PART VIII - OPERATION AND MAINTENANCE

PART VIII

OPERATION AND MAINTENANCE

A. GENERAL

Continuing regular maintenance of the storm drainage system is essential to assure that the system hydraulic capacity is available when storm runoff occurs. It is equally essential to preserve the considerable capital value of the system.

Generally, there is not a clear and accepted line of demarcation between street and drainage maintenance activities and budgets. Maintenance of the storm drainage system shares a need for many of the same types of equipment and labor as is common to sanitary sewer and street maintenance. Because of these common factors, it is logical to assign responsibility for storm drainage system maintenance to the Public Works Department.

The existing maintenance condition of Manhattan's drainage system at the time of the field observation activities gave clear evidence of the lack of any systematic maintenance program. Conditions were characteristic of those developing over time under a maintenance program generally limited to responding to emergencies "after-the-fact" on the basis of complaints.

B. MAINTENANCE RESPONSIBILITY

The City currently assumes maintenance responsibility for improved drainage system facilities within the corporate limits and will continue to do so in the future. These facilities include enclosed pipe-inlet systems, road culverts, roadside ditches within city street right-of-way, and improved open channels, generally those which are concrete or riprap-lined. Stormwater holding ponds located near the South Manhattan Avenue pump station are also the City's responsibility. Maintenance of public detention facilities, if constructed in the future, will become the responsibility of the City.

Maintenance of natural or unimproved channels is currently not performed by City personnel which will continue to be policy in the future. Upkeep of

these facilities is the responsibility of the private property owner(s) whose land abuts the channels.

C. ORGANIZATION AND EQUIPMENT

Currently, the City's Public Works Department normally assigns two laborers, a loader and a dump truck, all from the street maintenance division, as a storm sewer system maintenance/repair crew with additional personnel and equipment available for specific, larger jobs as needed. This "typical" crew would be capable of performing many of the routine maintenance tasks, described on the following pages, for the existing drainage system at an average hourly cost of $55.90, exclusive of administrative overheads.

As the City grows and the system expands, however, additional crews will be required just to perform the routine tasks. The following labor and equipment availability is recommended for eventual normal maintenance of the storm drainage system. These recommendations assume that the City will continue its policy of not performing regular maintenance along unimproved channels which is particularly labor intensive. In the event that position is reversed, additional labor and equipment will be required with hourly costs possibly reaching $100 to $150.

TABLE VIII -1

ORGANIZATION AND EQUIPMENT FOR STORM SEWER SYSTEM MAINTENANCE

ITEM	DESCRIPTION	NO.
1.0	LABOR	
1.1	Foreman	1
1.2	Laborers/Equipment Operators	4
2.0	EQUIPMENT	
2.1	Jet Rodder	1
2.2	Industrial Tractor/Loader Backhoe	1
2.3	Tractor/Mower	1
2.4	Concrete Mixer - 3-1/2 cu ft	1
2.5	Portable Generator	1
2.6	Air Compressor	1
2.7	Chain Saws	2
2.8	Truck, Dump Body	1
2.9	Truck, Flat Bed Utility or Pickup	1
2.10	Hand Tools	-

D. MAINTENANCE TASKS

There is not a clear line of demarcation between work classified as maintenance and that more properly classified as construction. City maintenance in the context of this study is defined as work necessary to preserve the capacity and function of an existing facility which can be performed by reasonably available conventional city equipment and labor forces. The following types of maintenance tasks are those necessary to effectively maintain the storm drainage system.

1. INSPECTION

System facilities should be routinely inspected and maintenance scheduled to correct deficiencies noted during the inspection. A systematic method of record keeping should be initiated to record the inspection and track the maintenance history of individual system components. Routine inspection can be performed by public works maintenance staff personnel with special follow-up inspections by staff professional engineers or consultants in those infrequent instances that the routine inspection identifies any unusual structural or operational defect in the facility. The following is the recommended inspection schedule for the various drainage facilities.

FACILITY TYPE	INSPECTION FREQUENCY
Inlet/Catch Basins	Annual
Open Channels	Annual
Culverts on Open Channels	Annual
Roadside Ditches	Annual
Detention Basins	Annual

Interior inspection of pipe storm sewers is not routinely necessary; however, those sections of pipe having a known history of becoming obstructed due to the entry of debris and sediment from upstream open ditches should be inspected annually. Television inspection is recommended for old existing pipe and box structures not accessible for visual inspection.

2. ROADSIDE DITCHES

Normal recurring maintenance needs are removal of sediment and debris from the ditch and driveway culverts. Although located in street right-

of-way, regular mowing in season should be considered the responsibility of the abutting property owner. It is also recommended that replacement of private driveway culverts be the responsibility of the property owner. Since many driveway culverts are older, partly corroded metal pipes, a high initial incidence of failure during or after clean-out should be expected.

The rate of ditch sedimentation will vary across the City. Where grades are steep, the rate will be relatively slow while flatter ditch slopes will result in a higher sedimentation rate. A maintenance interval of two years is suggested for initial programming until experience in specific areas indicates the need to shorten or lengthen the time period.

3. CULVERTS ON OPEN CHANNELS

Normal recurring maintenance needs are the removal of debris and sediment. Multi-barrel culverts are most prone to the accumulation of obstructing sediment. In areas where maintenance of natural open channels is adequate, the maintenance requirements for culverts will decrease.

Structural repairs such as minor patching of surface spalls, joint sealing, etc., will be necessary during the service life of the structures at irregular intervals. Sediment removal should be expected on an annual basis.

4. LINED OPEN CHANNELS

Annual maintenance requirements are usually limited to the removal of debris. Periodic surface patching and repair of joints in concrete-lined sections should be performed on an as-needed basis. Expansion joints and cracks that permit vegetation to lodge and produce root damage should be treated with an appropriate herbicide to control vegetation. Replacement or repair of lining material in riprap or gabion-lined channels should also be performed on an as-needed basis. Brush or other vegetation which obstructs the channel or causes deformation or displacement of the lining should be cut periodically.

Scheduled storm drainage system maintenance activities, especially those related to the maintenance of open channels, should be planned for the months of November through April to both assure maximum system capacity during the season of heaviest normal rain, and to take advantage of the most favorable conditions for accessibility of the work. Such seasonal scheduling of maintenance is also most conducive to efficient overall utilization of staff and equipment.

It is estimated that 1,020 labor hours per year are required to maintain the existing major drainage system based on performing the routine activities described above using the City's current typical maintenance crew. Regular maintenance activities associated with the minor system are anticipated to require another 1,000 hours.

E. ANNUAL MAINTENANCE

The City's existing major drainage system includes 55.1 miles of pipe, culverts, and open channels. Average annual maintenance costs over the useful life of the major system components, as estimated by the SYCOST model, is $ 43,000 per year. Maintenance costs associated with the minor system are expected to be at least as much as for the major system which results in an annual expense for the entire system of approximately $100,000. This initial annual budget will suffice to address the apparent maintenance needs of the existing major system but will not provide for a prudent reserve fund for increasing maintenance as the system ages and expands. Figure VIII-1 graphically illustrates the system-wide distribution and relative maintenance costs of the major classes of system components.

F. CURRENT MAJOR MAINTENANCE NEEDS

The following system components have been identified from field observations as high priority maintenance items on the major drainage system. These maintenance tasks are necessary to restore the full capacity of the system components. It is noted that several of the identified facilities are outside the municipal boundaries and are not the City's responsibility; however, it is recommended that the appropriate agencies be notified of these maintenance needs to help restore the overall system function.

1. Lines 1114 and 1145: Clear brush and vegetation obstructing the channel draining to the north from the diversion structure and the Riverside Drain south of the structure. Estimated cost - $ 3,600.
2. Line 1141: Remove sediment and regrade to re-establish the channel cross-section in the Riverside Drain immediately downstream from Bluemont. Estimated cost - $ 3,500.
3. Line 4005: Remove silt from the triple 10'x 3' RCB across Butterfield. Estimated costs - $ 500.
4. Line 4015: Remove silt from the barrels of the 6'x 2' RCB across Brockman and regrade the channel transition at the upstream end. Estimated cost -$ 1,000.
5. Line 4030: Remove silt and debris from the upstream end of the 7'x 6' RCB across Kimball. Estimated cost - $ 500.
6. Line 5032: Remove silt and debris from the upstream end of the 48-inch culvert across Claflin. Estimated cost - $ 300.
7. Line 5070: Remove silt from the double 7'x 2' RCB across Dickens. Estimated cost - $ 400.
8. Line 6051: Replace collapsed section of 96-inch CMP in CICO Park (25 LF assumed). Estimated cost - $ 17,600.
9. Line 11006: Remove silt and debris and repair upstream headwall of the two 42"x 24" CMPAs across College. The culverts should also be thoroughly inspected since one pipe appeared to be in danger of collapsing. Estimated cost - $ 800.
10. Line 11065: Remove silt and debris along the channel, especially at the outlets of culverts draining from adjacent streets. Estimated cost - $ 1,000.
11. Line 11091: Remove silt from 4'x 3' RCB across Browning. Estimated cost - $ 400.
12. Line 11140: Remove silt from 4'x 5' RCB across Marlatt. Estimated cost - $ 400.

G. MAINTENANCE OF PRIVATE SYSTEM FACILITIES

Regular maintenance of all storm drainage facilities is necessary to insure the system's continuing function at an acceptable level of service. However, maintenance of components which are the responsibility of private property owners is often neglected, especially along natural channels, creating potential drainage problems. Depending on the size and location of the

element, its failure to function properly can affect the system as a whole and impact a much larger group than just the residents in the immediate area. Maintenance of private components is generally difficult to regulate or enforce, though, since no ordinances currently exist that explicitly require the performance of such tasks. Methods of dealing with this issue suggested in the following paragraphs will require revisions to municipal ordinances and codes.

To insure that adequate private storm drainage maintenance is performed, the City may want to consider regulations similar to existing codes requiring upkeep of houses, yards, buildings, vacant lots, etc. This approach would include periodic inspections of private drainage facilities, which could be incorporated into the routine inspections recommended for public facilities, with notices of required maintenance issued to property owners as necessary. Once the owner has been notified, a reasonable period of time would be allowed to accomplish the work and a reinspection made at the end of the period. In the event the required maintenance has not been completed, City crews could perform the work and bill the property owner for the actual labor, equipment and administrative costs. Fines could also be imposed either in addition to, or in lieu of, the City billing the owner for the work. In extreme cases, a "last resort" approach could include revoking the occupancy or use permit for the property or possibly even condemning the property if the problems caused by the lack of maintenance are serious enough.

For private detention facilities, requiring an annual operating permit is also a possible solution to controlling private maintenance. The process would include an annual inspection, notices of required maintenance and follow-up activities similar to those for conveyance facilities. A nominal fee could be required to cover the City's inspection and administrative costs although this would, in a sense, penalize detention systems if similar charges are not required for conveyance facilities.

In addition to the requirements for maintaining the actual drainage system, it is recommended the City adopt a policy and appropriate regulations requiring erosion control plans for all new construction projects. These plans can be as simple as requiring a line of hay bales along the edges of a

residential building lot, to a more complex system of silt fencing, filters and siltation ponds on larger projects. This recommendation is intended to prevent siltation on public streets and in the existing downstream drainage system which increases the City's maintenance program and costs.

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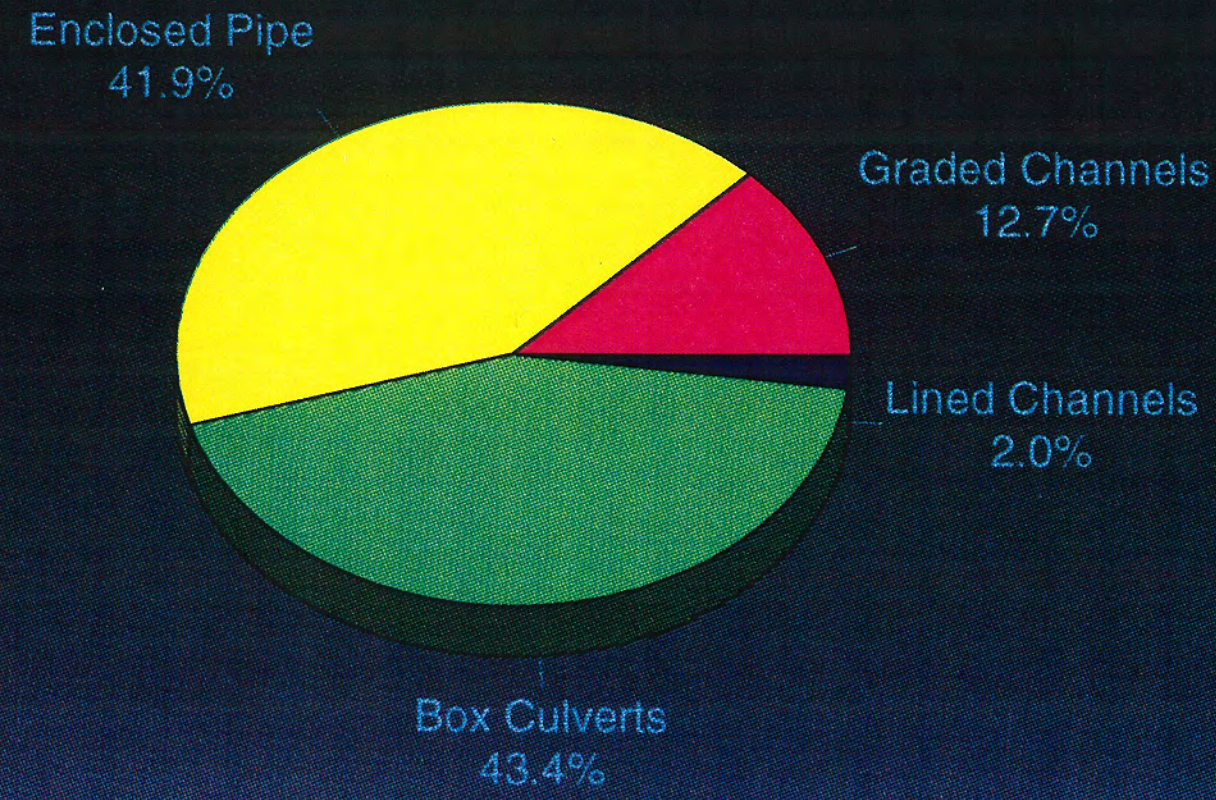
Annual Maintenance Cost Distribution

Improved Major System



City of Manhattan, Kansas
Stormwater Management Plan
Figure VIII-1