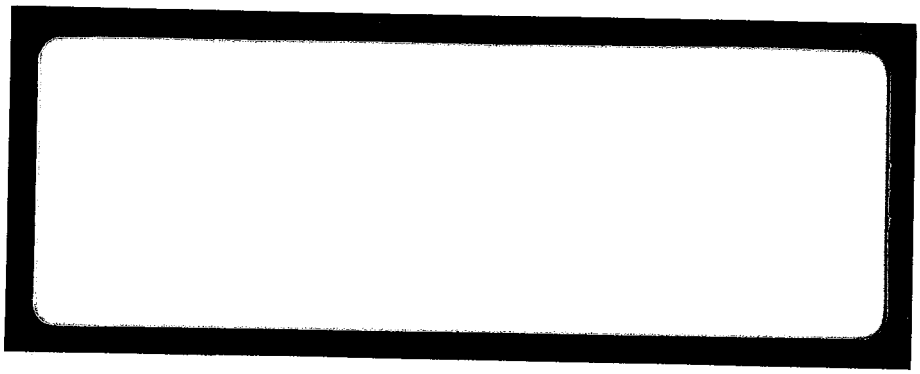
JMS Engineering



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Storm Drainage Master Plan

City of Aumsville, Oregon

March 2000

#108-29

Storm Drainage Master Plan
City of Aumsville, Oregon
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City Officials

Harold White-Mayor

David Drews-Council President

Chester Bridges-Commissioner -at -Large

Craig Chadwick-Personnel Commissioner

Timothy Dunn-Park Commissioner

Kenneth Fipps-Street Commissioner

Maryann Hills-City Administrator

Steve Oslie-Public Works Superintendent

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Prepared By;

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Table of Contents

Executive Summary

General

Since 1990, the City has experienced an annual growth rate of 2.46% and is projecting a 3% annual growth rate over the next 20 years. This rapid growth rate has resulted in development of much of the open area within the city limits. This development has resulted in increased flows within the City's storm drainage system. During periods of heavy rainfall, some areas of the system become overloaded and occasional storm drain overflows occur.

Because of the rapid growth rate, Aumsville has recognized the need for a coordinated master storm drainage plan in order to ensure that proposed new facilities are adequate for orderly growth and development of the community. How can the current storm drainage problems be corrected and what planning for the storm drainage system is required to accommodate future growth within the City? This study will try to answer those questions.

Scope of Study

The purpose of a storm drainage master plan is to act as a planning guide and data source in order to help determine the effects anticipated growth will have upon the existing system. It should also provide an outline of storm drainage facilities that will be required for future anticipated growth.

Existing Storm Drainage System

Much of the storm drainage system in the core area of Aumsville was build prior to 1970, while the remaining portions of the system were built between 1970 to present (**see Map 1**). Concrete storm drain pipe is the predominate pipe material used throughout the City, in sizes up to 36". In addition to underground concrete piping, concrete culverts are found mainly under driveway approaches along the County Roadways IE: First Street, Main Street and Eleventh Street. This is due to the existence of ditches along these roadways that are still being used for drainage instead of underground piping. Uneven ditch grading and vegetation growth cause water ponding problems along these streets.

The Aumsville Storm Drainage system has outfalls that flow into Mill Creek which borders the City to the south, and to Beaver Creek which borders the City to the north. The drainage collected from Main Street south between First and Eleventh Streets outfalls into Mill Creek. The drainage collected in the area bounded by First and Eighth Streets; and Cleveland and Delmar Streets outfalls into a natural swale west of Lincoln Street. It then travels overland westerly until it meets with Beaver Creek. The drainage from the remainder of the City west of First Street drains northerly and outfalls into Beaver Creek. The area east of First Street drains into a natural drainage ditch that flows westerly into the east ditch along First Street. It then flows northerly and also flows into Beaver Creek.

Storm Drainage Requirements

The City storm drainage system was divided into sub-basins. Each sub-basin was established by determining an area of runoff that each basin collects. The rational formula was then used to calculate the amount of runoff each sub-basin contributes to the overall storm drainage system. In most cases, this runoff is transferred to another basin through a single pipe. The flows are summed as it leaves one basin and is transferred to another, with the end result being the amount of storm water discharged into Mill Creek, Beaver Creek and any other receiving waterway.

Future Storm Drainage Requirements

The Aumsville Comprehensive Plan: 1997-99 Update projects a 3% annual growth rate over the next 20 years. This means that most of the currently vacant area within the Urban Growth Boundary will become occupied with medium and high density residential as well as industrial development.

As a result, the City must begin planning for future storm drainage development in these areas. New storm drainage facilities should wherever possible, be channeled into existing outfalls. In addition, all new developments shall utilized storm drainage detention to minimize the effect of run-off on existing facilities as well as the receiving streams. All new developments shall install engineered and City approved drainage facilities.

Recommended Improvements (see Map III)

Priority 1: Basin 3 Improvements:

- These improvements are relatively inexpensive and would greatly increase the efficiency of the storm water collection within the basin by allowing better capture of the storm run-off water.

- Estimated cost for the above work to install; 2 catch basins; 1 junction box; including engineering/staking is **$ 4,150.00**.

Priority 2: Basin 2-A Improvements:

- These improvements will involve installing an 12" storm drain pipe to close an existing open ditch along 11th Street. This storm drainage system would direct the drainage to the north into the 36" outfall off Lincoln Street.

- Estimated cost to install approximately 800' of 12" storm drain; 3 catch basins; traffic control; including engineering/staking is **$ 29,780.00**.

Priority 3: Basin 8 Improvements:

- This area currently does not have access to a designated drainage basin. However, this improvement requires the completion of Priority 2: Basin 2-A improvements first as it uses this basin's system for an outfall.

- Estimated cost to install approximately 800' of 12" storm drain; 3 catch basins; traffic control; including engineering/staking is $ **24,600.00.**

Priority 4: Basin 1-B Improvements:

- This improvement consists of installing an 18" storm drain pipe to close the open ditch near the church. This will eliminate a safety hazard and require less maintenance for the public works staff. The 18" pipe would also provide the storm drain detention that is being eliminated by closing the ditch.

- Estimated cost to install approximately 600' of 18" storm drain; 2 catch basins; surface restoration; including engineering & staking is $ **26,800.00.**

Priority 5: Basin 1-C Improvements:

- This improvement consists of installing a new 18" and 24" by-pass line from this basin-through basin 5-and connect to the 30" outfall line to Beaver Creek at Olney Street. This would provide additional capacity to relieve the flooding problem north of Lincoln Street. The new 30" outfall pipe north of Olney Street has the available capacity for this relief line.

- Estimated cost to install approximately 850' of 18" and 600' of 24" storm drain; 4 catch basins; surface restoration; including engineering & staking is $ **111,800.00.**

Chapter 1
Introduction

Background

Since 1990, the City has experienced an annual growth rate of 2.46% and is projecting a 3% annual growth rate over the next 20 years. This rapid growth rate has resulted in development of much of the open area within the city limits. This development has resulted in increased flows within the City's storm drainage system. During periods of heavy rainfall, some areas of the system become overloaded and occasional storm drain overflows occur.

Because of the rapid growth rate, Aumsville has recognized the need for a coordinated master storm drainage plan in order to ensure that proposed new facilities are adequate for orderly growth and development of the community. How can the current storm drainage problems be corrected and what planning for the storm drainage system is required to accommodate future growth within the City? This study will try to answer those questions.

In 1998 the City received a Rural Investment Fund Award for the preparation of a storm water drainage master plan and system development charge project.

Scope of Study

The purpose of a storm drainage master plan is to act as a planning guide and data source in order to help determine the effects anticipated growth will have upon the existing system. It should also provide an outline of storm drainage facilities that will be required for future anticipated growth. The scope of this study will include the following:

- Review all available maps and other storm drainage related data. Field inventory storm drainage facilities not included in available mapping.
- Provide the field information to the Public Works Department for plotting the information electronically on the City base map.
- Analyze the existing drainage system and determine any recommended improvements along with cost estimates. Analyze the drainage system requirements to accommodate future growth and determine the improvements along with cost estimates to accommodate this growth.
- Prepare a draft report and review it with the City Council for input and comments.
- Prepare a final report and submit the completed master plan to the city for their files.

Chapter 2
Existing Drainage System

General

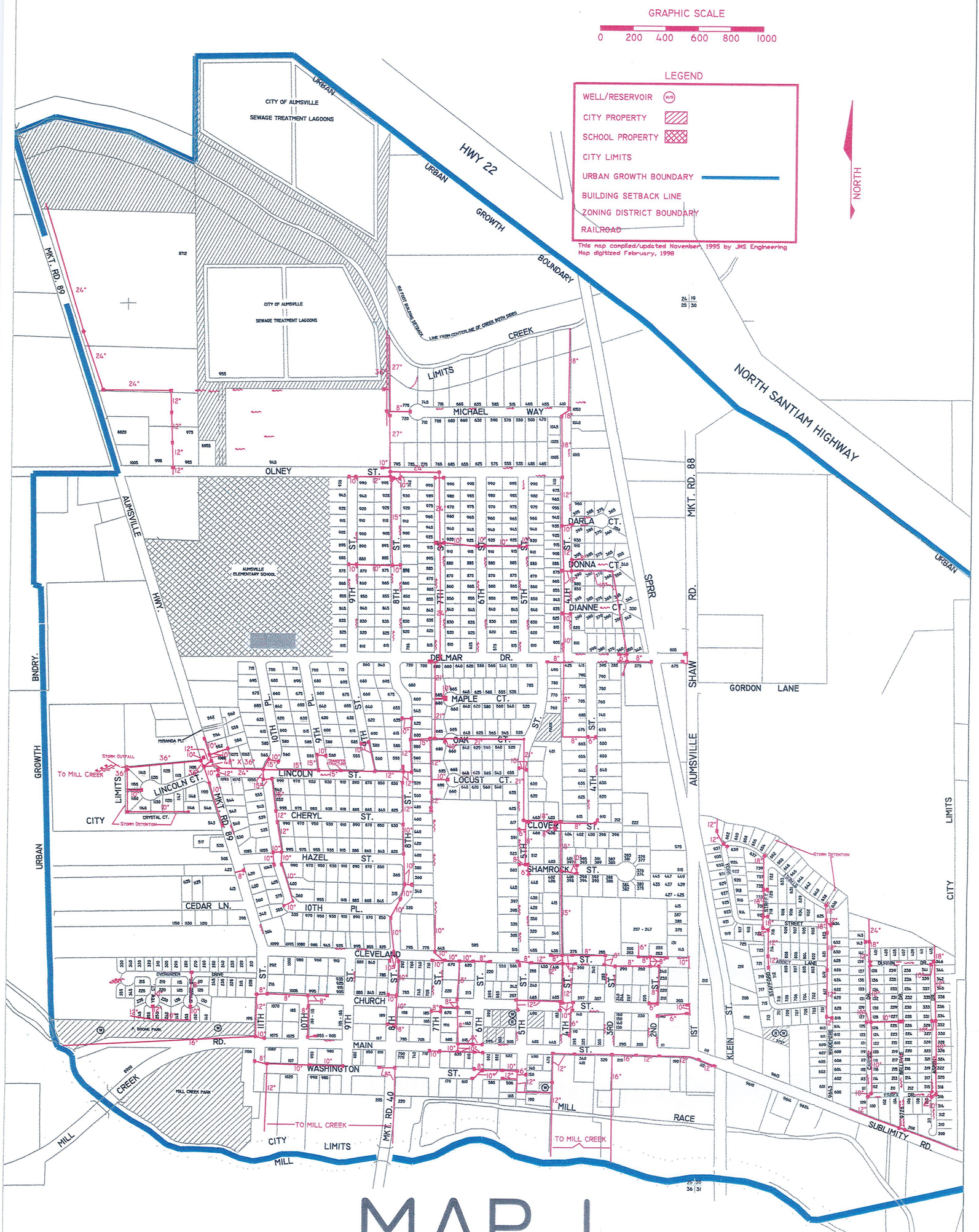
Much of the storm drainage system in the core area of Aumsville was build prior to 1970, while the remaining portions of the system were built between 1970 to present (**see Map 1**). Concrete storm drain pipe is the predominate pipe material used throughout the City, in sizes up to 36". In addition to underground concrete piping, concrete culverts are found mainly under driveway approaches along the County Roadways IE: First Street, Main Street and Eleventh Street. This is due to the existence of ditches along these roadways that are still being used for drainage instead of underground piping. Uneven ditch grading and vegetation growth cause water ponding problems along these streets. As new development occurs however, these ditches are being filled and replaced with underground storm drain piping. This is particularly true along First and Main Streets.

In recent years a considerable amount of Polyvinyl chloride (PVC) storm drain piping has been used and is the second most common pipe material found in the Aumsville storm drainage system.

The Aumsville Storm Drainage system has outfalls that flow into Mill Creek which borders the City to the south, and to Beaver Creek which borders the City to the north. The drainage collected from Main Street south between First and Eleventh Streets outfalls into Mill Creek. The drainage collected in the area bounded by First and Eighth Streets; and Cleveland and Delmar Streets outfalls into a natural swale west of Lincoln Street. It then travels overland westerly until it meets with Beaver Creek. The drainage from the remainder of the City west of First Street drains northerly and outfalls into Beaver Creek. The area east of First Street drains into a natural drainage ditch that flows westerly into the east ditch along First Street. It then flows northerly and also flows into Beaver Creek.

During extended periods of rainfall, Beaver Creek and Mill Creek tend to rise rather quickly. As a result, areas adjacent to these creeks risk being flooded by the high waters. For example, before 1997, Michael Way was subject to flooding from Beaver Creek when the levels rose. Storm water would backup through the catch basin in Michael Way, as it was the relief point when the system flows from the city would fight the high water levels of Beaver Creek. This was remedied in 1997 when a new 36" storm drain line was installed to serve the city system and the existing 27" line was dedicated to Michael Way. This flooding problem has now been eliminated..

CITY OF AUMSVILLE



MAP 1

EXISTING STORM DRAINAGE SYSTEM

Chapter 3
Design Criteria

Storm Drainage Terminology

In the discussion of storm drainage, this study will use different storm drainage terms. To better understand their meaning, some of these terms and their definitions are as follows:

- **5 Year Storm:** A design storm determined for the local area and used by engineers. In 100 years, storms with a rainfall intensity equal to or greater than the 5 year design storm is expected to occur only 20 times, or an average of once every 5 years.

- **10 Year Storm:** A design storm determined for the local area and used by engineers. In 100 years, storms with a rainfall intensity equal to or greater than the 10 year design storm is expected to occur only 10 times, or an average of once every 10 years.

- **Rainfall Intensity** is the intensity of rainfall in inches/hours. It combines how hard it rains (intensity) and how long it rains (intensity). This information is developed and graphed from weather bureau information and is normally based on a storm cycle (occurrence). A short term cycle (5-10 years) is used for residential developments while a longer one (20 years and longer) is used for commercial developments.

- **Time of Concentration** is composed of two parts: 1) the inlet time or time required for runoff to reach entrance into a catch basin, and 2) the time of flow in the storm drain system. In other words, it is the time required for all portions of the drainage basin to contribute to (usually) the catch basin furthest away under consideration.

- **Inlet Time** is a function of 1) the roughness of the surfaces over which the runoff is flowing, 2) the steepness of the ground, 3) the distance of the furthest point in the drainage basin from the catch basin. Inlet times may vary from 5 minutes to 30 minutes. In relatively flat residential areas (such as Aumsville) inlet times of 15 to 20 minutes are the norm.

- **Runoff Coefficient:** The amount of runoff from storm rainfall is reduced by evaporation, storage in depressions, required wetting of surfaces before they shed water and percolation of water into the ground. All of these losses decrease in magnitude with the duration of storms. These coefficients vary depending upon the land uses and land slope. After consideration of all these factors, composite coefficients have been developed for engineering use.

- **Detention Basin** is an area or basin designed to hold the peak runoff flows while concurrently a predetermined amount of water is being released. Inflow entering the basin exceeding the predetermined outflow is retained until the inflow amount is less than the permitted outflow.

Drainage Design Method

For some purposes, an estimate of total runoff volume from a basin within a given time period is adequate. More often however, an estimate of the instantaneous peak flow rate is required for design. In many cases, a complete hydrograph is needed for this determination. Methods for determining storm water runoff therefore, must include techniques for converting estimates of runoff volume to estimates of rate of flow.

For example, if rainfall were applied at a constant rate to an impervious surface, the runoff would eventually reach a rate equal to the rate of rainfall. The time required to reach this equilibrium is called the time of concentration. For small impervious areas, one may assume that if rainfall continues at a uniform rate for a period at least as long as the time of concentration, the peak runoff will equal the rate of rainfall. This is the basis of the Rational Formula.

The Rational Formula is commonly used for estimating the rates of storm water runoff and drainage system design and will be used for this study. It is based on the following formula:

$$Q = CIA$$

Where: **Q** = rate of storm water runoff in cubic feet per second
C = runoff factor
I = rainfall intensity in inches per hour for a duration equal to the time of concentration
A = drainage area in acres

Storm water flows for this study have been estimated at key points along the principal drainage way in each basin using this procedure.

Design Storm Rainfall

The affordability of storm drainage improvements is a major factor for communities when determining the degree of storm water protection to be provided. Most communities, such as Aumsville, have in the past, planned drainage facilities on the basis of a 5 year storm occurrence. However, particularly after the flood of 1996, some communities have changed their standards and now design their new facilities on the basis of a 10 year storm occurrence. Major structures such as bridges and larger culverts usually are designed for a 20 to 25 year storm occurrence.

For this study, a 5 year occurrence was used for the analysis of the existing system in order to strike a reasonable balance between costs and benefits of providing flood protection. It is also based on the fact that the existing system generally handles the storm water runoff satisfactorily under most conditions.

The storm rainfall intensity-duration curve used for this report is obtained from the Marion County Public Works Standards and is shown on **Figure 1**.

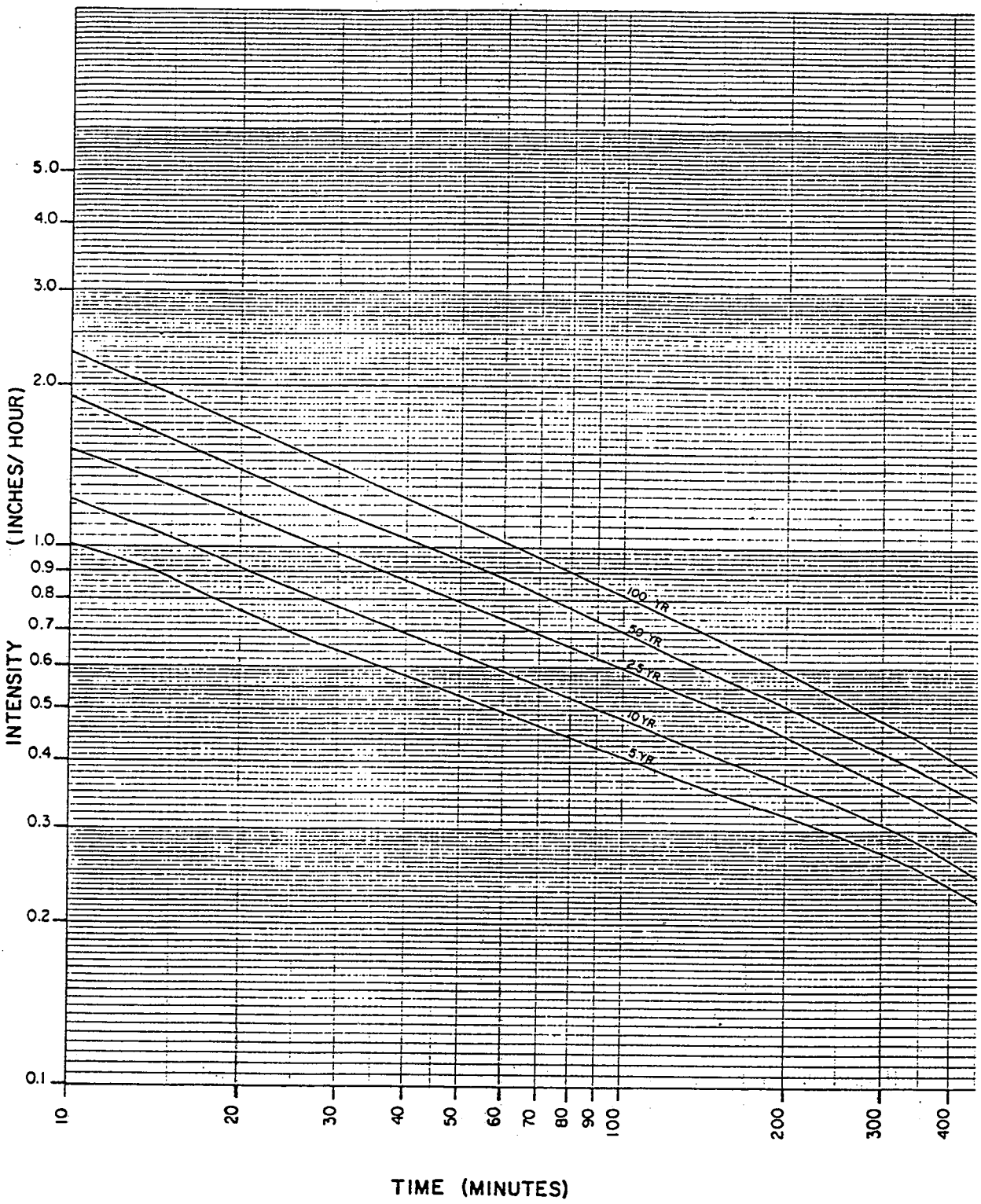


Figure 1

Rainfall Intesity-Duration Curves
(Marion County Department of Public Works)

Runoff Factors

The rates of storm water runoff are not only proportional to rainfall intensities, but they also depend on many other factors such as type of ground cover, slopes, land use and soil permeability. These factors all have an effect on the runoff rates and are consolidated into a single term call a runoff coefficient. This factor simply expresses the estimated amount of rainfall that results in surface runoff. In an intensely developed business district, 70 to 90 percent of all rainfall can result in runoff. In undeveloped areas with vegetative cover and good soil permeability, only a small percentage of rainfall results in runoff. The runoff coefficients used for this study are those commonly used by surrounding jurisdictional agencies and are shown on Table I:

Table I
Runoff "C" Coefficients

Existing Land Use	Flat Terrain (less than 2% slope)
High Impermeability (paved areas)	0.90
Commercial or Industrial	0.70
Multiple Family, Mobile Home Parks	0.60
Gravel Parking Lots	0.50
Single Family Residential (Up to 6 units per acre)[1]	0.35
Lawns, Pasture, Parks or Undeveloped	0.20

Runoff Concentration and Inlet Times

The longer a storm continues, the intensity of rainfall decreases. In estimating the rate of runoff to any point on a drainage way, the time it takes the runoff to concentrate at that point is used as the storm duration from which the rainfall intensity is derived. Time for water to reach the first inlet on a municipal drainage system is relatively short and is considered to be in the 5 to 15 minute range depending on the condition of the ground surface. An average inlet time of 15 minutes was used for this study.

[1] The Aumsville Comprehensive Plan 1997-99 Update shows the actual development densities (1986-1996) of Aumsville to be as follows: Single Family 4.44 units/acre; Multi-Family 7.96 units/acre and Mobile Homes 6.04 units/acre.

Soil Classification

Marion County soils maps indicate that the Aumsville area is underlain with two types of soil classifications: Clackamas gravelly loam (Ck) and Salem gravelly silt loam (Sa). The Sa soils are moderate in permeability, well drained. The Ck soils have moderately slow permeability with somewhat poor drainage. A high water table is also experienced during the winter months.

These soil classifications were also taken into consideration in determining the runoff coefficient to be used in this study.

Pipe Flows

Today, most widely used formula for calculating the flow of water in culverts and in sanitary and storm sewers was developed by Robert Manning and is known as "Manning's Formula". It is as follows:

$$Q = \frac{1.486}{n} r^{2/3} s^{1/2}$$

where: Q = discharge in cubic feet per second
n = roughness coefficient (0.011 for concrete pipe, 0.10 for PVC pipe)
r = mean hydraulic radius in feet
s = mean slope of the hydraulic gradient

The above formula was used for calculating the pipe flows in this study.

Chapter 4
Basin Analysis

General

The City storm drainage system was divided into sub-basins. Each sub-basin was established by determining an area of runoff that each basin collects. The rational formula was then used to calculate the amount of runoff each sub-basin contributes to the overall storm drainage system. In most cases, this runoff is transferred to another basin through a single pipe. The flows are summed as it leaves one basin and is transferred to another, with the end result being the amount of storm water discharged into Mill Creek, Beaver Creek and any other receiving waterway. The drainage basin layout is shown on **Map II.**

Design Criteria

Storm water runoff for this study will be determined by using the general design parameters shown in Table II, along with the Rational Formula.

Table II
Design Parameters

Marion County Rainfall Intensity-Duration Curve
Single Family Development: **C = 0.35** where slope is less than 2%
Undeveloped Area: **C = 0.20** where slope is less than 2%
Design Storm Frequency: **5 year** for existing areas, **10 year** for future development areas
Time of Concentration: **15 minutes**

Each Basin will be analyzed and discussed in detail in this chapter.

Basin 1-A

This drainage basin encompasses approximately 31 acres of residential area (see Storm Basin Drawing 1-A) . This basin is served by larger storm drain piping (12", 15" & 18") that was installed in the 1960-70 time period. As in-fill occurred, storm drain lines were extended to serve these newly developing areas.

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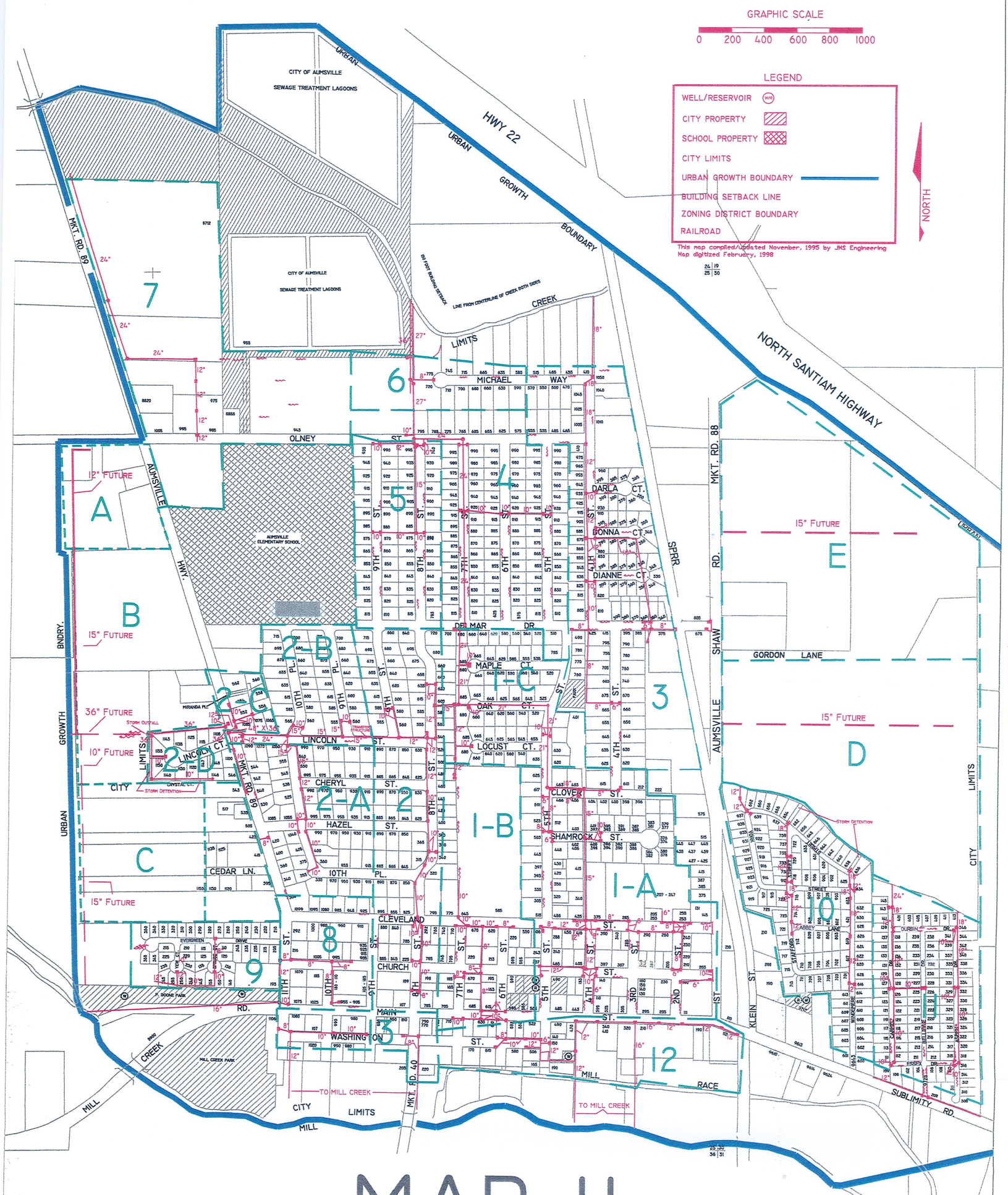
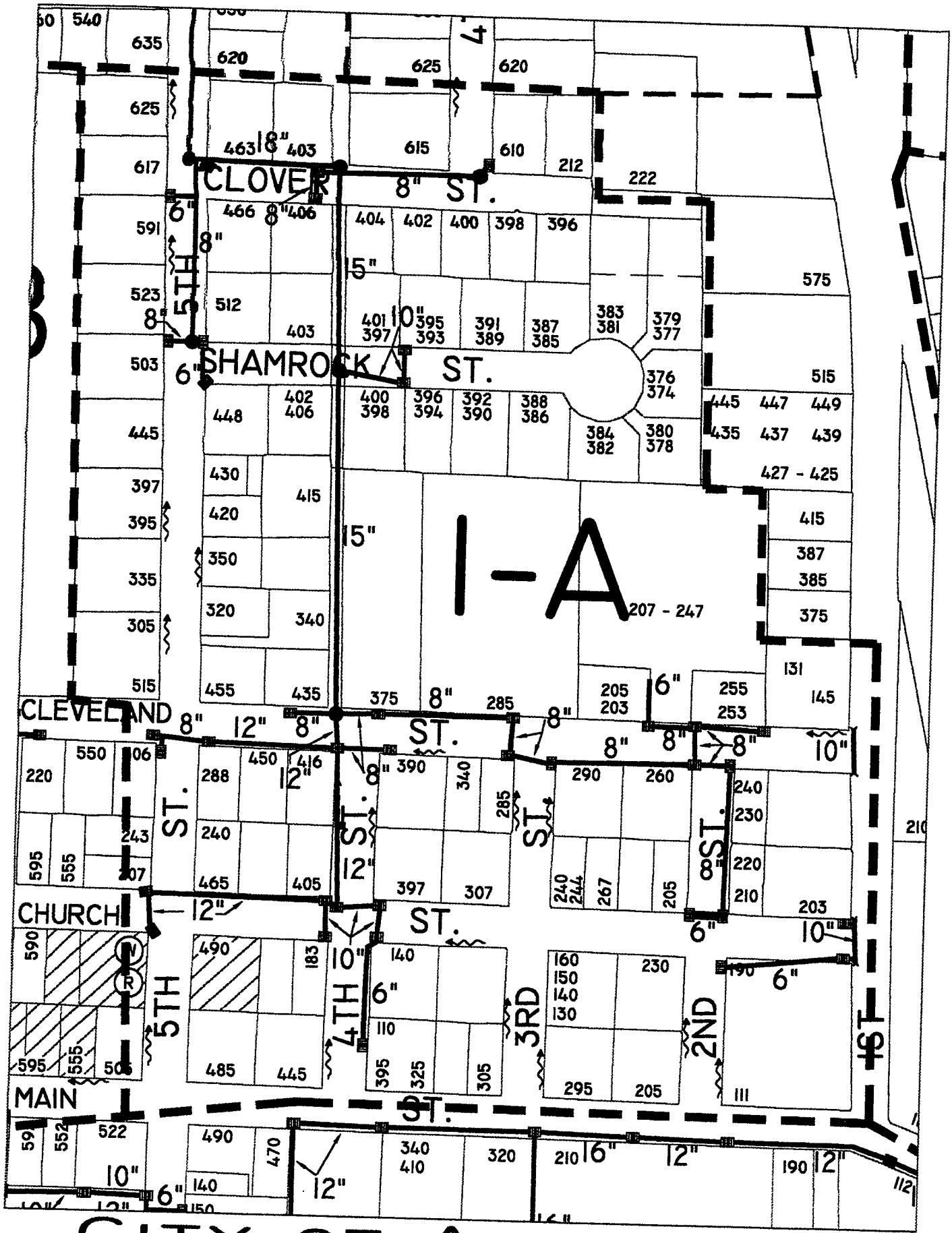


MAP II

STORM DRAINAGE BASINS (PRESENT AND FUTURE)



CITY OF AUMSVILLE
STORM BASIN 1-A

Estimated Runoff from this Basin:

$$Q = CIA = 0.35\ (.86)\ (31) = 9.3\ CFS$$

The available pipe capacity (18"): 15.0 CFS

This Basin is adequately served by the current storm drain system.

Basin 1-B

This drainage basin encompasses approximately 8 acres of residential area and 4.0 acres of open area (see Storm Basin Drawing 1-B). The open area consists of a grass area behind the church on Cleveland Street. The storm drainage crosses the westerly portion of this property through a ditch which also provides (unintentionally) storm water detention during periods of heavy rainfall. The outfall from this basin is a 12" storm drain. As with Basin 1-A, when in-fill has occurred, and in order to eliminate drainage problems, storm drain lines were extended to serve these areas.

Estimated Runoff from this Basin:

$Q = CIA = 0.20\ (.86)\ (4.0) = 0.7$ CFS (grass area)
$Q = CIA = 0.35\ (.86)\ (8.0) = 2.4$ CFS (residential area)
Q total = 3.1 CFS

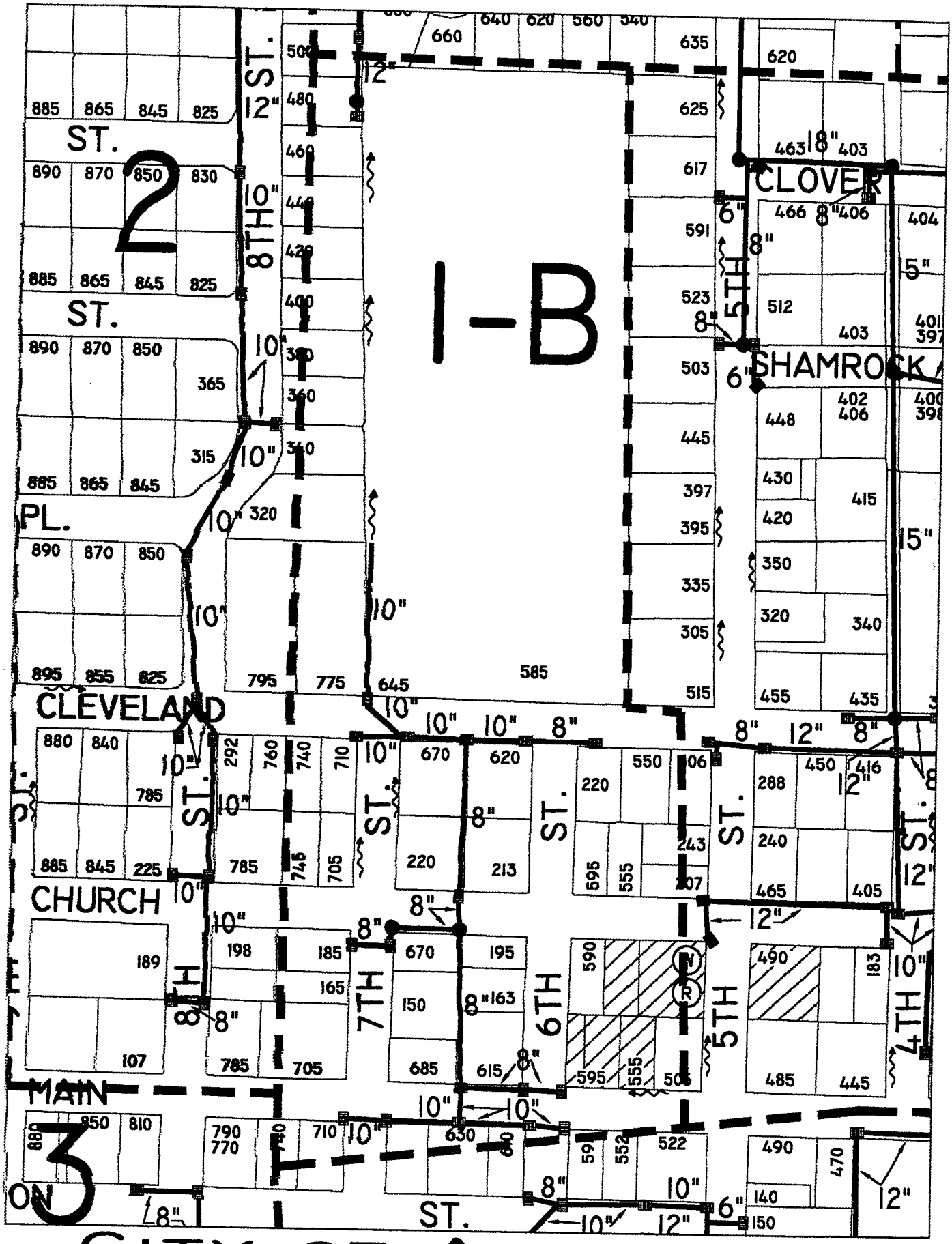
The available pipe capacity (12"): 2.8 CFS, slightly undersized.

There does not appear to be any other serious drainage problems in this basin. However, the Public Works Department has noted that the open drainage ditch west of the church requires a great deal of maintenance and poses a potential liability to the City. They would prefer to place a pipe in the open ditch to eliminate this problem.

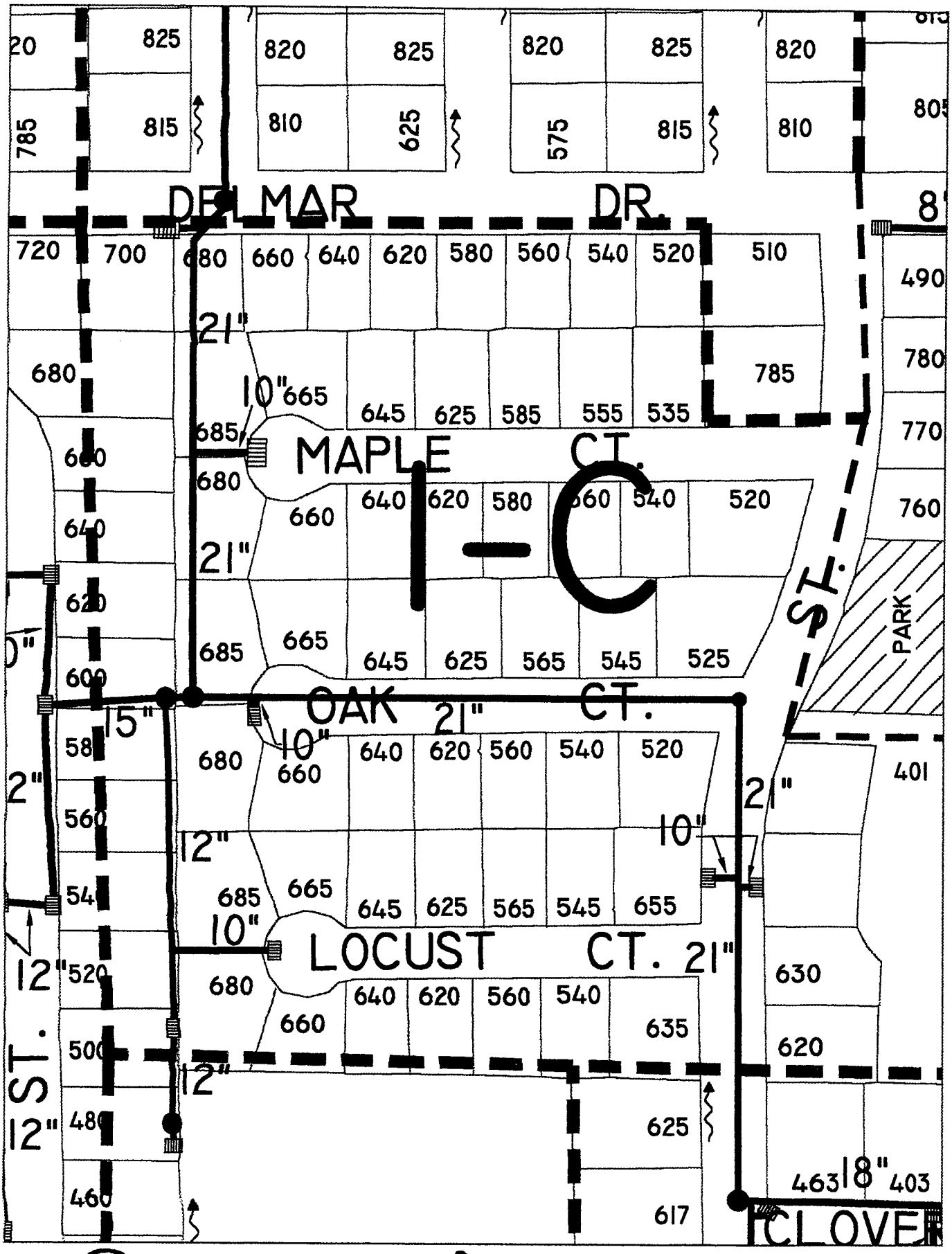
Estimated cost to install approximately 600' of 18" storm drain; 2 catch basins; surface restoration; including engineering & staking is $ 26,800.00. The 18" pipe would provide the storm drain detention that is being eliminated by closing the ditch.

Basin 1-C

This drainage basin encompasses approximately 16 acres of residential area (see Storm Basin Drawing 1-C). and is one of the more critical basins in the Aumsville storm drainage system. This is because flows from basins 1-A, 1-B, and partial flows from basin 2 also pass through this area. The 21" storm drain from this basin outfalls into a 24" storm drain line located in basin 4.



CITY OF AUMSVILLE
STORM BASIN 1-B



CITY OF AUMSVILLE
STORM BASIN 1-C

Estimated Runoff from this basin:

$$Q = CIA = 0.35\ (.86)\ (16.0) = 4.8\ CFS$$

Pass through flows:

Basin 1-A	= 9.3 CFS
Basin 1-B	= 2.8 CFS (available pipe capacity)
Total Flow	16.9 CFS

In addition, flows from basin 2 pass through this basin. The amount of runoff entering basin 1-C may vary as a transfer structure in basin 2-B directs excess flows from basin 2 to the west through basin 2-B to the westerly 36" outfall. It is estimated that 3.1 CFS enters from basin 1-C from basin 2.

Basin 2	= 3.1 CFS
Total Estimated Flow to 24" Outfall:	20.0 CFS

The available outfall pipe capacity (24") is 18.0 CFS, slightly undersized. Under normal conditions however, the existing pipe sizes appear to be adequate. During a 5 year storm however, backup may occur in the 8th and 9th Street area, just north of Lincoln Street. This situation happened during the 1996 flood. No property damage occurred however, other than having to replace bark dust.

As in-fill occurs, a greater load will be placed upon this basin. Much of the existing 21" storm drainage pipe in this basin passes through the backyards of residential property, making line up-sizing very difficult and expensive. It is recommended that a by-pass line be constructed from the basin outfall manhole at Delmar (just east of 8th Street), then extend up 8th Street and connect to the manhole at Olney Street. This would provide additional capacity and relieve the flooding problem north of Lincoln Street. The new 30" outfall pipe north of Olney Street has the available capacity for this relief line.

Estimated cost to install approximately 850' of 18" and 600' of 24" storm drain; 4 catch basins; surface restoration; including engineering & staking is $ 111,800.00.

Basin 2

This drainage basin encompasses approximately 17 acres of residential area (see Storm Basin Drawing 2) and is designed to outfall through a 15" storm drain line into basin 1-C. Should the 15" line be unable to accommodate all the flow due to full pipe flow through basin 1-C, a transfer structure in basin 2-B accepts the excess flows and passes them westerly to the 36" outfall.

Estimated Runoff from this Basin:

$$Q = CIA = 0.35\ (.86)\ (17) = 5.1\ CFS$$

Estimated flow split during maximum flows:

Flow through basin 1-C: 3.1 CFS
Flow through basin 2-B: 2.0 CFS

Available outfall pipe (15") capacity (west): 5.2 CFS

Since this basin consists of mostly new construction, it currently meets the storm drainage needs of the area. No improvements appear to be needed.

Basin 2-A

This drainage basin encompasses approximately 11 acres of residential area (see Storm Basin Drawing 2-A) and is designed to outfall through a 15" storm drain line into basin 2-B. .

Estimated Runoff from this Basin:

$$Q = CIA = 0.35\ (.86)\ (11) = 3.3\ CFS$$

Available outfall pipe (15") capacity: 5.2 CFS

A portion of 11th Street that has an open ditch on the west side, is included in this basin. Although this a county road, the open ditch continues to be a drainage and maintenance problem for the adjacent residents, as well as the City, due to grading and the existing culvert elevations. It is recommended that a 12" pipe be installed and the ditch filled in to eliminate this problem. This would also direct the storm water from 11th Street to the available 36" outfall.

Estimated cost to install approximately 800' of 12" storm drain; 3 catch basins; traffic control; including engineering/staking is $ 29,780.00.

Basin 2-B

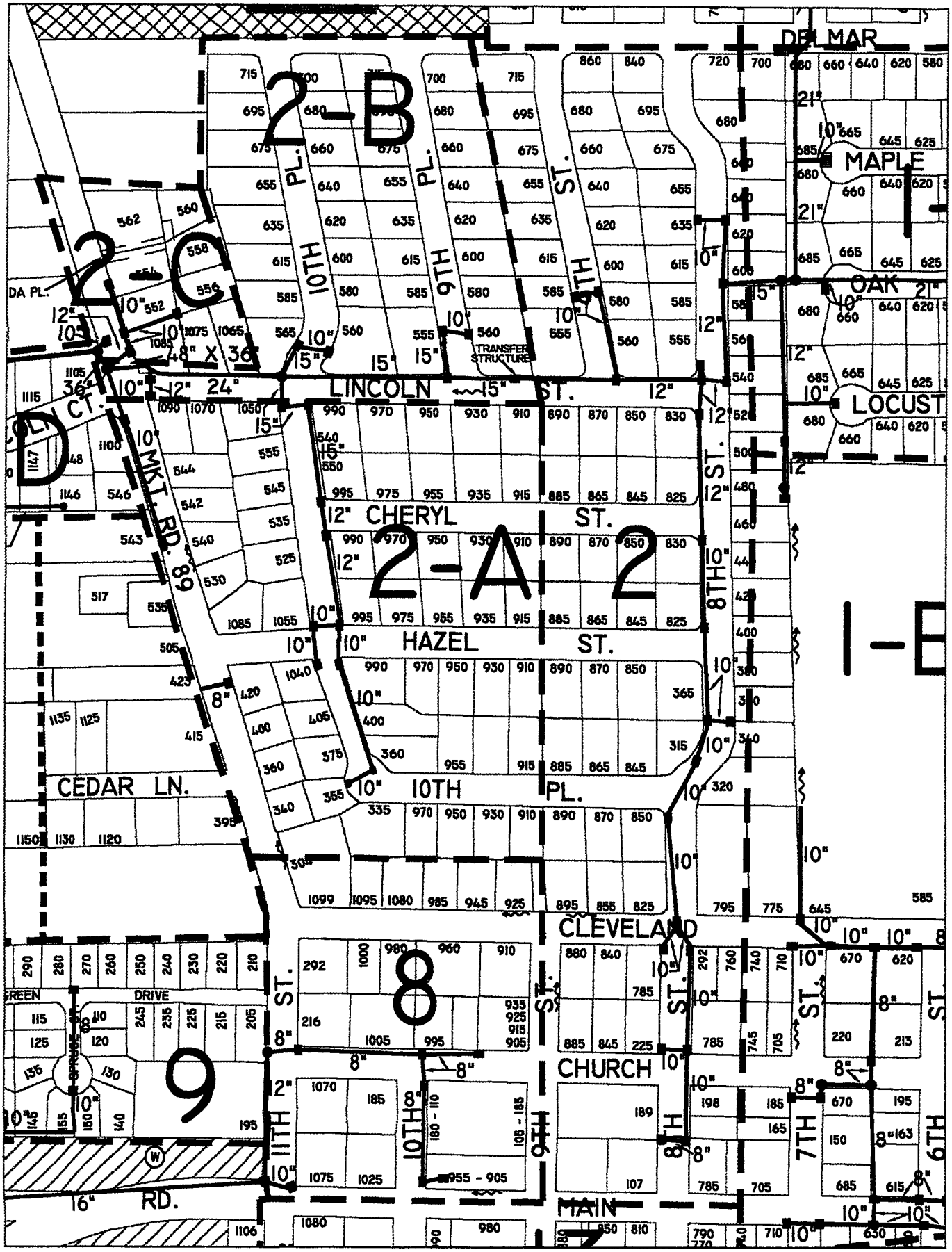
This drainage basin encompasses approximately 9 acres of residential area (see Storm Basin Drawing 2-B) and is designed to outfall through a 24" storm drain line into basin 2-D.

Estimated Runoff from this basin:

$$Q = CIA = 0.35\ (.86)\ (9) = 2.6\ CFS$$

Pass through flows:

Basin 2	= 2.0 CFS
Basin 2-A	= 3.3 CFS
Total Flow	7.9 CFS



CITY OF AUMSVILLE
STORM BASIN 2,2A,2B

Available outfall pipe (24") capacity: 11 CFS

This basin consists of mostly new construction and it currently meets the storm drainage needs of the area. No improvements appear to be needed.

Basin 2-C

This drainage basin encompasses approximately 2.0 acres of residential area (see Storm Basin Drawing 2-C) and is designed to outfall into a 36" storm drain line in basin 2-D.

Estimated Runoff from this basin:

$$Q = CIA = 0.35\ (.86)\ (2.0) = 0.6\ CFS$$

Available outfall pipe (12") capacity: 2.3 CFS

This basin consists of mostly new construction and it currently meets the storm drainage needs of the area. No improvements appear to be needed.

Basin 2-D

This drainage basin encompasses 3.0 acres of residential area and it is the latest sub-division to be completed within the City. It utilizes storm drain detention to restrict immediate storm drain run-off. None of the storm water from this basin enters the 36" outfall pipe.

The 36" outfall pipe passing through the northerly area of the basin however, carries the storm drainage collected by basins 2 (partial), 2-A, 2-B and 2-C.

Pass through flows:

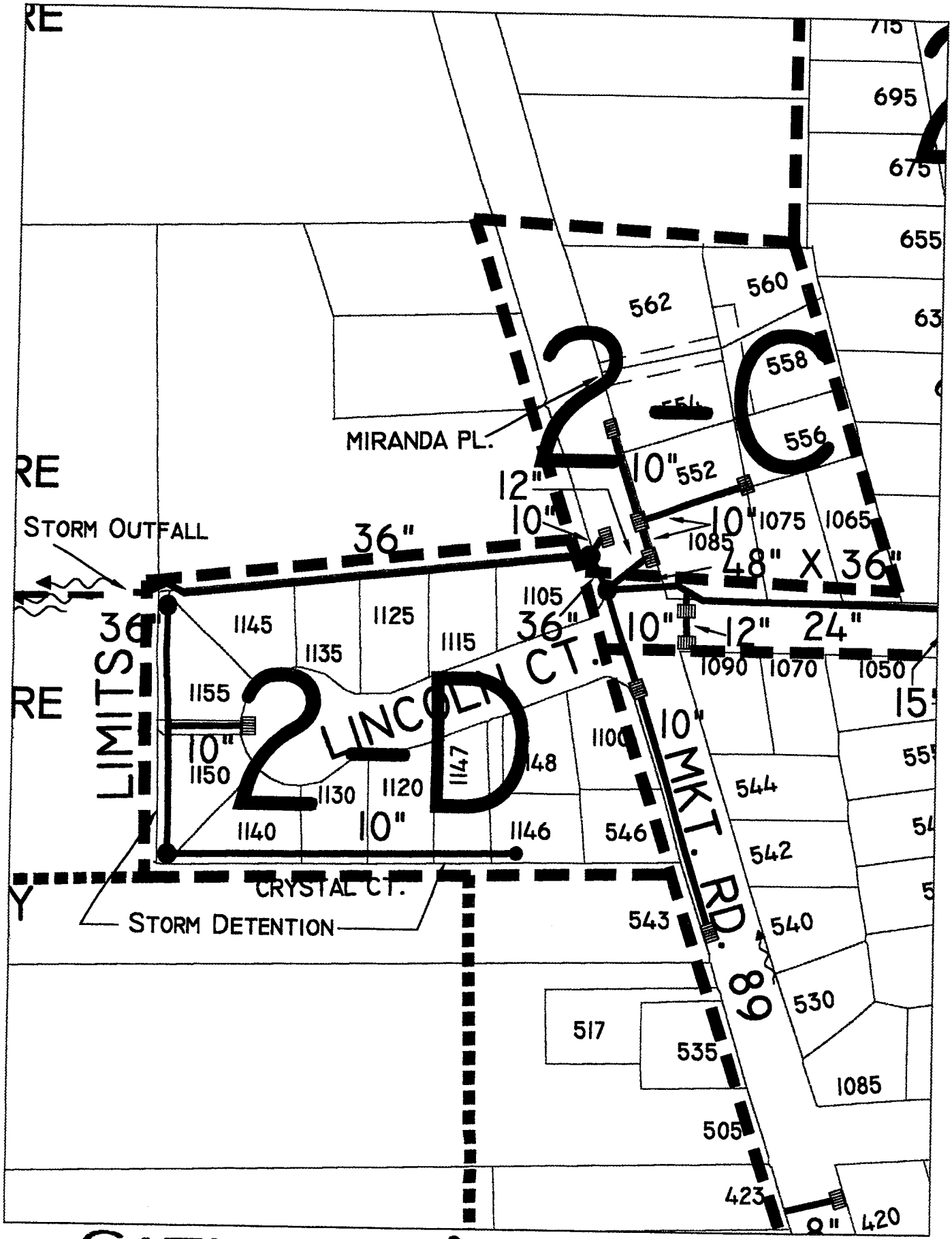
Basin 2	= 2.0 CFS
Basin 2-A	= 3.3 CFS
Basin 2-B	= 2.6 CFS
Basin 2-C	= 0.6 CFS
Total Flow	9.7 CFS

Available outfall pipe (36") capacity: 16 CFS

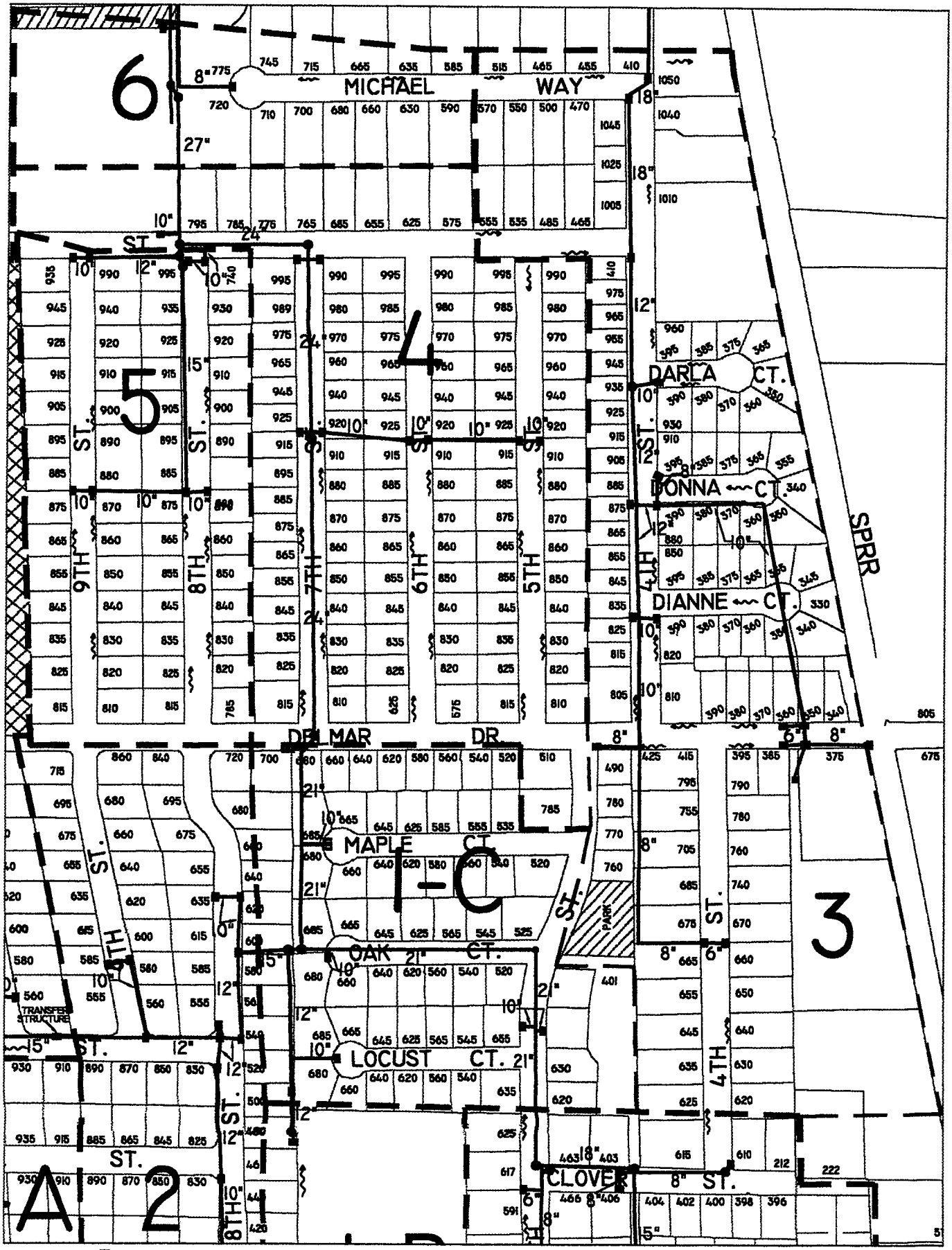
As can be seen, the 36" outfall pipe has approximately 6 CFS remaining capacity should it be required by future development.

Basin 3

This drainage basin encompasses approximately 13 acres of residential area (see Storm Basin



CITY OF AUMSVILLE
STORM BASIN 2C, 2D



CITY OF AUMSVILLE
STORM BASIN 3,4,5

Drawing 3) and is designed to outfall into a 18" storm drain line directly to Beaver Creek. Estimated Runoff from this basin:

$$Q = CIA = 0.35\ (.86)\ (13) = 3.9\ CFS$$

Available outfall pipe (18") capacity: 5 CFS

Several improvements are recommended to improve the drainage within basin 3. They consist of up sizing the small catch basins (3 ea) at 4th Street and Michael Way. This would allow for better capture of the street runoff water. A junction box is needed at 4th and Delmar so the public works crews can have an access to clean the storm drain lines.

Estimated cost for the above work to install; 2 catch basins; 1 junction box; including engineering/staking is $ 4,150.00.

Basin 4

This drainage basin encompasses approximately 22 acres of residential area (see Storm Basin Drawing 4) and is designed to outfall into a 18" storm drain line directly to Beaver Creek. Estimated Runoff from this basin:

$$Q = CIA = 0.35\ (.86)\ (22) = 7.0\ CFS$$
$$\text{Plus flows from Basin 1-C} = \underline{20.0\ CFS}$$
$$\text{Total Flow:} \quad 27.0\ CFS$$

Available outfall pipe (24") capacity: 18 CFS

As can be seen, during a 5 year storm occurrence, the 24" storm drain line is above capacity . As a result, there will be a backup in the system that will result in a backup through the catch basins on 8th and 9th Streets in Basin 2, and possibly the catch basin in the backyards in basin 1-C. This has happened in the past but did not cause any serious damage. The proposed improvement for basin 1-C would eliminate this problem.

Basin 5

This drainage basin encompasses approximately 13 acres of residential area (see Storm Basin Drawing 5) and is designed to outfall into a 15" storm drain line. Estimated Runoff from this basin:

$$Q = CIA = 0.35\ (.86)\ (13) = 4.0\ CFS$$

Available outfall pipe (15") capacity: 5 CFS.

This basin is operating at full capacity. The improvement recommended for basin 1-C (increase 15"

to 24") would also increase the available capacity for this basin.

Basin 6

This drainage basin encompasses approximately 8 acres of residential area (see Storm Basin Drawing 6). Estimated Runoff from this basin:

$$Q = CIA = 0.35\ (.86)\ (13) = 3.9\ CFS$$

Available outfall pipe (18") capacity: 5 CFS

The storm water from basin 6 flow into a 27" pipe dedicated only to this basin. Before 1998, during periods of high storm water flow, the water level in Beaver Creek would rise. With the down stream flows increasing in the storm drain system, the catch basin at Michael Way-being the lowest catch basin in the system-would act as a relief valve. As a result, storm water would backup onto Micheal Way, causing substantial flooding. A new 36" storm drain dedicated only to down stream flows, was installed in 1998. The existing 27" line was then dedicated only to Michael Way. This has since eliminated the flooding problem on Michael Way. It has also increased the total storm drainage outfall capacity for the future.

Basin 7

This drainage basin encompasses approximately 30 acres of industrial area (see Storm Basin Drawing 7). This area is served by a 24" storm drain line that outfalls into Beaver Creek. The industrial area is not typical of most industrial areas in that much of the area is still open, natural ground. This is due to the type of industries located there, the set aside requirements for wet lands and area dedicated to the 100 year flood plain. As a result, the runoff coefficient was adjusted to reflect a slightly greater non-permeable area than residential areas.

Estimated Runoff from this basin:

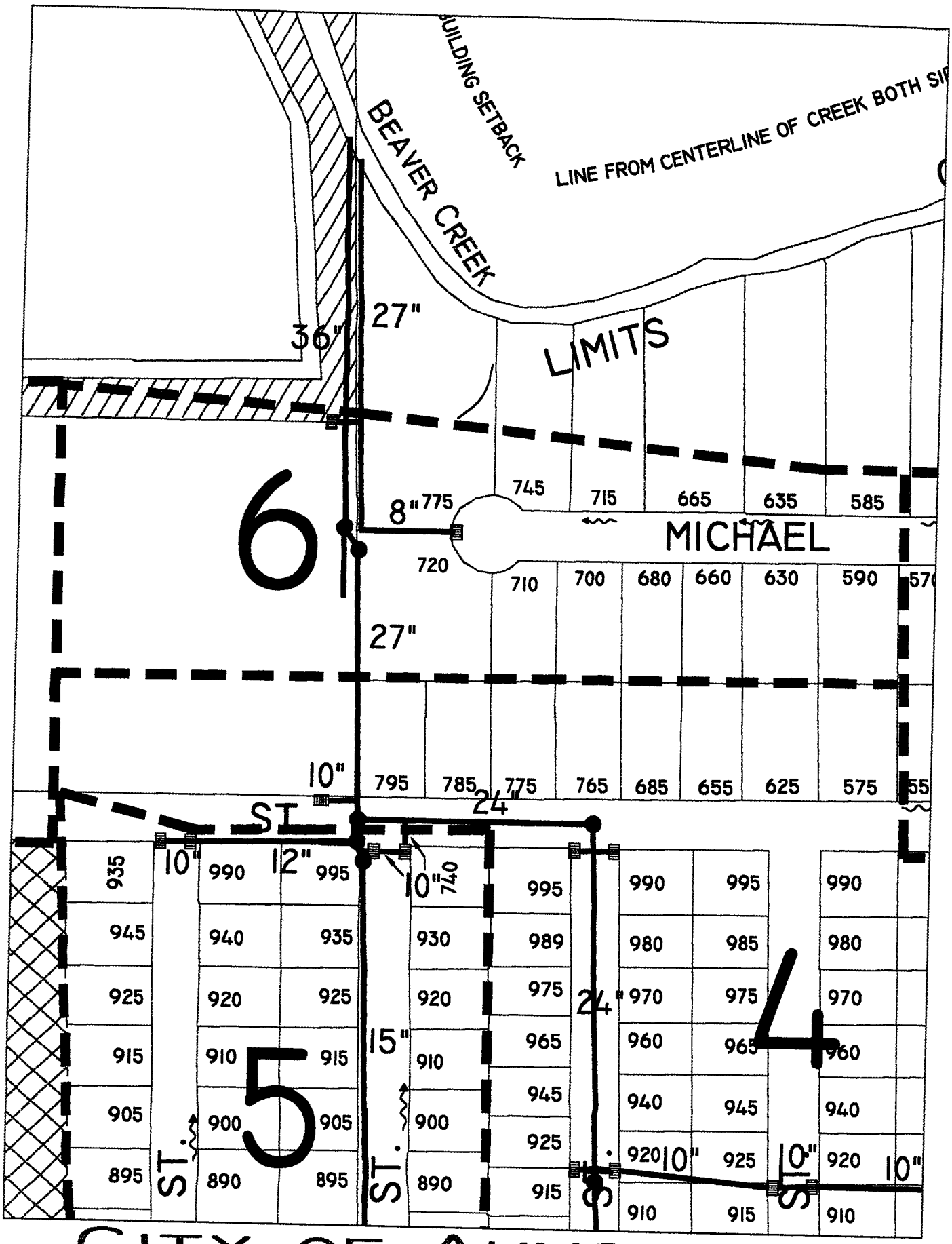
$$Q = CIA = 0.45\ (.86)\ (30) = 12\ CFS$$

Available outfall pipe (24") capacity: 12.0 CFS

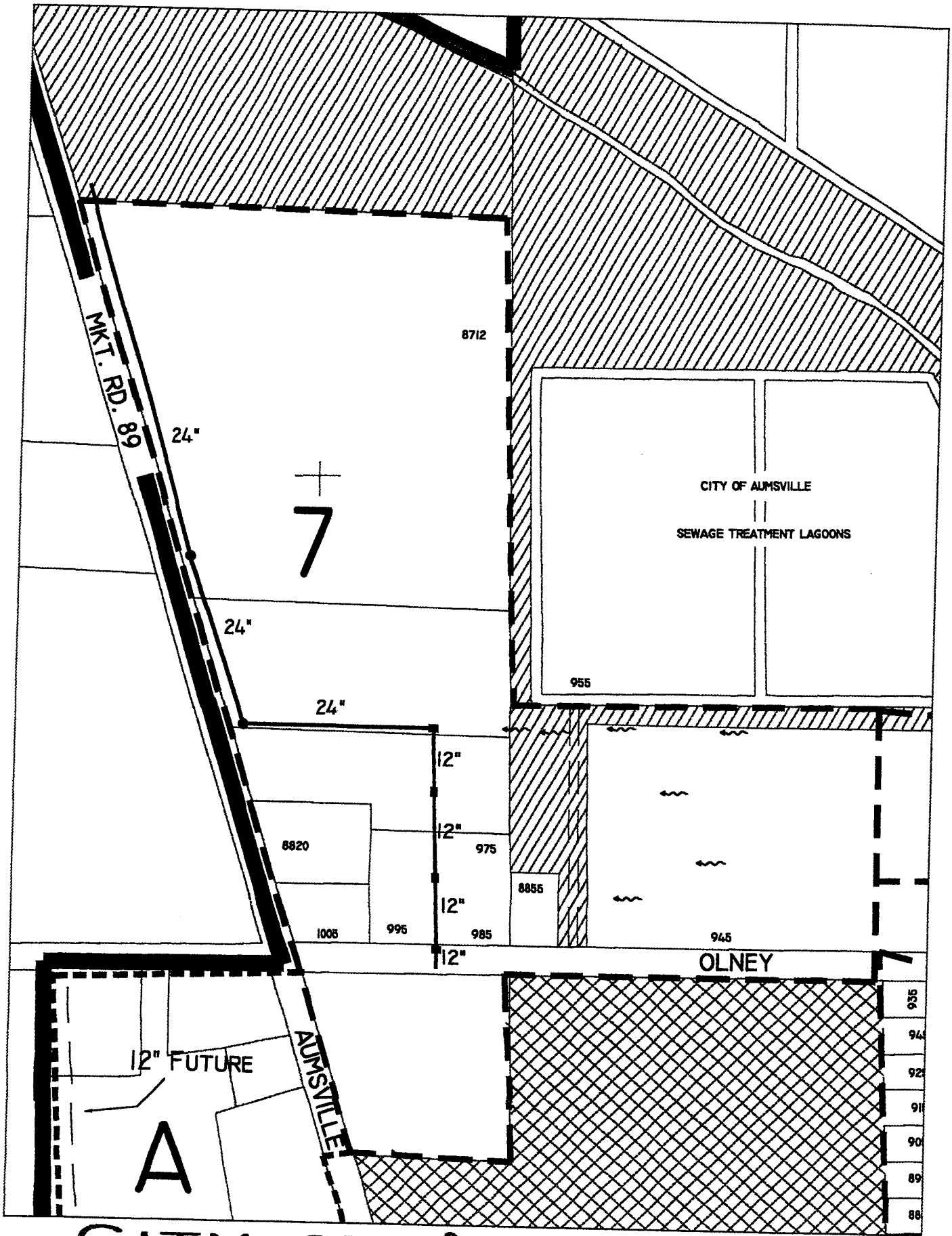
New construction will be required to use on-site storm drain detention with a controlled release rate. No new improvements are recommended for this basin.

Basin 8

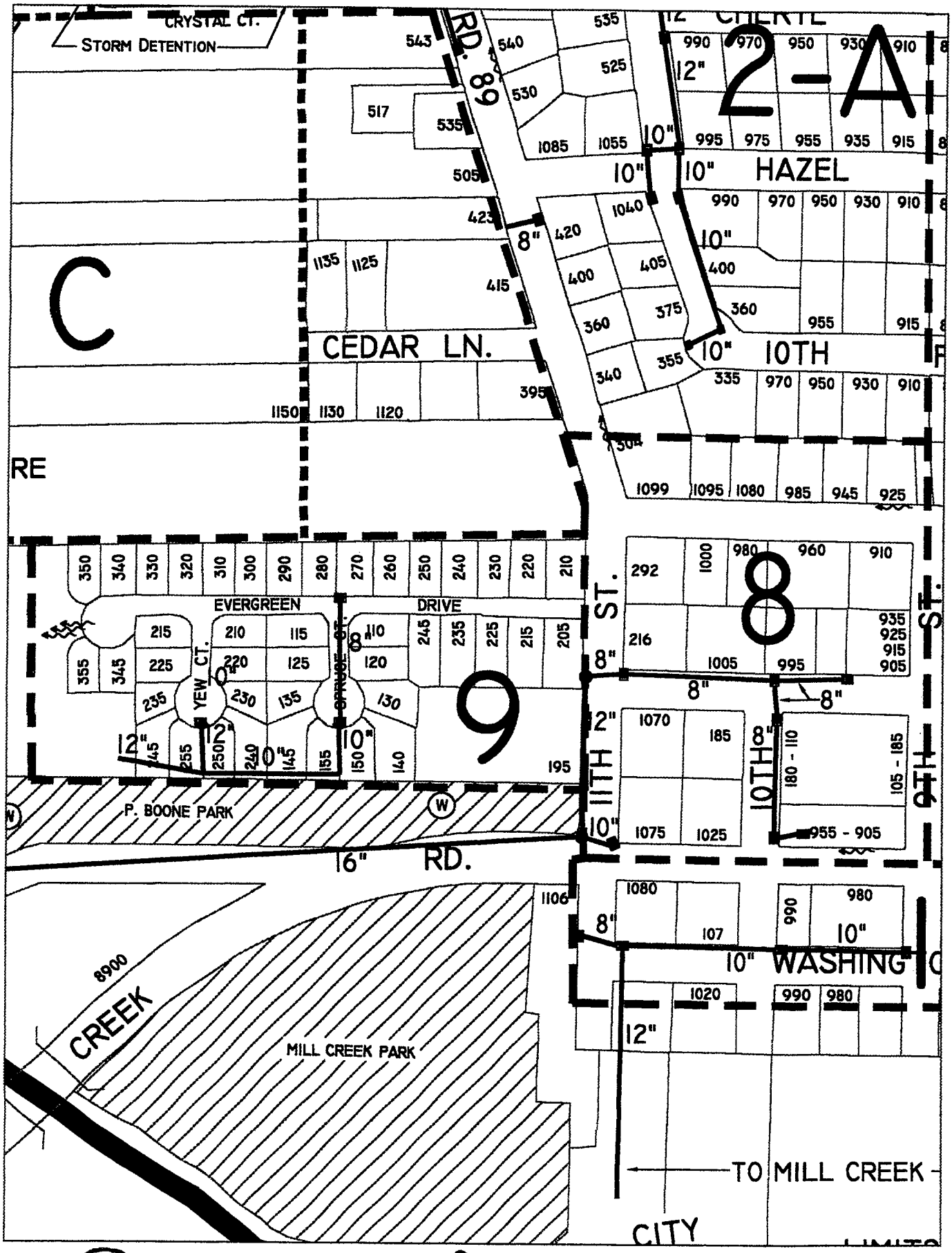
This drainage basin encompasses approximately 7 acres of residential area (see Storm Basin Drawing 8). Estimated Runoff from this basin:



CITY OF AUMSVILLE
STORM BASIN 6



CITY OF AUMSVILLE
STORM BASIN 7



CITY OF AUMSVILLE
STORM BASIN 8, 9

$$Q = CIA = 0.35\ (.86)\ (7) = 2\ CFS$$

Available outfall pipe (12") capacity: 2 CFS

Current drainage problems in the basin are caused by a lack of a storm drainage system along Cleveland Street. This is because there is no outlet available. However, when the proposed improvements in basin 2-A are completed, it is recommended that a storm drainage line be constructed along Cleveland Street and then cross 11th Street where it would then connect to the new basin 2-A system.

Estimated cost for the above work to install 500' of 8" storm drain piping; 4 catch basins; 1 junction box; surface restoration; including engineering/staking is $ 24,600.00.

Basin 9

This drainage basin encompasses approximately 8 acres of manufactured home area (see Storm Basin Drawing 9) and is designed to outfall into a 12" storm drain line. This storm drain line outfalls to Mill Creek on the west edge of the park. It then meanders to Mill Creek.

Estimated Runoff from this basin:

$$Q = CIA = 0.35\ (.86)\ (8) = 2.0\ CFS$$

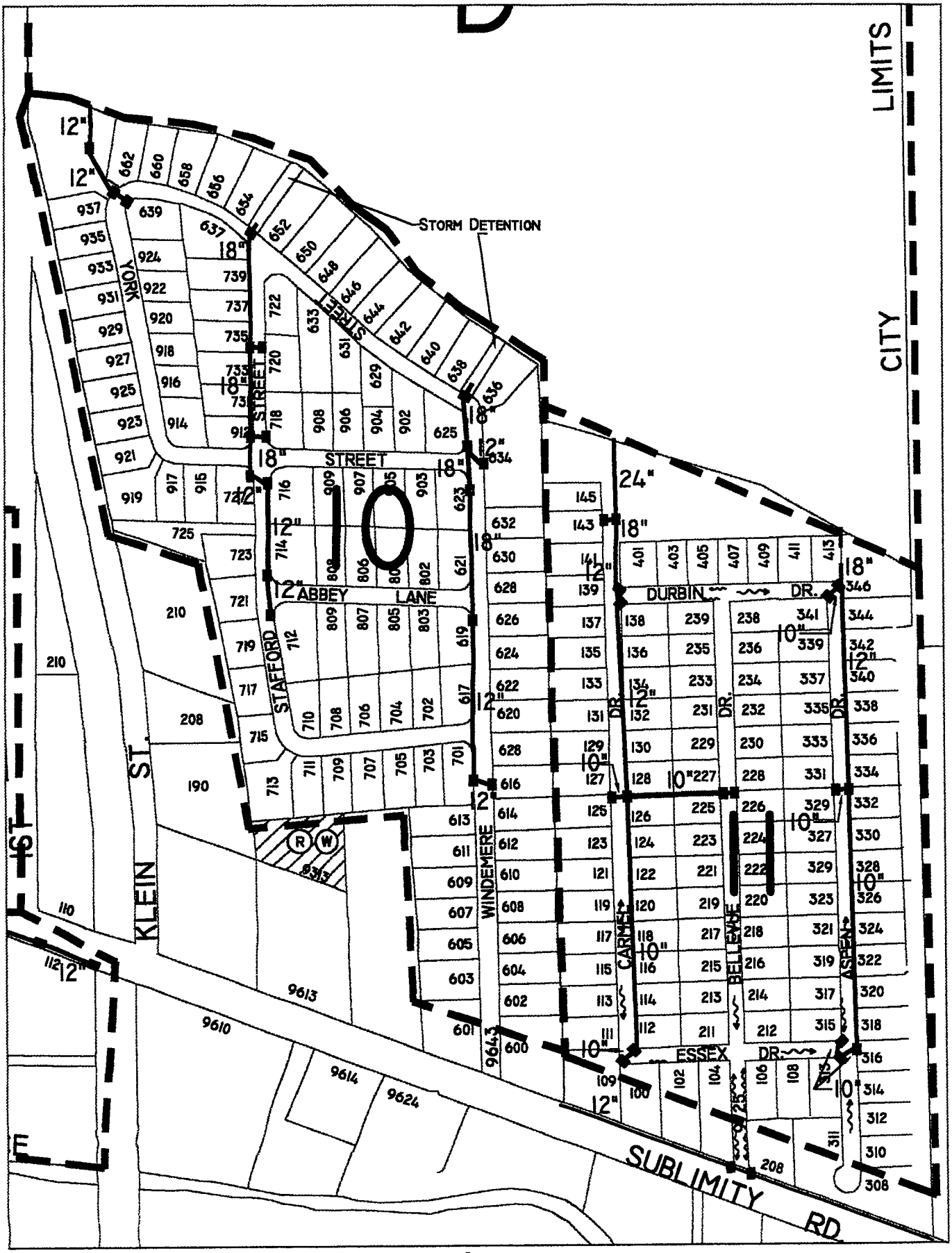
Available outfall pipe (12") capacity: 2.2 CFS.

No storm drainage improvements are recommended for this basin.

Basins 10 & 11

Drainage basins 10 and 11 encompasses two manufactured home areas: Windemere Meadows having an area of approximately 18 acres (see Storm Basin Drawing 10) and Mill Creek Estates having an area of approximately 11 acres(see Storm Basin Drawing 11). Each park has its own private storm drainage system with detention facilities. Both have outfalls into Herberger Ditch to the north. The discharged storm water then heads northerly in the east ditch of First Street and eventually into Beaver Creek. Included in the improvements to Highway 22 in 1997, the ditch along the east side of First Street was widened and improved to handle additional flows being generated upstream from the Stayton/Scio area. At the same time, several culvert crossings under First Street were eliminated to keep the Herberger Ditch water from crossing First Street and flooding several neighborhoods in Aumsville.

No storm drainage improvements are recommended for these basins.



CITY OF AUMSVILLE
STORM BASIN 10, 11

Basin 12

This drainage basin encompasses approximately 13 acres of commercial and open area (see Storm Basin Drawing 12). Estimated Runoff from this basin:

$$Q = CIA = 0.5\ (.86)\ (13): 5.6\ CFS$$

Available outfall pipe (15") capacity: 4 CFS
Available outfall pipe (12") capacity: 2.2 CFS

This storm drain system has some excess capacity that may be used in the future. New development along Main Street should attempt to connect to this system to keep from overloading the current system to the north. No storm drainage improvements are currently foreseen for this basin.

Basin 13

This drainage basin encompasses approximately 7 acres of residential area (see Storm Basin Drawing 13). Estimated Runoff from this basin:

$$Q = CIA = 0.35\ (.86)\ (7) = 2.1\ CFS$$

Available outfall pipe (12") capacity: 2.2 CFS

The drainage system in this basin is older, but over the past several years it has been upgraded with some new lines and additional catch basins. Until the streets are curbed, drainage will continue to occur along the shoulder areas.

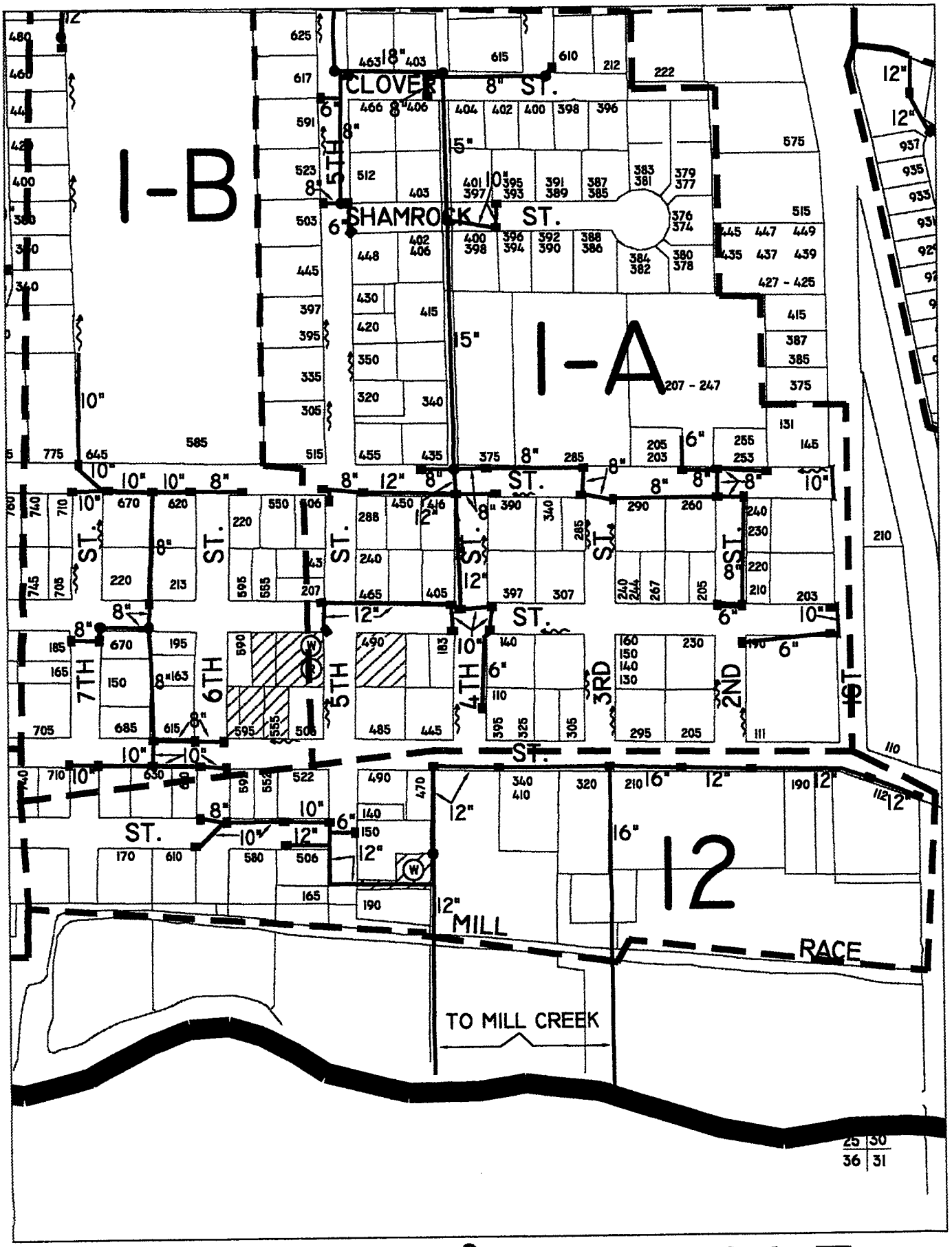
No storm drainage improvements are recommended for this basin.

Summary of Recommended Improvements: A summary of the recommended storm drainage improvements covered in this chapter are described as follows and are shown on **Map III**:

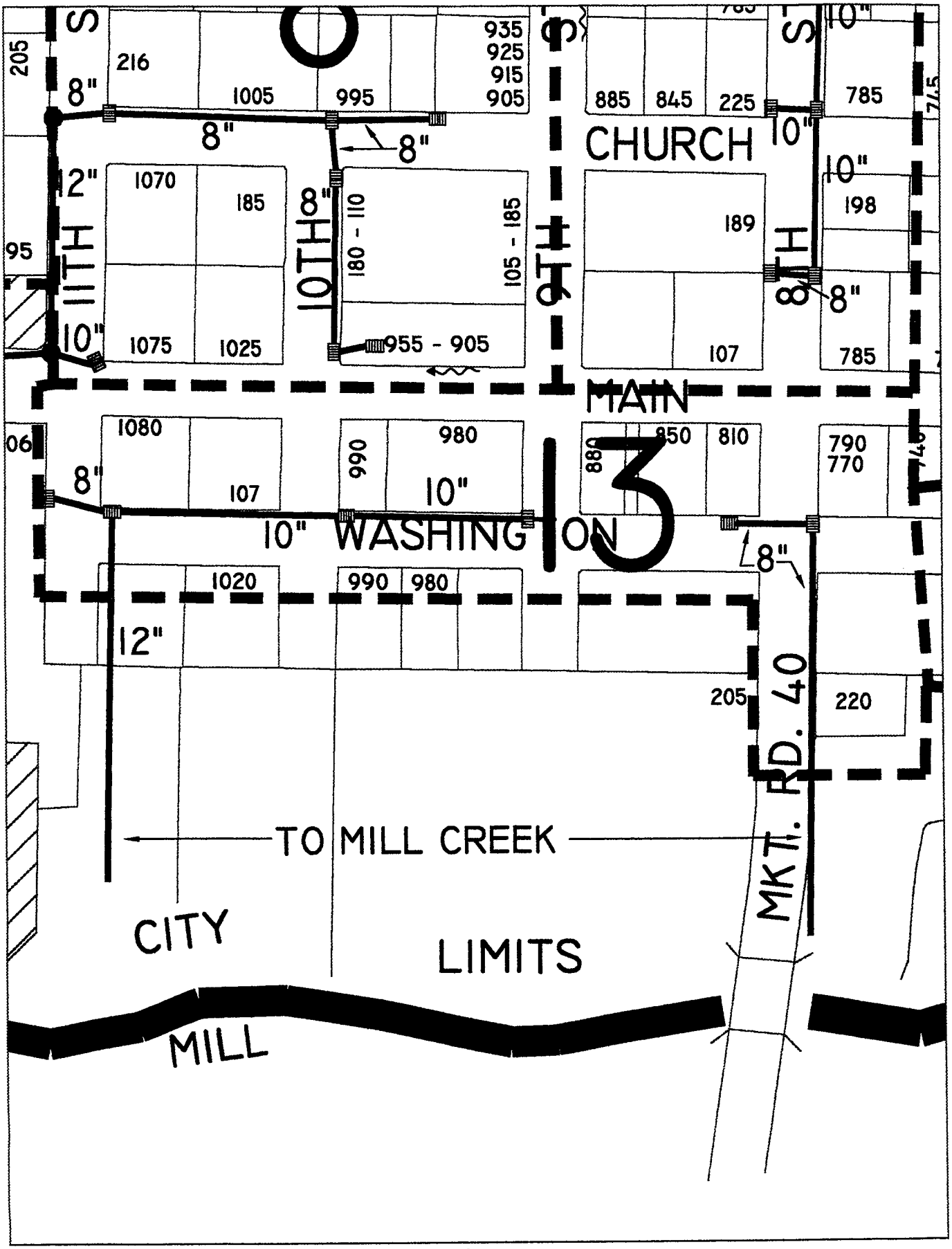
Priority 1: Basin 3 Improvements:

- These improvements are relatively inexpensive and would greatly increase the efficiency of the storm water collection within the basin by allowing better capture of the storm run-off water.

- Estimated cost for the above work to install; 2 catch basins; 1 junction box; including engineering/staking is $ 4,150.00.



CITY OF AUMSVILLE
STORM BASIN 12



CITY OF AUMSVILLE
STORM BASIN 13

Priority 2: Basin 2-A Improvements:

- These improvements will involve installing an 18" storm drain pipe to close an existing open ditch along 11th Street. This storm drainage system would direct the drainage to the north into the 36" outfall off Lincoln Street.

- Estimated cost to install approximately 800' of 12" storm drain; 3 catch basins; traffic control; including engineering/staking is $ 29,780.00.

Priority 3: Basin 8 Improvements:

- This area currently doe not have access to a designated drainage basin. However, this improvement requires the completion of Priority 2: Basin 2-A improvements first as it uses this basin's system for an outfall.

- Estimated cost to install approximately 800' of 12" storm drain; 3 catch basins; traffic control; including engineering/staking is $ 29,780.00.

Priority 4: Basin 1-B Improvements:

- This improvement consists of installing an 18" storm drain pipe to close the open ditch near the church. This will eliminate a safety hazard and require less maintenance for the public works staff. The 18" pipe would also provide the storm drain detention that is being eliminated by closing the ditch.

- Estimated cost to install approximately 600' of 18" storm drain; 2 catch basins; surface restoration; including engineering & staking is $ 26,800.00.

Priority 5: Basin 1-C Improvements:

- This improvement consists of installing a new 18" and 24" by-pass line from this basin-through basin 5-and connect to the 30" outfall line to Beaver Creek at Olney Street. This would provide additional capacity to relieve the flooding problem north of Lincoln Street. The new 30" outfall pipe north of Olney Street has the available capacity for this relief line.

- Estimated cost to install approximately 850' of 18" and 600' of 24" storm drain; 4 catch basins; surface restoration; including engineering & staking is $ 111,800.00.

Chapter 5
Future Storm Drainage Planning

General

The Aumsville Comprehensive Plan: 1997-99 Update projects a 3% annual growth rate over the next 20 years. This means that most of the currently vacant area within the Urban Growth Boundary will become occupied with medium and high density residential as well as industrial development.

As a result, the City must begin planning for future storm drainage development in these areas. New storm drainage facilities should wherever possible, be channeled into existing out falls. In addition, all new developments shall utilized storm drainage detention to minimize the effect of run-off on existing facilities as well as the receiving streams. All new developments shall install engineered and City approved drainage facilities.

In order to provide a general planning guide for future storm drainage facilities, the undeveloped areas within the Urban Growth Boundary have been divided into six basins noted as basins A, B, C, D, E and F (see **Map II**). For this study, the storm drainage pipe size requirements have been estimated and a cost estimate developed for the storm drainage main lines in each basin. Once the final development plans for a particular basin have been submitted and approved, the storm drain line sizes would then be engineered by the developer and approved by the City. Each basin will be discussed in the remainder of this chapter. The proposed improvements are shown on **Map III**.

Basin A

This drainage basin encompasses approximately 20 acres zoned medium density residential. The natural topography of this basin slopes east to west. A new 18" storm drain main line would be required along the west edge of this basin to direct the storm drainage run-off southerly to meet with the City's 36" outfall line which would also have to be extended to the UGB.

Estimated cost for this improvement is $ 88,550.00

Basin B

This drainage basin encompasses approximately 8 acres zoned medium density residential. The natural topography of this basin also slopes east to west. A new 15" storm drain main line would be required along the west edge of this basin to direct the storm drainage run-off southerly and connect to the 18" storm drain line in Basin A.

Estimated cost for this improvement is $ 42,570.00.

Basin C

This drainage basin encompasses approximately 12 acres zoned medium density residential. The natural topography of this basin slopes northeast to southwest. A new 15" storm drain main line would be required along the west edge of this basin to direct the storm drainage run-off southerly to the drainage swale currently being used by the outfall from basin 9.

Estimated cost for this improvement is $ 51,600.00.

Basin D

This drainage basin encompasses approximately 32 acres zoned industrial. The natural topography of this basin slopes east to west. A new 18" storm drain main line would be required through the center of this property to collect the storm drainage run-off and direct it into the east ditch along First Street where it would then flow northerly to Beaver Creek. The developer would be required to obtain approvals from Marion County and ODOT that the existing facilities have the capacity for the additional runoff.

Estimated cost for this improvement is $ 69,300.00.

Basin E

This drainage basin encompasses approximately 41 acres zoned industrial. The natural topography of this basin slopes east to west. A new 18" storm drain main line would be required through the center of this property to collect the storm drainage run-off and direct it into the east ditch along First Street where it would then flow northerly to Beaver Creek. The developer would be required to obtain approvals from Marion County and ODOT that the existing facilities have the capacity for the additional runoff.

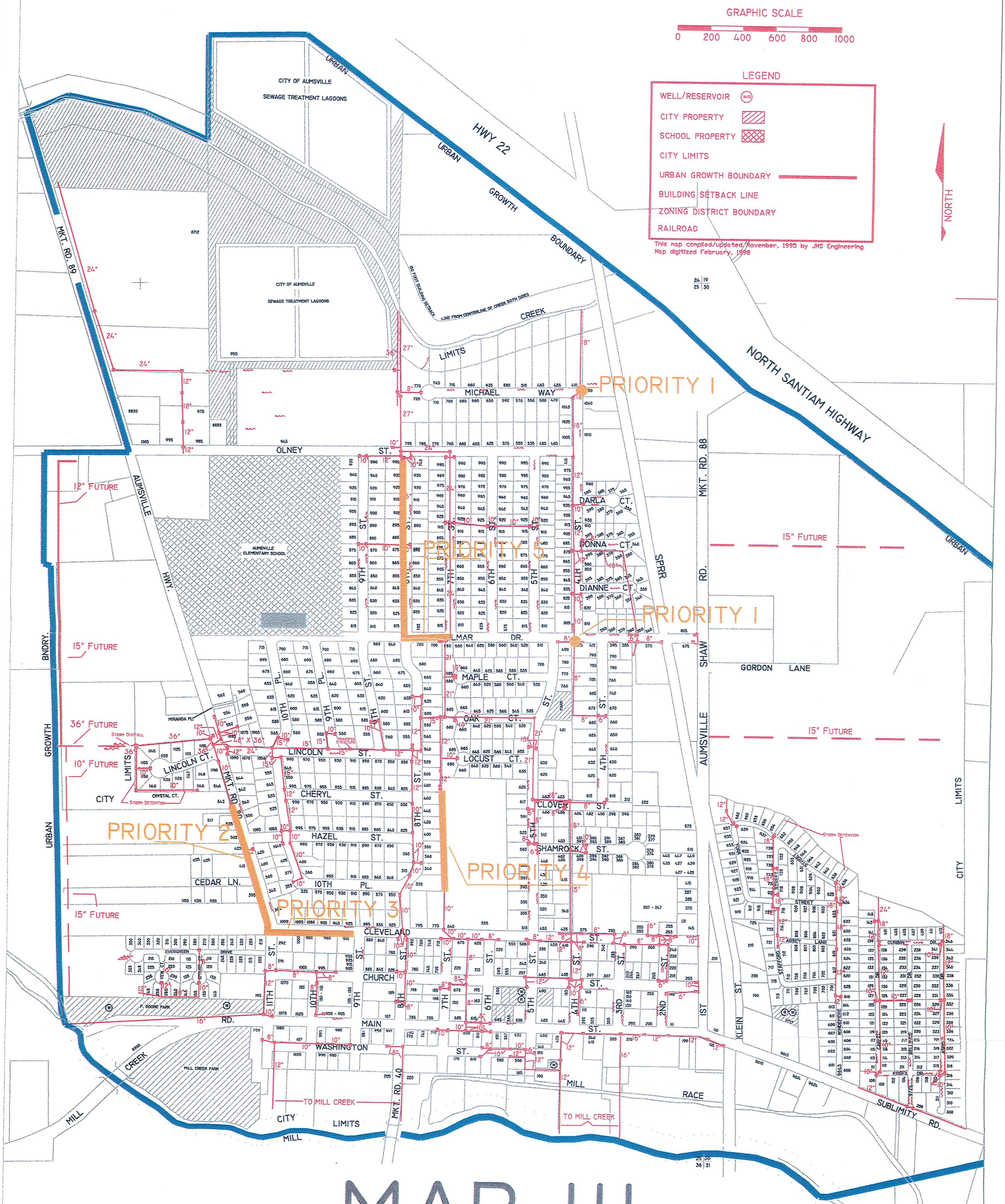
Estimated cost for this improvement is $ 66,000.00.

Basin F

This drainage basin encompasses approximately 93 acres zoned medium density residential. The natural topography of this basin slopes northeast to southwest. A new 18" and 15" storm drain main line would be required through the center of this property to collect the storm drainage run-off and direct it into the existing drainage swale known as the Herberger Ditch. This ditch flows westerly to the east ditch along First Street where it then flows northerly to Beaver Creek. The developer would be required to obtain approvals from Marion County and ODOT that the existing facilities have the capacity for the additional runoff.

Estimated cost for this improvement is $ 69,300.00.

CITY OF AUMSVILLE



MAP III

PROPOSED STORM DRAINAGE IMPROVEMENTS (PRIORITIES I THROUGH 5 & FUTURE)