SECTION 6
IMPROVEMENT OPTIONS

General

This section describes the various improvement options that may be utilized to address system deficiencies and provide system improvements to serve future growth areas within the City of Sheridan.

There are generally two types of improvement options considered for stormwater improvements: structural and non-structural. An example of a structural improvement is the construction of a diversion pipe around a flow restriction. A non-structural improvement could include increased cleaning of catch basins to reduce the potential for sediments filling up natural conveyance channels downstream. The City typically relies on a combination of both structural and non-structural improvements to provide cost-effective stormwater management.

The focus of this section is to describe structural improvement options that could be used to correct existing system deficiencies, or to accommodate future growth within the planning areas. Preferred alternatives were selected for each improvement required for the City's 20-year Capital Improvement Program (CIP), based on the discussion presented below. The 20-year CIP, and specific recommended projects, are presented in Section 7 of this study.

Conveyance System Improvements

Conveyance system improvements are intended to ensure the conveyance system can pass the estimated runoff from the design storm event without flooding. The conveyance system generally includes pipes, manholes, catch basins and inlets, swales, ditches, creeks and culverts. The system may also include regional detention facilities, which are publicly-owned and maintained facilities designed to store and reduce peak runoff rates.

Increase Pipe Capacity

Increasing pipe capacity is the traditional approach to increasing overall stormwater system conveyance. Increased capacity can be accomplished by replacing undersized pipes and by installing parallel pipes. Larger pipes are typically recommended when existing pipes are in poor condition. Stormwater piping is often relatively shallow in comparison with other buried utilities, and pipe enlargement under roadways can be limited by the requirement for structural cover over the pipe. Stormwater pipes flow by gravity and are additionally constrained by existing utilities and the downstream discharge elevation. Parallel pipes are often recommended where existing pipes can remain in service. Problems associated with undersized culverts can often be alleviated by constructing an adjacent parallel culvert.

Increase Capacity of Natural Channel

All stormwater runoff in the City is ultimately discharged to the natural surface water system. In some cases, the stormwater flows through smaller natural channels before reaching the larger receiving waters. Where capacity in these natural channels may be limited, increasing capacity can be approached in two ways. Larger flows can be accommodated by increasing the cross-sectional area of the channel or by reducing the frictional resistance of the channel. Increasing cross-sectional area typically requires increasing the width, because channel depth is often limited by the available elevation drop in the system. Frictional resistance can be improved through routine maintenance, such as clearing vegetation, or by cleaning or resurfacing the channel.

Under current environmental regulations, natural channels are considered natural resource areas, providing valuable habitat for fish and wildlife as well as other water quality benefits. Construction work within these areas often requires a lengthy process to obtain permits from various regulatory agencies with restrictions put on the type and timing of work performed. Mitigation work is often required to improve surrounding natural areas, thereby increasing overall project cost. Because of the cost and uncertainty of the permitting process and the requirements imposed, improvements to the natural channels usually consist of minor maintenance only to restore historical stream capacity. Public Works staff has expressed their preference for constructing bypass underground conveyance piping to remove and reroute excess flows from natural channels during high storm events to prevent localized flooding. In some cases, where site conditions may permit, upstream detention facilities and other low-impact development methods may be used to limit peak runoff rates to the capacity of the channel.

Construct Detention Facilities

Detention facilities temporarily store peak stormwater runoff from a developed area and then discharge the water to the receiving system at a lower controlled rate. This is traditionally performed where an analysis demonstrates the downstream conveyance system may be overburdened by increased flow. Often these facilities are constructed on a site-by-site basis. Generally, a site developer must construct permanent on-site stormwater quantity detention facilities to reduce the peak runoff rates from the site to the pre-development peak runoff rates, or improve the downstream receiving system capacity to accommodate the increased runoff.

More specifically, the City may require on-site detention if any of the following conditions exist:

- There is an identified downstream deficiency, and the City determines that detention rather than conveyance system enlargement is the more effective solution.

- There is already an identified regional detention site within the boundary of the development.

It is recommended that the City consider allowing detention facilities in developments that will have wetland mitigation as a result of their development. Generally, regional facilities are preferable to individual on-site facilities because they are publicly-owned and maintained, and their continued performance is better assured.

Regional detention facilities appear to be most suited for future development of undeveloped areas north of Blair Street and east of Bridge Street. These areas flow through the Elm and Cherry Hill basins, where additional runoff will flow through already developed areas and capacity restrictions already exist. Capacity improvements in either basin will generally be difficult due to the predominance of natural channels, and the lack of right-of-way.

Provide Reduction in Peak Flow Rates through LIDA

Over the years, traditional stormwater management techniques have adapted to the development of impervious surfaces by typically increasing conveyance capacity. The compounded effects of increased runoff are shown in many cases to degrade the natural environment, with peak runoff rates resulting in erosion, increased pollutant loads and reduced stream base flows caused by reduced groundwater infiltration. There is now an increased awareness of these impacts, and a desire by citizens, community leaders and developers to reduce hydrologic impacts caused by stormwater. One method that has received increased attention recently is the use of Low-Impact Development Approaches (LIDA). LIDA are methods for stormwater management which are intended to reduce the impact of stormwater runoff from a development's impervious surfaces to the natural environment. This is accomplished through the reduction of peak runoff rates from impervious surfaces such as building roofs or pavement, and through infiltration, which reduces the overall volume of runoff. Examples of LIDA include vegetated infiltration swales, pervious asphalt and Portland cement concrete pavements, eco-roofs, vegetated filter strips and "green streets".

Some LIDA depend on permeable soil to allow infiltration for runoff control. A significant portion of the City is located on less permeable soil types, classified as 'C' or 'D' (as described in Section 2). It is important that proper assessment of each development site is provided to determine infiltration ability, so that proper LIDA techniques are utilized. Proper maintenance is also essential in the long-term effectiveness of LIDA, and should be considered in the application of these techniques.