring is conducted on both the Reference and the Rehabilitated (Subject) Sewersheds before and after rehabilitation, then any difference in response between the Reference and the Subject before and after the rehabilitation is deemed to be due to the rehabilitation

Why Was Friar Lane and E. Edgewood Chosen: The Friar Lane Sewershed was selected to be rehabilitated using Cured in Place Pipe (CIPP) lining, and approximately 7,000 feet of 8-inch clay pipe sewer was lined in late 2004/early 2005. Prior to lining the Authority identified the use of the East Edgewood sewershed as a control or reference sewershed to help identify if the lining project removed any I&I. East Edgewood makes a good reference sewershed because is immediately adjacent to the subject sewershed, consists of similar age of construction and pipe materials, similar topography, and is fairly equivalent in footage and number of dwellings. Furthermore, pre-project flow monitoring identified that the peak flows originating from East Edgewood were fairly equivalent to the for the Friar Lane sewershed, on the order of 900 to 1,000 GPM.

Homes in the sewershed were constructed in mid-1960's. The predominate material for building sewers was Vitrified Clay Pipe (VCP) or the more common term, Terra Cotta pipe. System wide, we estimate that 70% of our customers have non-PVC (plastic) pipe. Over time, this type of pipe has a tendency to shift due to improper installation. This shifting causes cracks in the pipe and joints to open. This allows groundwater and tree roots to enter the sewer. Many, if not the majority, of sewers have never been inspected or maintained by the property owner until a problem forces action. Sewers are often "out of sight-out of mind."

In 2002, the Authority commissioned its engineer to conduct flow isolation testing throughout the Brush Run system to identify sewersheds that were contributing excessive amounts of I&I. The Authority, on eight occasions since 2006, has tested homes in the Friar Lane Sewershed to document sources of I&I, and to eliminate false positives, with in-house and contracted testing. The Authority has contracted twice with C&K Industrial Services to conduct Rainfall Simulation Testing on properties within the sewershed. The results of these tests are as follows:

- There was very little infiltration from the public sewer
- 39% of dwellings discharge less than 1 gallon per minute (GPM). Repairs not required.
- 61% discharge greater than 1 GPM. Repairs needed.
- 18% of the total inspected discharge greater than 3 GPM. Repairs needed.
- 8% of the total inspected discharge greater than 8 GPM. Repairs needed.

Extrapolating data from tests in the Friar Lane sewershed to the entire Brush Run system, we can say that 60% of the problem is from 12% of the customers.

How Bad is the Problem on Friar Lane?

During peak rain events, the 24-hour volume of flow, measured in Gallons Per Day (GPD) per Equivalent Dwelling Unit (EDU) is:

AREA	GALLONS PER DAY PER EDU
Newer PVC Pipe Systems in general	Less than 100 GPD per EDU
Brush Run Sewer System as a whole	1,600 GPD per EDU
Friar Lane Sewershed	13,000 GPD per EDU

What Corrective and Preventative Measures Have Been Taken on Friar Lane?

- The Authority has relined ~7,000 LF of its sewer main
- Two manholes have been repaired
- Five sewer connections to the Authority main line have been repaired by grouting
- One private building sewer has been replaced
- Two private building drains have been repaired
- One property has had their downspouts disconnected from the sewer system
- One property has had their foundation drain disconnected from the sewer system

Why is This Important?

Regulatory agencies have applied increasing amounts of pressure on sewerage agencies during the past decade to eliminate SSOs (Sanitary Sewer Overflows), and that trend is expected to continue. Currently, ALCOSAN and its contributing 83 satellite communities are under Administrative Consent Orders with the US Environmental Protection Agency (EPA) to substantially reduce Combined Sewer Overflows (CSOs), and eliminate all SSOs at a projected cost of \$8 billion dollars. Other metropolitan areas forced to spend hundreds of million of dollars to manage peak wet weather flows include Atlanta, Baltimore, Cincinnati, Nashville, Detroit, Toledo, Washington, D.C., and Youngstown to name a few. Other local sewage providers currently being forced to upgrade their treatment plants to significantly reduce CSOs include McKeesport and Clairton, at a cost of \$20 to \$40 million, each.

The regulatory agencies can not force nearby communities to expend millions of dollars to eliminate illegal discharges and then ignore Peters Township Sanitary Authority. Sooner or later, if we fail to address our peak wet weather problems proactively, we will be forced to do so by regulatory pressure.

The Clean Water Act and NPDES permits do not provide an exemption for severe rain events. Enforcement actions for violations during severe rain events are largely a matter of regulatory discretion which varies widely depending on regions and individuals involved. The Authority's strategy is to avoid regulatory enforcement by being more proactive, and more successful in our endeavors, than other nearby sewerage providers.

The most probable regulatory pressure, and the most influential to the Authority, is a tap ban or tap restriction which would inhibit the building of new homes. Part of our Mission is to provide for sewage service to the undeveloped areas of the Township in our service area, therefore, a tap ban would be failure at our Mission.

Other consequences of failure to manage peak flows include:

- Sewage backups in to homes
- Otherwise unnecessary multi-million dollar plant expansions
- Lawsuits by environmental groups
- Significantly increased costs when nutrient discharge limits are imposed
- Consent orders dictating term and schedules for capital improvements
- Penalties up to \$10,000 per offense