

What does Wastewater Engineering do?

The Engineering Division of the Wastewater Department supports their mission by performing a number of functions such as data management, sewer design, construction management, flow monitoring, reviewing development plans, and inspecting sewer construction.

Data and Construction Management

The Wastewater Department gathers data on the condition of the sanitary sewer collection system through reports from operators, visual inspections conducted via closed-circuit television, flow monitoring, and special studies. These data are analyzed and problem conditions are prioritized problems based on severity. The Engineering Division determines the best and most cost-effective means of correcting problems in the sanitary sewer system, designs sewer rehabilitation projects, and manages construction projects that repair sanitary sewers to minimize the likelihood of sewer blockages that result in spills or backups.



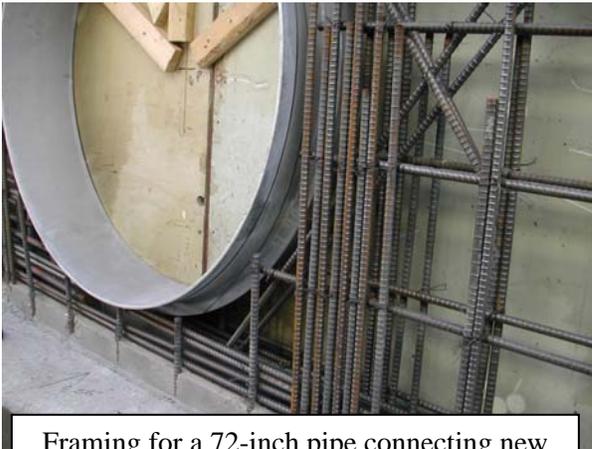
Designing a sanitary sewer construction project



Removing old infrastructure from the 1930's to make room for new

Construction Management

The Engineering Division deals with projects both in the sanitary sewer collection system as well as at the Water Reclamation Facility. The Water Reclamation Facility is over 25 years old. Many pieces of equipment are worn out and need to be replaced. Much of the infrastructure, including concrete tanks, valves, and underground pipes and vaults, are also beginning to fail and need repair. All of these projects are costly, and most need professional engineering design and construction management. The Engineering Division supports these projects by assisting treatment facility staff in determining the best and most cost-effective means of correcting problems with equipment and infrastructure, designing the corrective action project, managing the contractual and financial aspects of the project including competitive bidding and construction oversight.



Framing for a 72-inch pipe connecting new basins at the Water Reclamation Facility



Tying re-bar for new tankage at the Water Reclamation Facility

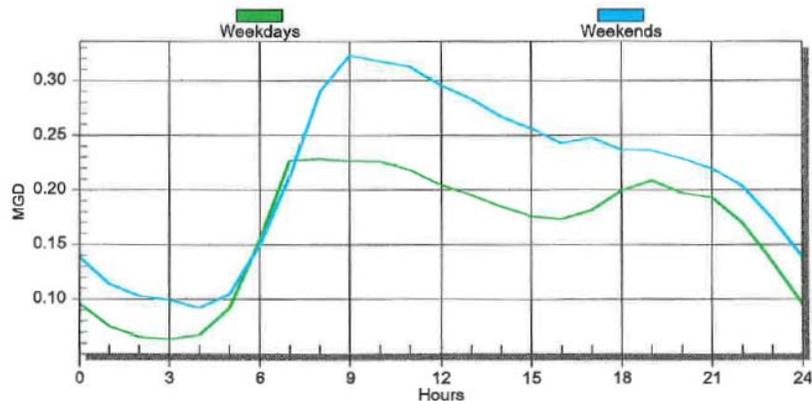


Drilling a well to lower the water table temporarily at the Water Reclamation Facility

Flow Monitoring

Sewer system capacity is a major concern. As cities grow and expand their boundaries, the sewer lines in the interior city that had plenty of capacity when they were built sometimes become over-full. Sewer capacity is a significant issue in controlling spills and backups.

The Engineering Division has portable flow monitors that can be placed in sanitary sewer manholes to measure wastewater flow. Wastewater flow in sewers changes significantly throughout the day, and from day to day during the week. The flow monitoring program allows the Engineering Division to measure the actual flows in sewer mains and compare those flows to the calculated capacity of the sewer mains. By comparing these values, the Engineering Department can identify “hydraulic bottlenecks” – locations where sewer mains are undersized for the flows they carry. This information is used to prioritize sewer construction projects to ensure that all of Pueblo’s sewer mains are able to carry the flows they receive.



The flow monitoring hydrograph above tracks wastewater flows through a manhole throughout the day for a full week. The vertical scale on the left measures flow in millions of gallons per day. The scale at the bottom shows the time of day from one minute past midnight (0) to midnight (24) using a 24-hour military time scale. The hydrograph shows that wastewater flows are significantly higher on weekends than on weekdays. It also shows that flow varies significantly throughout the day, from a low at about 3:00 am to a high at about 9:00 am.

Reviewing Development Plans

The Engineering Division reviews plans for new developments to ensure that new sanitary sewers are built according to Pueblo's design specifications. Sanitary sewers in Pueblo are designed and constructed by the developers who plan and build subdivisions. Sanitary sewers must be built with adequate size and slope to carry all the wastewater expected to be generated within a drainage basin in the future. These requirements are intended to ensure that sewer mains will not have to be replaced in the future, after development has resulted in costly improvements to public and private property that will be damaged by sewer main replacement.



Developers may be required to construct over-sized sewer mains, larger than needed to serve the immediate development, in order to ensure that it will not be necessary in the future to dig up paved streets and disturb other underground utilities in order to install larger sewer mains to accommodate growth. Developers may also be required to make off-site

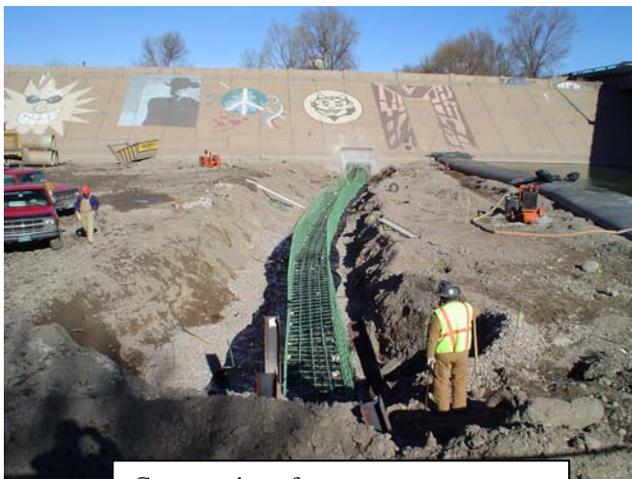
sewer improvements, such as enlarging existing sewer mains downstream of their development, in order to accommodate existing or future wastewater flows. Where oversized mains or offsite improvements are required, developers are eligible for cost recovery agreements that allow them to be reimbursed for those portions of sanitary sewer construction costs that go beyond the cost of serving their development alone.

Inspection

Designing projects is only half the battle. Proper construction techniques are needed to bring a project to successful completion. In pipeline construction, pipes need to be properly bedded to prevent sags in the pipe, and the trench must be properly filled and compacted to prevent damage to the pipe and sags in the surface pavement. The pipes and fittings must be of the proper size and material, installed properly, and coated to resist corrosion. Pipes must be laid at the proper elevation to connect to existing infrastructure, and must be laid on the proper slope in order to carry wastewater flow efficiently by gravity. Inspecting the work in progress to make sure everything is done properly is an essential part of construction management. The Engineering Division performs these roles.



Workers erect forms for vertical walls of concrete tankage at the Water Reclamation Facility



Construction of a concrete encasement for a 36-inch sanitary sewer main beneath the Arkansas River



A workman places concrete around a manhole base