



Activity 3.3.3 Wastewater Management (Optional)




Introduction

As urban centers grew in size, it became apparent that dumping raw sewage into streets, creeks, rivers, and lakes ultimately threatened the drinking water supply. The concept of wastewater management was born.





Once water has entered a structure, it is inevitable that the water will be used and the quality changed – usually for the worse. The used water is called wastewater. The constituents (impurities) within wastewater are dependent upon how the water has been used.

Sanitary wastewater is generally accepted to consist of human waste, household cleaning solutions, oil and grease from cooking activities, small solid particles from garbage grinders, or soil from cleaning clothes and floors. Wastewater from commercial establishments may include metals, strong acids and bases, cleaning solvents, oil and grease, and grit (small plastic, glass, stone, or metal particles), in addition to sanitary wastewater. Sometimes water is used for cooling purposes; thermal pollution is created and must be managed correctly.

A civil (environmental) engineer must decide how to manage the wastewater by considering three broad categorical options:

-  **Reuse:** Wastewater that can be used again without treatment of any kind
-  **Recycling:** Wastewater that is treated either on-site or off-site and used again
-  **Discharge/treatment:** Wastewater that is simply discharged from the structure for treatment either on-site or off-site

Equipment






-  Pencil
-  Engineering notebook
-  Calculator
-  Computer with internet access

Procedure

In this activity you will select an appropriate wastewater management method and perform fundamental layout calculations.

The selected method of wastewater management depends upon the quantity (i.e., flow

rate) and quality of the wastewater, available treatment technologies, and the economics. For the purposes of this activity, you will assume that the primary contaminant in the wastewater is organic matter and NOT toxic to microorganisms. If the wastewater from your project structure has unique characteristics (e.g., heavy metals from electroplating or strong solvents from a dry cleaning business), you need to consider the quality of the wastewater as well as the quantity.

1. Apply what you have learned about wastewater management and the Noblesville Code of Ordinances to choose a wastewater treatment method for the Keystone Library Renovation project.
2. Design the connection from the library to the system. Show all work and document your design. Assume that the **invert** elevation of the 12 inch sewer main where the sewer lateral will connect is 766.05 feet.
 -  Calculate approximate crown elevation of the existing 12 inch sanitary sewer pipe.
 -  Determine horizontal distance from the structure to the existing sewer main.
 -  Determine the sewer lateral pipe invert elevation at the structure foundation.
Assume that the sewer invert must be at least 2 feet below the lowest floor requiring sanitary sewer drainage and that the sewer crown must be below frost depth. Frost depths are available at http://www.soundfootings.com/pdf/US_Map_Frost_DepthAVG.pdf
 -  Calculate slope of the sewer lateral from the structure to sewer main.
 -  If the local regulations require a 2% slope, does your design meet the requirement?

Conclusion

1. Why is there a minimum slope for gravity wastewater disposal but no slope requirements for water supply?
2. What would be required if the wastewater from a commercial facility were toxic?