

Pollution Detectives at Work: Identifying Illicit Discharges

The City of Duluth in partnership with Western Lake Superior Sanitary District (WLSSD) has a program to identify and eliminate discharges of [sanitary wastewater](#) (sewage) **Link** and other pollutants into the storm sewer system. These discharges can occur when materials are intentionally dumped down a storm water drain or when a private sewer pipe has accidentally been connected to a stormwater pipe, or when leaks occur in both private and public sanitary pipes allowing wastewater to enter the stormwater system. These “sanitary” waste discharges are often discovered only after water testing reveals high levels of [fecal coliform bacteria](#) in a stream or other body of water. Other illicit discharges are discovered when the public or City public works or WLSSD staff notice strange smells or colors in the water.

By definition the **Storm water sewer system** is designed to transport only stormwater runoff, snow melt, surface runoff and drainage.

However, after a rain storm it is not unusual to see higher concentrations of fecal coliform bacteria and other pollutants (fecal coliforms are a group of bacteria associated excrement from humans and other warm-blooded animals). The rain water flushes these wastes, sediments and other pollutants from the surfaces of the City into the streams. During extremely large storm events the sanitary sewer pipes may overflow with rainwater from footing drains and overflow – a problem called [Inflow and Infiltration, or I&I](#). The City and WLSSD have an ongoing [I&I program](#) to eliminate these sanitary stormwater overflows. Because we know the problem can occur, wading in streams following heavy rain is not advisable

It’s confusing that we wash our hands to maintain good *sanitation* but that the piping system that carries our toilet and drain water is called the *sanitary* sewer system. Imagine what an *unsanitary* sewer system must be like.

In dry weather the coliform levels in the streams should be low. Unfortunately, sometimes they aren’t and when this occurs - the pollution detectives go to work. This crack team of sleuths from WLSSD and the City of Duluth team starts looking for

sources of wastewater entering the stream. The two stories that follow describe investigations of incidents in which samples from City streams were found to contain high levels of fecal coliforms with two different sources of pollutants being identified.

EPISODE 1(2004): *Finding the leaking pipes*

High fecal coliform levels in dry weather in a stream discharging below the Superior *LakeWalk* set the *Team* to work. They met to review the situation. The problem – how to find the source?

Step 1: The detectives reviewed a map of all the connections that might contribute to the outlet. They then began sampling at 10 points along the path of the stream to determine where the high counts occurred. From these data the team determined that the pollution occurred somewhere near Superior Street.

Step 2: To identify the source the investigators placed a [bright green dye](#) in the sanitary sewers of buildings in the vicinity and watched to see if it appeared in the storm water system. The green dye appeared from several buildings near Superior Street.

Step 3: The detectives placed a camera in the storm line feeding the stream at that point. [Click on the video](#) to see what they discovered.



These images are video clips from the sewer cam. On the ceiling of the main stormwater drain tunnel you can see a dark colored pipe that is the much smaller diameter sanitary sewer line. Most of the white streaks are dripping water

A sanitary sewer line crossed over the top of the storm line. At some point recently, the sanitary sewer line had cracked and now was leaking into the storm line.

Step 4: A construction crew was called in and the line was repaired – problem solved!

However, testing after the repair indicated that there may be some other problems and so other repairs were ordered and the investigative team continued to test to find other sources. The initial testing required over 40 hours of staff time sampling in the field, testing in the laboratory, televising and added fluorescent dyes to trace inputs from building and residential drains.

EPISODE 2(2004): *What is going on under the expressway?*

High fecal coliform counts were found at the mouth of [Buckingham Creek](#). The mouth is located in the industrial area of Duluth and there is limited risk for human exposure. However, the source must be found and so once again, the pollution investigative team went to work.

Step 1: Again a map of the region was examined and samples for bacteria were taken up-stream of the known problem site.

Step 2: The sampling revealed that fecal coliform levels were relatively low before the stream went under Interstate-35. However, when the stream came out from under I-35 the values were very high as show on the map below.



Fecal coliform bacteria concentrations in lower Buckingham Creek in summer 2004. The units of the measurement are in colony forming units (cfu) per 100 ml of water.

Step 3: The pollution detectives investigated what was occurring below the expressway. Their discoveries are illustrated in the following pictures. A picture is worth a thousand words, or at least a thousand cfus of fecal coliform bacteria.

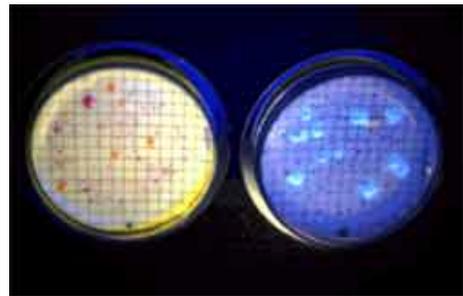


Some of the hundreds of pigeons roosting under the expressway. Note the white streaks.



Just a bit of the pigeon droppings seen along the creek

Mystery solved. The fecal coliforms were from a natural, albeit unpleasant source - pigeon guano (bird poop). Problems with wildlife sources are much more difficult to eliminate and the actual health risks to humans are usually not well understood. In some cases the only answer is putting up signs at the point of discharge to warn people that there is a potential health risk and they should avoid water contact. You can find out more about water borne diseases at LakeSuperiorStreams.org and at <http://mnbeaches.org/>. The Lake Superior Beach Monitoring program now (2006) only monitors *E. coli* bacteria, a subgroup of the fecal coliforms after 3 years of monitoring both *E.coli* and fecal coliforms simultaneously. The fecals assay has been determined to be less accurate in terms of identifying human health risks than the more specific *E. coli* assay. However, for this type of investigation, fecal coliform measurements work well and are easier and cheaper, and routinely performed at WLSSD.



Solving this mystery required 8 hours of field staff time and more than a dozen samples were taken to the laboratory for testing requiring another 4 hours of travel time as well as hundreds of dollars of analytical costs.

The *Pollution Sleuths* will continue to work each time a problem is discovered with the quality of our surface waters.

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