



INFRASTRUCTURE

INTRODUCTION

The purpose of this chapter is to examine the city's potable water distribution, sanitary sewer collection, and stormwater drainage systems to assess the capability of each system to provide reliable service, allow the city to meet projected population levels and planned development, and meet existing and future demands on each system. This update includes an analysis of planned land uses, anticipated growth, and review of historical data related to water, sanitary, and stormwater system use. The City of Ankeny's infrastructure systems are the framework for the City's basic operation and future growth. These systems operate quietly and provide basic municipal support for the lives of Ankeny's residents.

The goal of this chapter is to provide citizens, designers, City staff, and potential developers with the knowledge to make more informed choices for the route and sizing of infrastructure that will extend to development areas; and effectively manage the potable water, sanitary sewer, and stormwater systems to reduce or prevent negative impacts to public and private property throughout the City.

The previous *2010 Ankeny Comprehensive Plan* infrastructure chapter was reviewed to determine whether the observations and improvement recommendations in that plan remain valid, if certain improvements have been made since that plan was developed and if other improvements should be implemented either now or in the planning period to ensure adequate utility infrastructure service is provided to the growing community.

WATER SYSTEM

Current development and planned growth in the city will require improvements to the potable water system in order to meet projected water demands. The need for water system improvements is determined by analyzing: 1) available storage capacity, supply and treatment; 2) available flow rates and pressures throughout the distribution system, and 3) system demands.

A Water Master Plan Final Report dated June 19, 2017, was prepared by the firm HDR for the City of Ankeny. The Water Master Plan was prepared to identify needed improvements in the Ankeny water system. Relevant excerpts

and summarizations from that Master Plan were reviewed and included in this chapter.

EXISTING WATER SYSTEM DEMAND

The Average Day Demand (ADD) for 2016 has increased from the *2010 Ankeny Comprehensive Plan* value of 4.22 MGD to 4.86 Million Gallons per Day (MGD) which represents an increase of approximately 15.2 percent.

The Maximum Day Demand (MDD) for the last three years was 12.3 MGD, which occurred on June 12, 2017. The previous Maximum Day Demand included in the *2010 Ankeny Comprehensive Plan* was 10.3 MGD, which occurred in 2016. The approximate increase is 19.4 percent.

With the existing Aquifer Storage and Recovery (ASR) wells, the actual total available source capacity is approximately 12.38 MGD.

EXISTING WATER SUPPLY

The City of Ankeny currently purchases all of its domestic potable water supply from Des Moines Water Works (DMWW). Water is

FIGURE 8.1 Recommended Future Water Supply Improvements

Target Year	Water Supply Improvement
2020	Additional supply through existing Polk County and Delaware Pump Stations
2025	Expansion of Saylorville WTP to 20 MGD capacity with full backup power and replacement for Ankeny's ASR #1 at 1.5 MGD capacity with backup power
2045	Increased production available from DMWW's Fleur WTP through Delaware Pump Station expansion / replacement
2050	Increased production available from DMWW's Fleur WTP through Polk County Pump Station expansion / replacement
2055	Addition of Ankeny's ASR #3 at 2.5 MGD capacity with backup power

Source: HDR

supplied from various DMWW connections including a connection from the Saylorville Water Treatment Plant (WTP). In its purchase agreement with the DMWW the total available capacity to the City of Ankeny is 8.28 million gallons per day (MGD).

The concept of "Purchased Capacity" was introduced as part of the most recent agreement with DMWW. This allowed the City of Ankeny to buy down their wholesale water rates by making an upfront capital contribution to the DMWW. The agreement gives the City of Ankeny a total of 8.28 MGD purchased capacity in the DMWW.

The agreement states that the City of Ankeny can draw potable water from the DMWW system up to 8.28 MGD and pay the lower wholesale water rate (purchased capacity rate). If the City draws water at a daily rate exceeding 8.28 MGD, the cost of water would be impacted during the succeeding water purchase year. Since the "With Storage" rate is significantly higher than the "Purchased Capacity" rate, drawing water from the system at a larger rate than purchased capacity rate can result in a significant increase in the cost of water.

Since the *2010 Ankeny Comprehensive Plan* was adopted, the new Des Moines Water Works (DMWW) Saylorville water treatment plant has come online and is now providing water supply to the City of Ankeny in addition to the other existing supply points from DMWW in the system. The opportunity to obtain additional source capacity from the new Saylorville water treatment plant in the future should be explored with DMWW as plans for increasing the treatment capacity there are considered.

The CIRDWC Technical Advisor Committee's population projections for 2020, 2030 and 2040 for the City of Ankeny have been estimated to be approximately 62,298, 81,546 and 102,310, respectively. The HDR Master Plan projected maximum day demands for the years 2020, 2030 and 2040 are 15.2 MGD, 20.0 MGD, and 25.1 MGD, respectively, based on projected population increases. These numbers have slightly increased from the 2002 Facility Plan referenced in the 2010 Comprehensive Plan.

SYSTEM SUPPLY AND CONNECTIONS CAPACITY

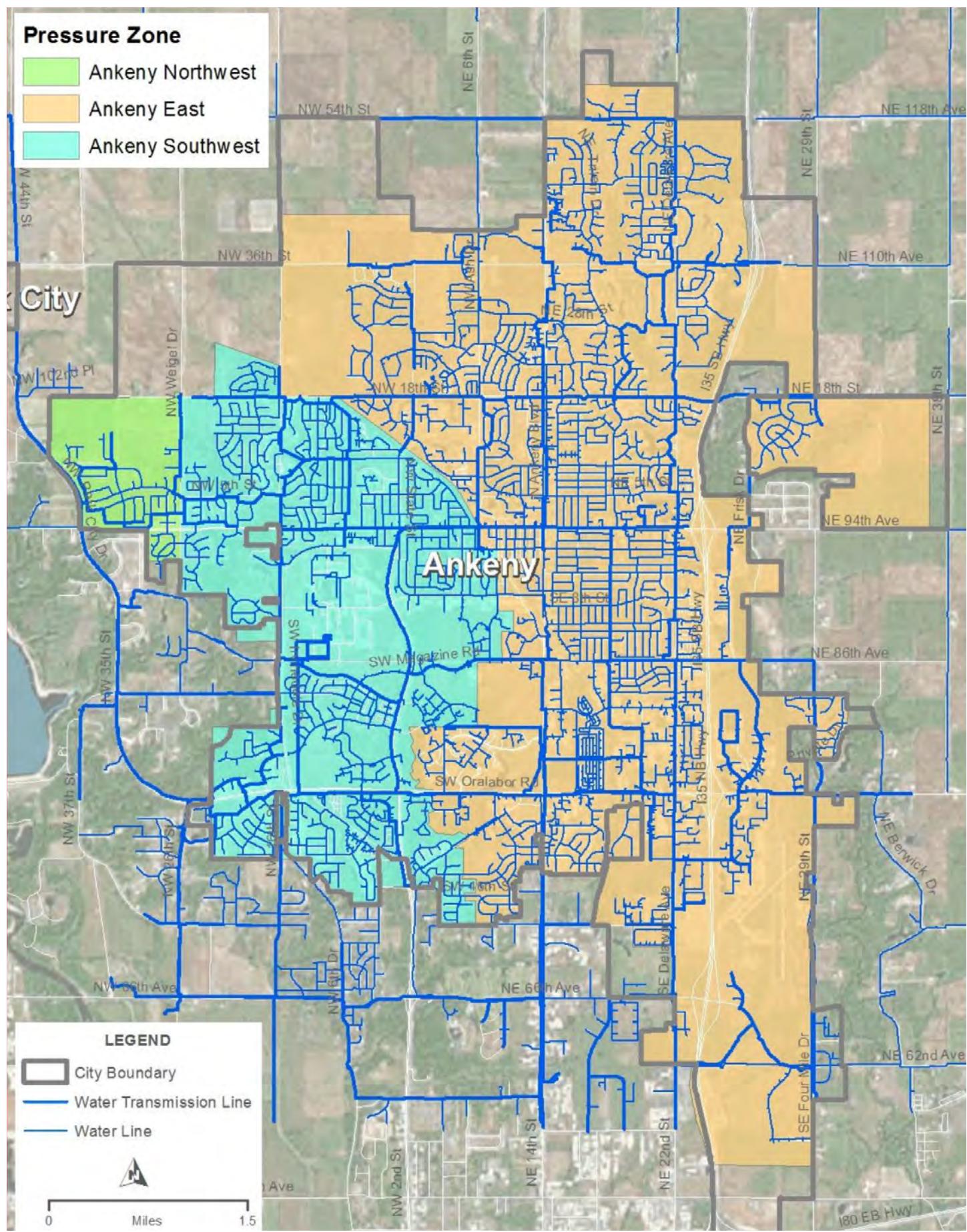
An overall analysis of system production, supply capacity, and individual connections to the service areas was conducted by HDR Engineering, Inc. for the Joint Water System Master Plan to determine future treatment, pumping and transmission needs from a study area-wide perspective. A study of area-wide production and supply capacity analysis was completed to determine future needs for treatment and pumping based on the demand projections through the Year 2055. Production and supply improvement recommendations are as noted in the Figure 8.1 above.

The Saylorville WTP expansion is currently planned for 20 MGD by 2025 with a capacity review forthcoming with the DMWW's Long Range Plan update. The expanded Saylorville WTP (at a 20 MGD capacity) is expected to be able to supply the joint study area until the Year 2045 when additional production needs to be provided by DMWW's Fleur WTP through the Polk County and Delaware Pump Stations. An additional 2.0 MGD by 2020, 3.0 MGD by 2040, 2.5 MGD by 2045, and 2.5 MGD by 2050 were assumed by Joint Water Master Plan analysis from the Fleur WTP with a potential reassessment during the update of DMWW's Long Range Plan.

EXISTING WATER DISTRIBUTION SYSTEM

The Ankeny water distribution system currently provides service to customers within the city limits. The existing water distribution system consists of approximately 281 miles of public water mains ranging from 4 to 24 inches in diameter. There are two elevated storage tanks and two above ground storage tanks owned and maintained by Ankeny in the distribution system that provide water storage needs. There are two aquifer storage and recovery (ASR) wells that together can feed up to 4.10 MGD to the system. Ankeny owns, maintains, and operates two pump stations in the system, Delaware Pump Station and Magazine Pump Station, which both pump to the East pressure zone. There are approximately 3,110 fire hydrants and 3,878 isolation valves located in the distribution system.

FIGURE 8.2 Existing Pressure Zones



Among the tasks completed by HDR was an update of Ankeny's water distribution system hydraulic model. A future conditions model was developed based on future facilities, demands and operations developed from flow projections, storage and pumping analysis, and supplemental information provided by the City of Ankeny. Using the validated existing conditions model, Maximum Day Demand (MDD) condition scenarios were constructed and used to evaluate scenarios under future projected demand conditions within the distribution system. The expansion of Ankeny's service area boundary and demand allocation based on estimated future development was accounted for in each of these future model scenarios. The results of the joint modeling process were used to develop capital improvement program recommendations and to forecast long-term project needs and improvement projects. Excerpts and summarizations from the HDR Joint Water Master Plan follows.

EXISTING AND FUTURE SYSTEM ANALYSIS

The level of service goals, existing and future analysis hydraulic model results, and infrastructure capacity needs for the three entities' systems were included in the Joint Water Master Plan study. For the purposes of *The Ankeny Plan 2040*, only relevant excerpts for Ankeny's recommendations from the study have been reported in this chapter.

LEVEL OF SERVICE GOALS

Maximum day and maximum hour evaluation criteria were established for analyzing the performance of the Ankeny water distribution system under existing and future peak demand conditions. The results of planning year analyses compared against the evaluation criteria are the basis for required improvements and their sizing. Two criteria tiers were established to evaluate two levels of performance deficiencies within the system: moderate (Tier 1) and critical (Tier 2). Improvements were generally sized around minimizing as many Tier 2 deficiencies as possible, which typically has a positive effect on reducing the Tier 1 deficiencies as well. The following level of service criteria are used during the system analysis and depicted on the model results figures.

Maximum Hour Conditions

The MHD conditions are evaluated against the following criteria indicated in the table below:

FIGURE 8.3 Recommended Future Water Supply Improvements

Maximum Hour Condition	Tier 1 Deficiency	Tier 2 Deficiency
Distribution Pressure	Low: 45 to 55 psi High: 90 to 100 psi	Low: Less than 45 psi High: Greater than 100 psi
Distribution Velocity	3 to 5 fps	Greater than 5 fps
Distribution Headloss	3 to 5 feet per 1,000 feet	Greater than 5 feet per 1,000 feet
Pump Station Capacity	Below firm capacity by 1 pump	At firm capacity
Maximum Day Plus Fire Flow Conditions Required Fire Flow Availability	50 to 100 percent at 20 psi residual	Less than 50 percent at 20 psi residual

Source: HDR

DISTRIBUTION SYSTEM AND FUTURE PRESSURE ZONES

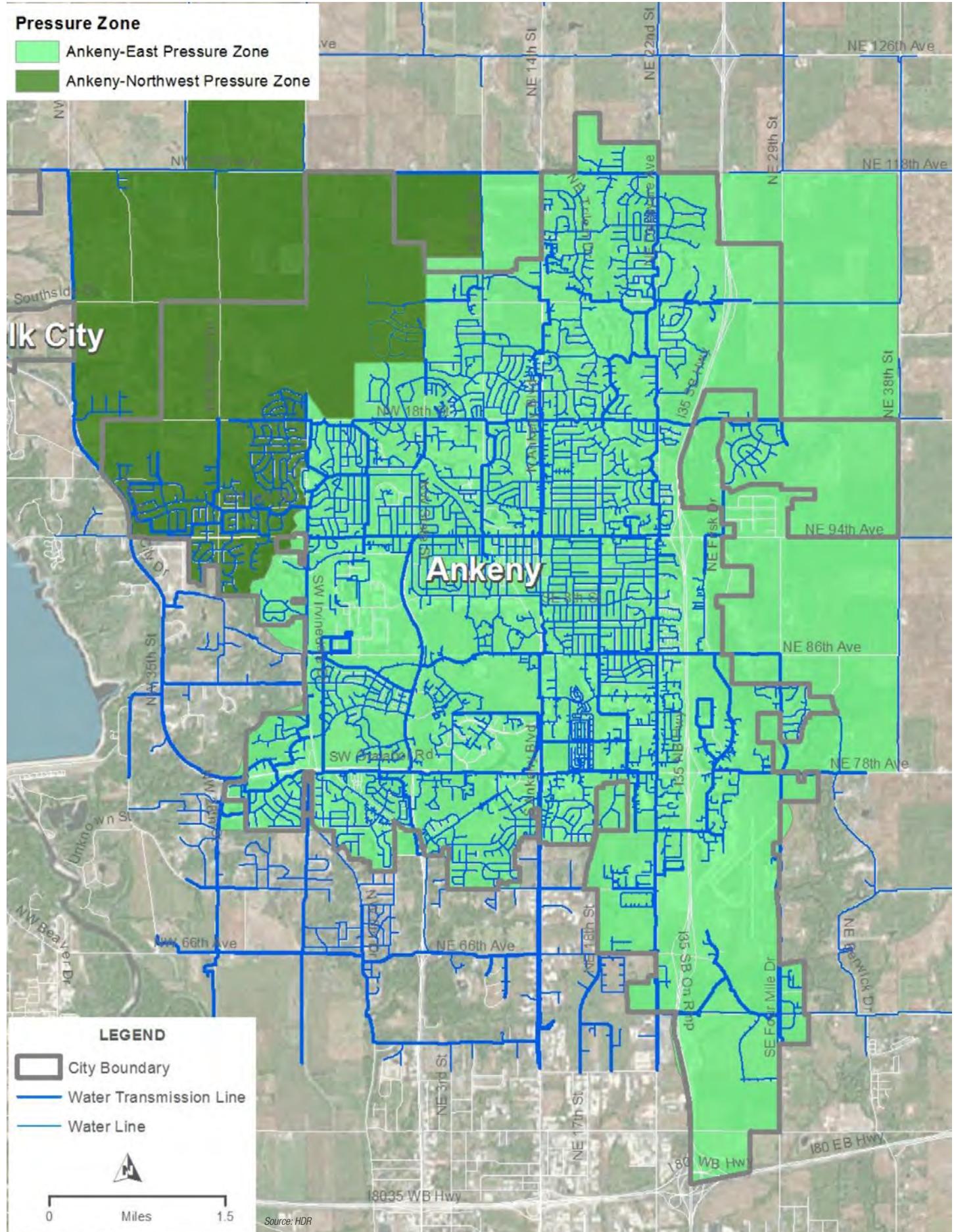
The proposed new planning boundaries in this comp plan have extended farther north and east from those in the 2010 comp plan. This planning area extends also beyond the service area contained in the DMWW agreement. The Water Master Plan looked at future pressure zone development and optimization to provide information about the majority of the areas with the operating pressure level of service summarized above, including:

- Current pressure zones and transmission configuration
- Future service areas, topography, and transmission, pumping, and storage needs
- Goal of combining Ankeny's East and Southwest pressure zones for shared storage, transmission, and improved operations

The result of the review and future pressure zones was a slightly simplified configuration that reduces the infrastructure needs within the study area while meeting level of service goals. The recommended changes to the existing pressure zones boundaries are shown between Figures 8.2 and 8.4.

The study found that current transmission capacity within Ankeny limits the amount of potable water that can be supplied by DMWW under peak demand conditions. Supply from the Saylorville WTP through the NW 26th Street meter pit is limited by a 12-inch main along SW Edgewood Lane. Combined supply from the Polk County Pump Station and Saylorville WTP along Ankeny Blvd is limited due the 24-inch main reducing to a 16-inch main and eventually down to 6-inches before reaching the Ash Water Tower. This limits the ability to fill the Ash Water Tower during periods of high demands. Within the Ankeny

FIGURE 8.4 Future Pressure Zones



system, existing transmission capacity throughout the system is limited. This is most noticeable around the Ash Water Tower and can be seen in the results showing MHD velocity and MHD headloss, and is demonstrated by the reported difficulties of having the Ash and Irvinedale Water Towers float together at the same HGL.

The Master Water Plan provided water system implementation recommendations for Ankeny summarized in detail by planning year. The improvements were developed to correct the issues identified while evaluating the existing and future distribution system. The following are general improvement recommendations to be implemented to maintain and improve current system performance through the planning period:

- Serve Northwest pressure zone through Ankeny instead of from the Polk City Booster Station using a proposed Northwest Booster Station by 2020
- Increase transmission capacity through the existing system to serve the Northwest pressure zone from the combined East pressure zone by 2025
- Improve transmission between the Ash and Irvinedale Towers so they can float together better over time in a combined East pressure zone by 2025
- Improve various bottlenecks in the existing transmission system for specific and overall improved hydraulic performance throughout this study's planning horizon
- Improve transmission and construct system extensions to support on-going development and population growth throughout this study's planning horizon
- Improve pressure, fire flow, and pipe condition around older parts of Ankeny's system near the Ash Water Tower by upsizing 4- and 6-inch diameter mains throughout this study's planning horizon
- Increase transmission from the Saylorville WTP, Polk County Pump Station and Delaware Pump Station to Ankeny to increase supply from DMWW and support growth and development throughout this study's planning horizon
- Provide sufficient storage and pumping capacity including one additional ASR well to reliably serve Ankeny in conjunction with transmission capacity improvements

STORAGE AND PUMPING ANALYSIS

Storage and pumping within water transmission and distribution systems are complimentary to each other. Therefore, storage and pumping analyses were conducted concurrently to determine the existing and future needs.

Storage Analysis

The primary advantages of distribution system storage are:

- Equalization of water demands on raw water supply, treated water production, water transmission, and pumping facilities.
- Stabilization of distribution system flows and pressures.
- Provision of reserve supplies in the distribution system for contingencies such as fire and emergency demands.
- Reduced energy cost through optimized pumping flows and pumping timing
- Extended system life due to reduced pressure variations

The plan used a storage component analysis to account for all uses including operating, equalizing, fire flow and emergency / standby volumes during peak demand conditions to establish existing and future storage needs. The storage surplus or deficiency is defined as the amount of available storage compared to the sum of the separate storage component needs. Additional storage improvements in the future are included in the calculation to balance the storage needs with the available volume.

The future storage needs determined from the analysis which include replacement of existing, aging storage infrastructure are presented in Figure 8.5 below:

FIGURE 8.5 Recommended Future Water Storage Improvements

Planning Year	Water Storage Improvement
2018	Inspect, Repaint, and Repair Ash Water Tower
2025	Northwest Water Tower near NW 36th Street and NW Irvinedale Drive (2.25 Million Gallons (MG))
2030	Inspect, Repaint, and Repair Irvinedale Water Tower Replace Ash Water Tower near NW Ash Drive and W 1st Street (2.5 MG)
2035	Decommission Magazine Ground Storage Tank once maintenance costs become too high Inspect and Rehabilitate or Replace Delaware Ground Storage Tank
2045	New East Elevated Water Storage Tank near NE 94th Avenue and NE 38th Street (1.0 to 2.0 MG)

Source: HDR

PUMPING ANALYSIS

The Water Master Plan provided a pumping analysis for Ankeny with future demand projections to review the source capacity needed through the planning years. These projections and fire flow definitions were used to identify water surplus or deficiency in situations of Maximum Daily Demand (MDD), Maximum Hourly Demand (MHD), where applicable, and fire flow. Available source(s) to meet MDD (or MHD for service areas / pressure zones without storage) are found using the pump stations' firm capacity, the pumping capacity with the largest pump out of service. The source surplus or deficiency is defined as the amount of available sources compared to MDD (or MHD) plus fire flow demand. Additional pumping improvements in the future are included in the calculation to balance the demand needs with the available capacity.

The future pumping needs determined from the analysis which include replacement of existing aging pumping infrastructure are presented in Figure 8.6 below:

FIGURE 8.6 Recommended Future Water Storage Improvements

Planning Year	Water Pumping Improvements
2018	Northwest Booster Station at NW Irvindale Drive and NW 18th Street (6 MGD Total / 3.5 MGD Firm)
2035	Decommission Magazine Pump Station Rehabilitate or Replace Delaware Pump Station (7.5 MGD Total / 5 MGD Firm)
2040	Increase Pumping Capacity at Northwest Booster Station (Add 4 MGD to 10 MGD Total / 7.5 MGD Firm)
2045	Increase Pumping Capacity at Delaware Pump Station (Add 2.5 MGD for 10.0 MGD Total / 7.5 MGD Firm)

Source: HDR

ASR ANALYSIS

Ankeny currently operates two aquifer storage and recovery wells (ASRs) that provide base flow to the service area during the high demand season. The ASRs increase the pressure in the vicinity of the ASRs when the Ash Water Tower is operating at lower levels. The existing ASR #1 is nearing the end of its useful life and will need to be replaced in the next 5 to 10 years; also its current location is constrained in terms of space at the site for access for maintenance and construction. In addition, only ASR #2 has backup power currently and can be relied upon for supply under emergency conditions.

Backup power and SCADA for operations and flow recording should be provided for all of the new ASR installations.

In order to provide additional base flow as the Ankeny service area grows while balancing operations during the lower demand portions of the summer season, the Joint Water Master Plan recommended that one additional ASR be installed by the Year 2055 in addition to replacing ASRs #1 and #2. The future ASR #3 is recommended to be installed in the northwest portion of the combined East pressure zone. The ASR #1 replacement can be located at the existing Magazine Ground Storage and Pump Station site while ASR #2 replacement can be located at its existing site. ASR improvements were recommended for the following planning periods outlined below in Figure 8.7:

FIGURE 8.7 Recommended Future ASR Improvements

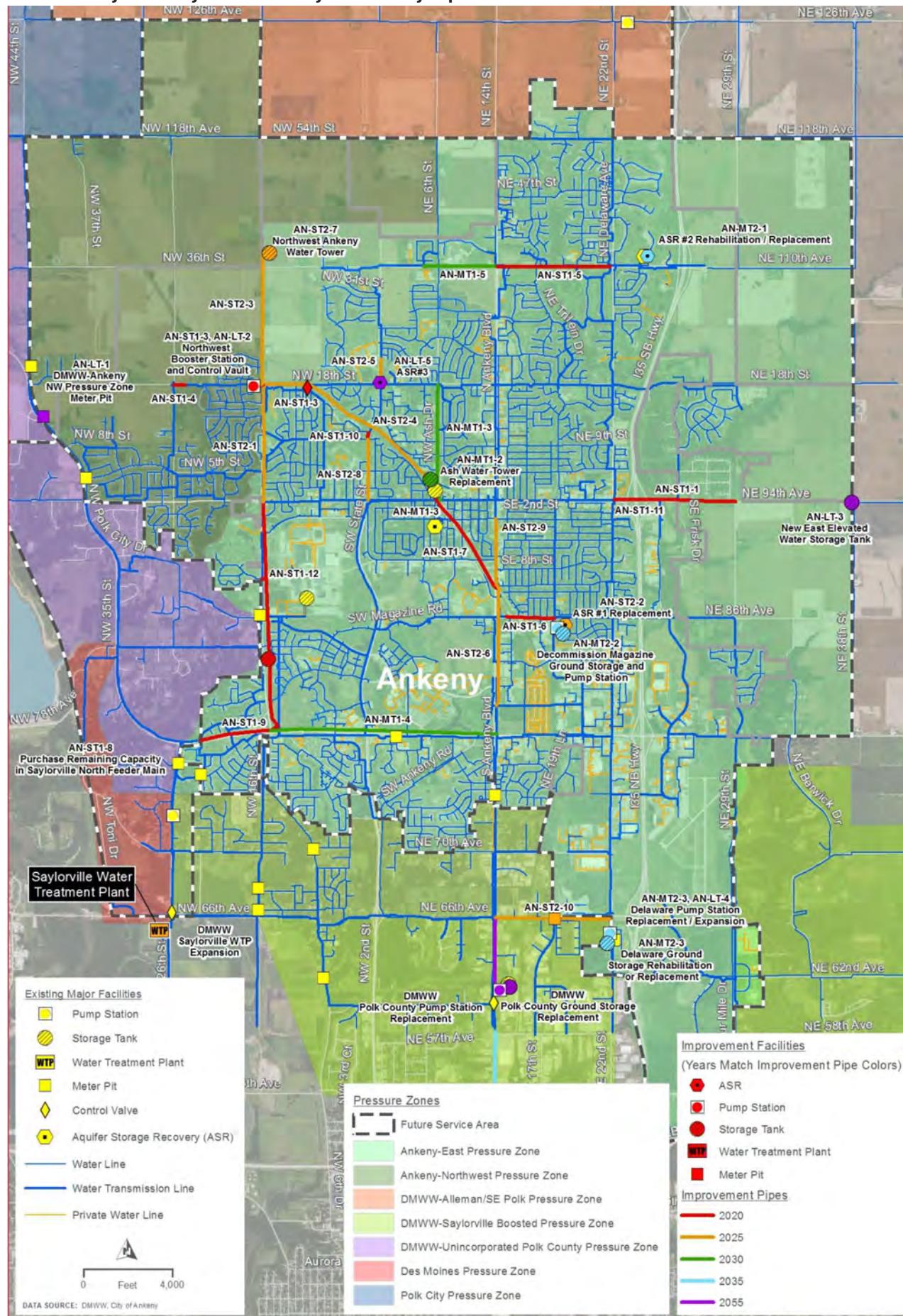
Planning Year	ASR Improvement
2025	ASR #1 replacement in southeast Ankeny at the existing Magazine Ground Storage and Pump Station site (combined East pressure zone)
2035	ASR #2 replacement in northeast Ankeny at current location in the vicinity of NE 36th Street and Delaware Avenue (combined East pressure zone)
2055	New ASR #3 in northwest central Ankeny in the vicinity of 18th Street and NW State Street (combined East pressure zone)

Source: HDR

As ASRs are basically storage and pumping facilities combined, generating a plume of water in the winter season by pumping excess water into the ground and recovering from that plume as much of it as possible during the summer season, spacing of the ASRs and the ability to balance the storage and recovery cycles over a year are important. A hydrogeologic study was also recommended to be able to evaluate several subsurface storage zones and help locate focused site opportunities for ASR development.

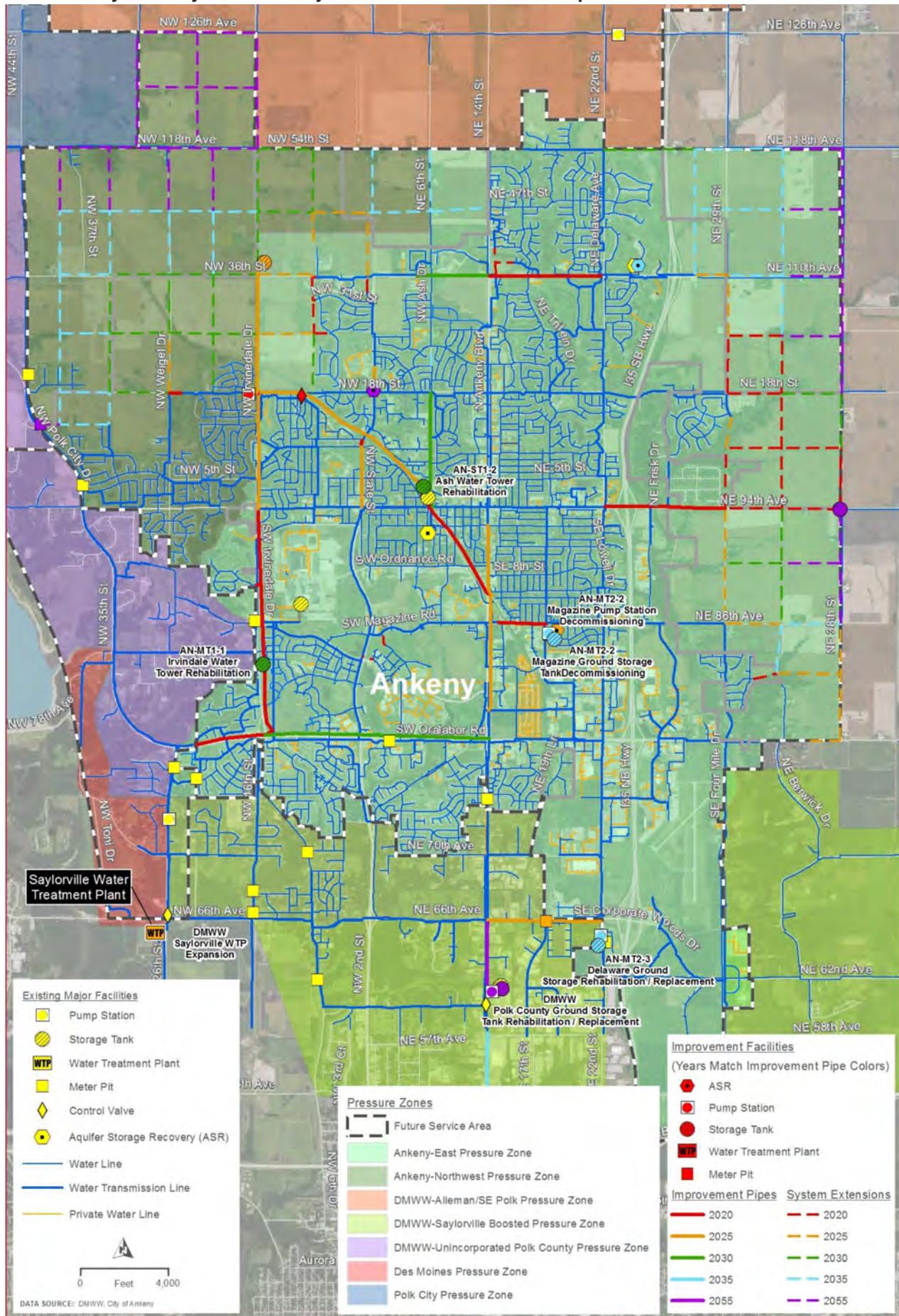
The Water System Master Plan analyzed short-, mid-, and long-term implementation recommendations for the Ankeny municipal water system. In addition to the hydraulic modeling and analysis completed by the plan for the City of Ankeny, Ankeny's existing 5-year CIP (2016-2020) was also reviewed and included in the following proposed operational investments summary. Figures 8.8 and 8.9 illustrate Ankeny's recommended primary improvements and secondary growth and maintenance-related improvements, respectively, across the system.

FIGURE 8.8 City of Ankeny Future Water System Primary Improvements



Source: HDR

FIGURE 8.9 City of Ankeny Future Water System Growth and Maintenance Improvements



OPERATIONAL INVESTMENTS

The following operational changes are recommended in the Master Water Plan by planning period (short, mid, and long-term) for Ankeny:

SHORT-TERM (2017-2025)

Target Years 2017/2018

The objective of removing Ankeny's Northwest pressure zone from DMWW's existing 16-inch feeder main to Polk City will be accomplished by a series of projects including a new booster pump station near NW 18th Street and Irvineland Drive intersection and transmission system upgrades within Ankeny's system.

Target Years 2019/2020

Additional larger pipeline projects are recommended to increase transmission and improve performance in Ankeny's system as its demands grow. Continue to use Oralabor and NW 26th Street control vaults as needed but begin to test opening the two Ankeny East and Southwest pressure zones to each other to see how the two tanks float together once the first phase of transmission projects are in place. The control valves may be needed until 2025 when the second phase of transmission projects are in place hydraulically connecting the tanks with larger mains and the tanks are more able to fully float together.

Target Year 2021

Due to the age and condition of the existing ASR #1 well, a replacement of the ASR well is recommended at the Magazine Ground Storage and Booster Pump Station site as city-owned land is available and access is better than the existing site. There is adequate transmission into and out of this site to use the replacement ASR effectively. This replacement ASR #1 would be operated with the existing ASR #2 well in much the same fashion as the existing one. The size of the new ASR is recommended to be slightly larger than the existing one at around 1.5 MGD. However, the base demand in the system should be high enough at that time to support its use near capacity, especially once the plume is established by 2025-2026. It is recommended to use ASR #2 first to base load the system, and install a VFD, if available, for the replacement ASR #1 to allow it to be controlled at a lower flow to allow for increased regulation in meeting the supply difference needed day to day.

Target Years 2022/2023

The possibility of joint operation of the northwest pressure zone with Polk City and DMWW should be considered. Ankeny's Northwest pressure zone would operate at the Future Joint System pressure zone HGL if the joint transmission is built between a Joint Northwest Booster Station and a Joint Northwest Water Tower. The Northwest Booster Station would then be used to control the level of the Northwest Water Tower. The Joint Northwest Water Tower would store Ankeny's purchased water from DMWW and be sold back at the proposed meter pit and joint pipelines north and west towards the Polk City, Unincorporated Polk County and Alleman / SE Polk systems.

Target Year 2025

Additional large pipeline projects are planned throughout the city during 2021-2025 to improve transmission and hydraulic performance to support expected development in Ankeny. As demand continues to increase in Ankeny and the northwest portion of the system grows, transmission mains will need to be built from SW Edgewood Drive and Oralabor to SW Irvineland Drive, then north to SW Tower, and then to W 1st Street and then to NW 18th Street by 2025. Projects are all currently programmed to be completed by 2021. In conjunction with the Northwest Booster Station. One of the transmission mains along NE 66th Avenue from NE 14th Street connecting DMWW's system into Ankeny's around NW 22nd Lane will need a new meter pit as it will be a new supply into Ankeny's system. Once the majority of the transmission is constructed between the Irvineland Water Tower as part of the existing Southwest pressure zone and Ash Water Tower as part of the existing East pressure zone, the tanks will float together much better than in the past. Due to the existing size and location of the Ash Water Tower, it will be drawn down further than the Irvineland Water Tower, especially during greater demand periods, but they will generally cycle in the same pattern throughout the day. At this point the Southwest and East pressure zones can be combined into a single pressure zone, referred to as the East pressure zone in this study. All of the closed isolation valves along the current pressure zones boundary would be opened. The Oralabor Road and SW Franklin Drive Flow Control Vault is likely not needed after this combined zone is established, but could be kept in place and operated if needed to control how much water is sent west towards the Irvineland Water Tower versus kept flowing north towards Ash Water Tower. The modeling performed during this project did not use the Oralabor Road flow control valve in the 2025, 2030 or 2035 maximum day scenarios. By 2030, a parallel transmission main to the existing Oralabor Road 12-inch main is recommended, effectively bypassing this flow control valve.

MID-TERM (2026-2035)

Target Year 2027

Replacement of the Ash Water Tower would not change operations much but would provide additional storage to the system, further helping balance out the use of storage in Ash and Irvineland Water Towers. The HGL of the replacement Ash Water Tower would stay the same to match Irvineland Water Tower's HGL, setting the East pressure zone's HGL.

Target Year 2033

Due to expected condition and performance, replacement or rehabilitation of the ASR #2 well in the same location would not change operations and would be operated with the replacement ASR #1 well in much the same fashion as the existing ones. The size of this ASR is recommended to remain the same as the existing one. If possible, install a VFD for the replacement ASR #2 to allow it to be controlled at a lower flow to allow for increased regulation in meeting the supply difference needed day to day.

Target Year 2034

Decommissioning the seldom used Magazine Pump Station and Ground Storage Tank will remove a temporary source of water to Ankeny's system, making that part of the system more reliant on the Delaware and Polk County Pump Stations during peak demand conditions and fire flows. Transmission in this area of distribution system should be improved by this time period, so that the areas that this pump station was originally designed to serve can receive adequate pressure during high flow conditions. Additionally, the storage volume in the Delaware Ground Storage Tank replacement should be increased to make up for the reduced storage from decommissioning the Magazine Ground Storage Tank.

Target Year 2035

Rehabilitating or replacing the Delaware Pump Station and Ground Storage Tank provides an opportunity to increase the capacity of the pump station and storage to provide for future demands on the east side of Ankeny, including east of I-35. In addition, a couple of empty pump spaces should be added in the design to the replacement pump station for future capacity addition.

LONG-TERM (2036-2055)

Target Year 2040

Install additional pumping capacity at the Northwest Booster Station as the area it serves and demand in the Northwest pressure zone grows northwest away from the existing city.

Target Year 2045

In the 2055 planning period once demands have increased due to development, additional storage for Ankeny will likely be required. Additional storage in the northeast growing area of Ankeny is recommended. However, the volume is variable at this time depending on how long in the future beyond 2055 the storage is planned for. This future storage level will be controlled mostly by the Delaware and Polk County Pump Stations.

Target Year 2055

An addition of a third ASR well in the long-term planning period is recommended when the baseline demands (approximately a third of average day) in the system are above 6.5 MGD. ASR #3 would be the third priority to operate after ASRs #1 and #2. If possible, install a VFD for ASR #3 to allow it to be controlled at a lower flow to allow for increased regulation in meeting the supply difference needed day to day. A park near-by this location could be where the new well is placed to assist in obtaining chlorine contact time before the first customer. Additional pumping capacity may be needed at Delaware Pump Station to support future growth in the northeast portion of Ankeny in the future, and could be added to the future replacement pump station if space is left for additional pumps.

RECOMMENDED WATER SYSTEM CAPITAL IMPROVEMENTS

Specific project recommendations were recommended for Ankeny's future Capital Improvement Planning purposes in the Joint Water System Master Plan.

NEAR TERM (2017-2025)

Target Year 2018

- Upsize 6-inch water main along SE Magazine Road between S Ankeny Boulevard and SE Trilein Drive.
- Transmission main from Ash Water Tower to SW Magazine Road and S Ankeny Boulevard.
- As needed, inspection, repair, and repainting of the Ash Water Tower is recommended prior to replacement in about 10 years

Target Year 2019

- Transmission main from Oralabor Road and SW Edgewood Lane to SW Irvinedale Drive to Irvinedale Water Tower.
- Upsize 6-inch water main along NW State Street between NW 9th Street and NW 10th Street.

Target Year 2020

- East First Street Rural water main extension from just east of NE Frisk Drive west to NE Delaware Avenue crossing including a crossing of I-35 with interchange reconstruction project.
- Transmission main from Irvinedale Water Tower to W 1st Street.

Target Year 2021

- Transmission main along NW Irvinedale Drive from W 1st Street to NW 18th Street.
- Purchase remaining capacity in the existing 24-inch Saylorville North Feeder Main from Saylorville WTP to support future growth in Ankeny

Target Year 2022

- Replacement for ASR #1 at the existing Magazine Ground Storage and Booster Station site.
- Transmission main along High Trestle Trail from Ash Water Tower northwest to NW 18th Street and west to NW Irvinedale Dr.

Target Year 2023

- Distribution main along NW State Street from NW 18th Street to NW 22nd Lane.
- Transmission main along S Ankeny Boulevard from north of Oralabor Road to SW Ordinance Road.

Target Year 2024

- Distribution main along NW State Street from NW 1st Street to NW 9th street.
- Transmission main along S Ankeny Boulevard from north of Ordinance Road (High Trestle Trail) to SE 3rd Street.

Target Year 2025

- Transmission main along NE 66th Avenue from NE 14th Street to NE 22nd Street.

All Years

- Water Main Upsizing Program for Development.
- Systems Extensions for Development.
- Annual Water Main Replacement Program. Due to aging infrastructure in the distribution system, an annual water main replacement program is recommended.
- Water Meter Replacement Program. Continuing Ankeny's water meter replacement program is recommended. These programs help revitalize meters that have diminished accuracy over time achieving increased precision metering and revenue generation.

MID-TERM (2026-2035) PROJECTS

Target Year 2026

- As needed, inspection and repair of the Irvineland Water Tower is recommended to maintain optimal condition and performance of the reservoir.

Target Year 2027

- Replacement of Ash Water Tower. Due to the required future storage in Ankeny's system and the existing condition of the Ash Water Tower, the existing reservoir should be replaced within the next 15-years.

Target Year 2028

- Transmission main along NW Ash Drive from W 1st Street to NW 18th Street.

Target Year 2029

- Transmission main along SW Oralabor Road from SW Irvineland Drive to S Ankeny Boulevard.

Target Year 2030

- Transmission main along NW 36th Street from NW Des Moines Street to N Ankeny Boulevard. The purpose of this main is to further build out the transmission grid within the city as it grows north and east. This project consists of 3,200 ft of 16-inch transmission main.

Target Year 2033

- ASR #2 well rehabilitation or replacement is recommended after a thorough inspection to determine improvement needs due to age, condition and performance.
- Parallel Transmission main from NW 66th Ave to SW Oralabor Rd along NE 14th Street

Target Year 2034

- Eventually due to age, condition and performance of the tank and pump station as well as the addition of significant transmission to Ankeny's system, the Magazine Pump Station and Ground Storage Tank is recommended to be decommissioned.

Target Year 2035

- Eventually due to age, condition and performance of the tank and pump station as well as the need for additional supply capacity from DMWW, the Delaware Pump Station and Ground Storage Tank is recommended for inspection, rehabilitation and/or replacement.

Target Years 2026-2035

- Water Meter Replacement Program. Continuing Ankeny's water meter replacement program is recommended.
- Water Main Upsizing Program for Development.
- System Extensions for Development.
- Annual Water Main Replacement Program.

LONG-TERM (2036-2055) PROJECTS

Target Year 2040

- DMWW - Ankeny NW Joint pressure zone meter pit, NW Polk City Drive (Highway 415) and NW 98th Avenue.

Target Year 2045

- New East Elevated Water Storage Tank, NE 94th Avenue and NE 38th Street.
- Add 2.5 MGD for 10 MGD total of pumping capacity at Delaware Pump Station with backup power, VFDs, and suction and discharge header connections to 24-inch suction and discharge mains.

Target Year 2055

- In the long-term, baseline system demands will be great enough to support an ASR #3 well addition. The recommended location is in vicinity of 18th Street and NW State Street with a near-by park as an option to obtain chlorine contact time prior to the first customer.

Target Years 2036-2055

- Water Meter Replacement Program. Continuing Ankeny's water meter replacement program is recommended.
- Water Main Upsizing Program for Development.
- System Extensions for Development
- Annual Water Main Replacement Program.

WATER SYSTEM GOALS + POLICIES

Goal 1: Provide residents and businesses with affordable potable water that is safe and high quality

Policy 1.1 - Meet or exceed all federal and state drinking water standards

Policy 1.2 - Inform customers of maintenance practices that may impact water quality

Goal 2: Provide a low-maintenance, cost-effective water system that meets the long-term needs of residents and businesses

Policy 2.1 - Design and construct a water system that supports the City's Land Use Plan at ultimate development

Policy 2.2 - Establish assessment rates, fees, and connection charges to ensure new development pays for construction of the expanded system as growth occurs

Policy 2.3 - Require developers to pay the cost of off-site water facilities necessary for any development that occurs in a non-sequential order

Policy 2.4 - Operate and maintain the water system to ensure its long-term function with equitable user charges

Goal 3: Provide adequate water supply and pressure for all residents and businesses

Policy 3.1 - Design and construct water system improvements that meet demand for fire protection and adequate system pressure for current and future growth areas

Policy 3.2 - Continue to seek and secure an adequate water supply and purchase capacity for future growth

Goal 4: Continue working with adjacent communities and the regional water supply agency to provide a cooperative water system for emergency services such as droughts or water system failure

Goal 5: Provide water service for growth areas in a planned and cost-effective manner

Goal 6: Protect the City's sustainable water supply through conservation by improving the efficiency of water use and reducing loss and waste of water

Policy 6.1 - Monitor and update as needed the Water Emergency Conservation Plan

Policy 6.2 - Continue to inform and educate customers about individual water conservation practices

Action 6.3 - Evaluate a program to provide homes with low-flow water fixtures

SANITARY SEWER SYSTEM

Sanitary sewer service availability is a major factor in determining the feasibility of development in planned growth areas in the community. The previous *2010 Ankeny Comprehensive Plan* included an evaluation of existing sewer basins as well as extending those basins into future growth areas to allow development to occur. Although the planning boundaries of the previous comprehensive plan did not reach as far outward as this plan, much of the evaluations that were completed for that previous plan are still valid for this planning effort.

The major conditions that have changed since the *2010 Ankeny Comprehensive Plan* include:

- The City of Ankeny has since connected to the Des Moines WRA interceptor and regional wastewater treatment system, with discontinued operation of the Ankeny's wastewater treatment facility. The 10 MG equalization basin at the decommissioned Ankeny wastewater treatment facility remains in service for use during significant wet weather events to shave off the peak flows to the WRA system. The City of Ankeny does not treat any of its own wastewater since the interceptor connections have been in operation.
- All of Ankeny's wastewater is now collected and transported to two WRA interceptor sewers, the Four Mile Interceptor to the east of the community, and the Rock Creek Sewer to the west. These two interceptors then transport wastewater flow from Ankeny southerly through the WRA system until it reaches the WRA treatment facility.
- As a result of connecting to the WRA interceptor system, the following existing pumping stations in the Ankeny sanitary sewer collection system have been taken off line: Oralabor lift station and Rock Creek lift station
- Several relief sewers that were recommended in the previous comprehensive plan have been installed to address capacity issues that caused sewer backups.
- Sanitary sewer service has been provided to the Golf View Acres area that was previously unsewered.
- Several CIP projects recommended in the previous comprehensive plan that included sewer extensions and improvements to provide for new developments as well as to replace or upgrade existing sewer segments have been completed.

Trend data has been analyzed for the period since the *2010 Ankeny Comprehensive Plan* was adopted. The City's current agreement with the Des Moines Metropolitan Wastewater Reclamation Authority (WRA) was also reviewed. Also, the WRA Facility Plan Update – 2012, which was finalized in April of 2014 was referred to in a review of the existing system capacities.

WRA TREATMENT FACILITY CAPACITY

The City of Ankeny still operated its own wastewater treatment facility at the time of the *2010 Ankeny Comprehensive Plan*. That treatment facility has since been taken offline and now all wastewater flows generated in the City of Ankeny are transported via new connections to the WRA interceptor sewer system for treatment by the WRA at the WRA's wastewater treatment facility located adjacent to Vandalia Drive and the Des Moines River in the southeast part of Des Moines. The existing 10 MG flow equalization basin facility at the discontinued Ankeny wastewater treatment facility remains on line to detain wastewater during periods of high flow. The WRA is responsible for operation of the equalization basin. High flows during rain events will be diverted by pumping facilities to the equalization basin and held there until the flows in the interceptor sewer subside allowing the equalization basin to be discharged by gravity back into the interceptor sewer. It is our understanding from City staff that this equalization facility has not yet been utilized since the capacity of the downstream interceptor sewers have not been exceeded.

Long term sewer flows from the community to the WRA are estimated based on population and land-use projections. This information is necessary to ensure that Ankeny's capacity at the WRA treatment facility as well as WRA interceptors are adequate for long term growth. Last year, the City of Ankeny accounted for 9.5% of the treatment capacity in the Wastewater Reclamation Authority which is equal to an average daily flow of about 7.03 MGD.

The overall daily flows combined from the two separate WRA interceptor sewers serving the community were reviewed to determine the approximate flows from the entire City currently being transported to the WRA system. The following observations have been made based on the overall flows reported:

- The highest 30-day average flow of 10.6 MGD occurred during the month of June 2014.
- The highest daily flow of 22.0 MGD occurred on July 1, 2014.
- The lowest minimum flow of 3.9 MGD occurred on March 24th of 2014.
- The observed average winter flow since 2010 is approximately 4.3 MGD.
- The observed average daily flow for the years 2014 and 2015 was approximately 7.1 MGD.
- Based on these observations, the City's current wastewater flows to the WRA treatment facility already exceed the allocated amount.
- The maximum daily flow of 22.0 MGD is approximately 5.1 times the observed winter base flow of approximately 4.3 MGD (during dry periods when little to no infiltration and inflow is entering the system). This is an indication that infiltration and inflow (clear water) may enter the sewer system during wet weather such as via sump pumps or other direct inflow sources, and future policies and sewer system improvements to reduce infiltration and inflow should be considered.

The per capita average daily wastewater design flow used in the facility plan update to determine future flows is 134 gallons per capita per day over the entire WRA service area. The average daily flow over the year being transported from the City of Ankeny to the WRA treatment facility is approximately 7.1 MGD. This equates to a per capita flow of approximately 142 gallons per day per person. At that per capita daily flow, the projected average flow

from Ankeny would be approximately 8.8 MGD, 11.6 MGD and 14.5 MGD for the years 2020, 2030 and 2040, respectively using the projected population increase noted in the HDR Joint Water Master Plan over the planning period.

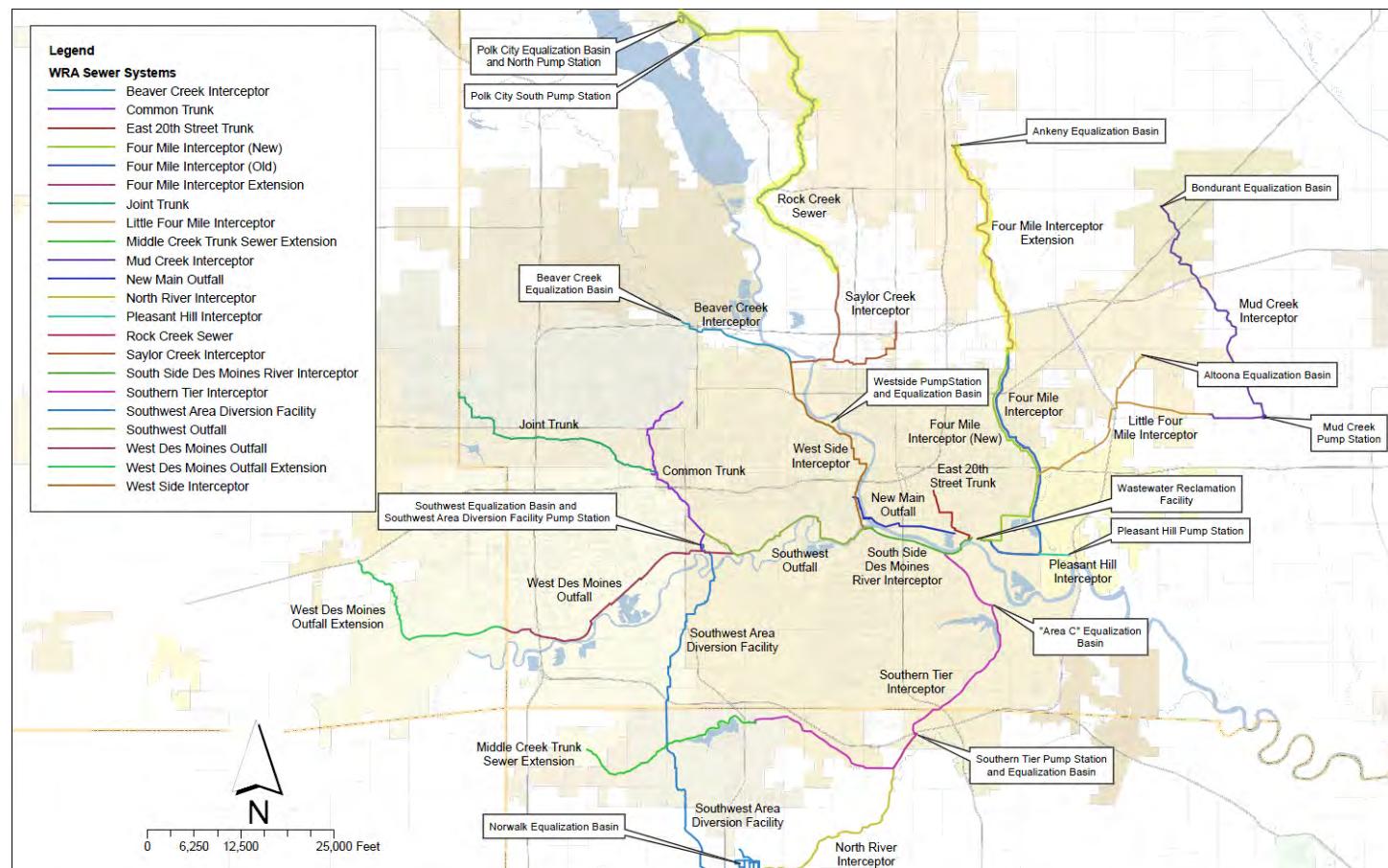
The WRA Facility Plan Update – 2012 recognizes that high wet weather flows are being transported to the WRA treatment facility in addition to projected growth of the WRA communities, and the facility plan update includes measures to increase the treatment capacity by approximately 100 MGD from the current design flow of 200 MGD to an upgraded design flow of 300 MGD. The City of Ankeny should therefore be engaged in the negotiation process for allocation of treatment capacity as upgrades to the WRA treatment facility occur in the future.

WRA INTERCEPTOR SEWERS SERVING ANKENY

Two separate interceptor sewers serve the City of Ankeny for conveyance of all wastewater generated in the community to the WRA regional treatment system. A majority of the current wastewater flow generated by the City is transported via the WRA Four Mile Interceptor that runs along the eastern edge of the community. The remainder of the wastewater flow generated is transported to the WRA Rock Creek Trunk Sewer that is located along the western edge of the community, which is also shared with the City of Polk City. As part of the WRA agreement, the City has been allocated certain portions of the available design capacity in each of the two WRA interceptor sewers serving the community.

Refer to Figure 8.10 below for a representation of the existing WRA interceptor sewers that service Ankeny.

FIGURE 8.10 WRA Sewer Systems - Des Moines Area



FOUR MILE INTERCEPTOR SEWER

The WRA Four Mile Interceptor Trunk Sewer extends from the Des Moines Wastewater Reclamation Facility northerly along Four Mile Creek to the City of Ankeny's discontinued Southeast Water Pollution Control Plant. This interceptor is 60 inches in diameter at the connection point with the City's sewer system. The WRA continues to use the flow equalization basin at the plant for mitigating high wet weather flows. The majority of the wastewater flow from Ankeny discharges to this sewer. All flows from the existing Ankeny Four Mile Interceptor, Northern Interceptor, Southern Interceptor, and West Outfall trunk sewers discharge to the WRA Four Mile Interceptor Trunk Sewer.

The design capacity of the WRA Four Mile Interceptor that serves Ankeny (most restricted downstream segment), the design flow allocated to Ankeny, and the highest recent flows noted from flow monitoring records are:

- Four Mile Interceptor Peak Flow Capacity = 47 MGD: WRA Allocation = 47 MGD
 - Maximum Daily Flow to this Interceptor = 18 MGD (July 1, 2014)
 - Peak Hourly Wet Weather Flow to this Interceptor = 29.4 MGD (September 10, 2014)

Based on the observed peak flows compared to available interceptor sewer capacity, there is approximately an additional 17.6 MGD in capacity available in the interceptor for future growth. Also, additional capacity is available during peak flows when the 10 MG equalization basin is put into use.

ROCK CREEK SEWER

The Rock Creek Sewer provides gravity sewer service to the west side of Ankeny. This interceptor has a diameter that ranges from 30 inches to 42 inches downstream of the connection point with the City's sewer system. The trunk sewer connects to the existing WRA Saylor Creek Interceptor Trunk Sewer. The WRA Saylor Creek Interceptor is a 30-inch sanitary sewer which currently terminates along NW 6th Drive at NW 62nd Avenue south of Ankeny. The Rock Creek Sewer connects to the Saylor Creek Interceptor at that termination point. The sewer also serves any future development in the Rock Creek basin.

The Rock Creek Sewer serves three entities: City of Ankeny, Polk County, and Polk City. The trunk sewer is intended to serve unincorporated areas west and south of Ankeny in Polk County, the entire City of Polk City, and the design capacity of the Rock Creek Sewer that serves Ankeny (most restricted downstream segment) and the highest recent flows noted from flow monitoring records are:

- Rock Creek Trunk Sewer Peak Flow Capacity = 17 MGD: WRA Allocation = 11.2 MGD
 - Maximum Daily Flow to this Interceptor = 4.4 MGD (June 30, 2014)
 - Peak Hourly Wet Weather Flow to this Interceptor = 10.2 MGD (July 5, 2014)

Based on the observed peak flows compared to available interceptor sewer capacity, there is approximately an additional 1.0 MGD in capacity available in the interceptor for future growth. However, additional capacity will become available in the Rock Creek Sewer after the WRA's East Side Interceptor that is currently under construction is completed in 2019. This new interceptor sewer will also create the possibility for Ankeny to take the existing Saylor Creek lift station off line and direct flow to the west to Rock Creek Sewer. This will then open up additional capacity for future growth in the Four Mile Interceptor Sewer.

EXISTING SANITARY SEWER COLLECTION SYSTEM

The existing collection system consists of sanitary sewers ranging from 6-inch to 48-inch in size with various types of pipe materials. There are four main trunk sewers that currently serve the existing portions of the City.

1. Northern Interceptor
2. Four Mile Interceptor
3. Southern Interceptor
4. West Outfall

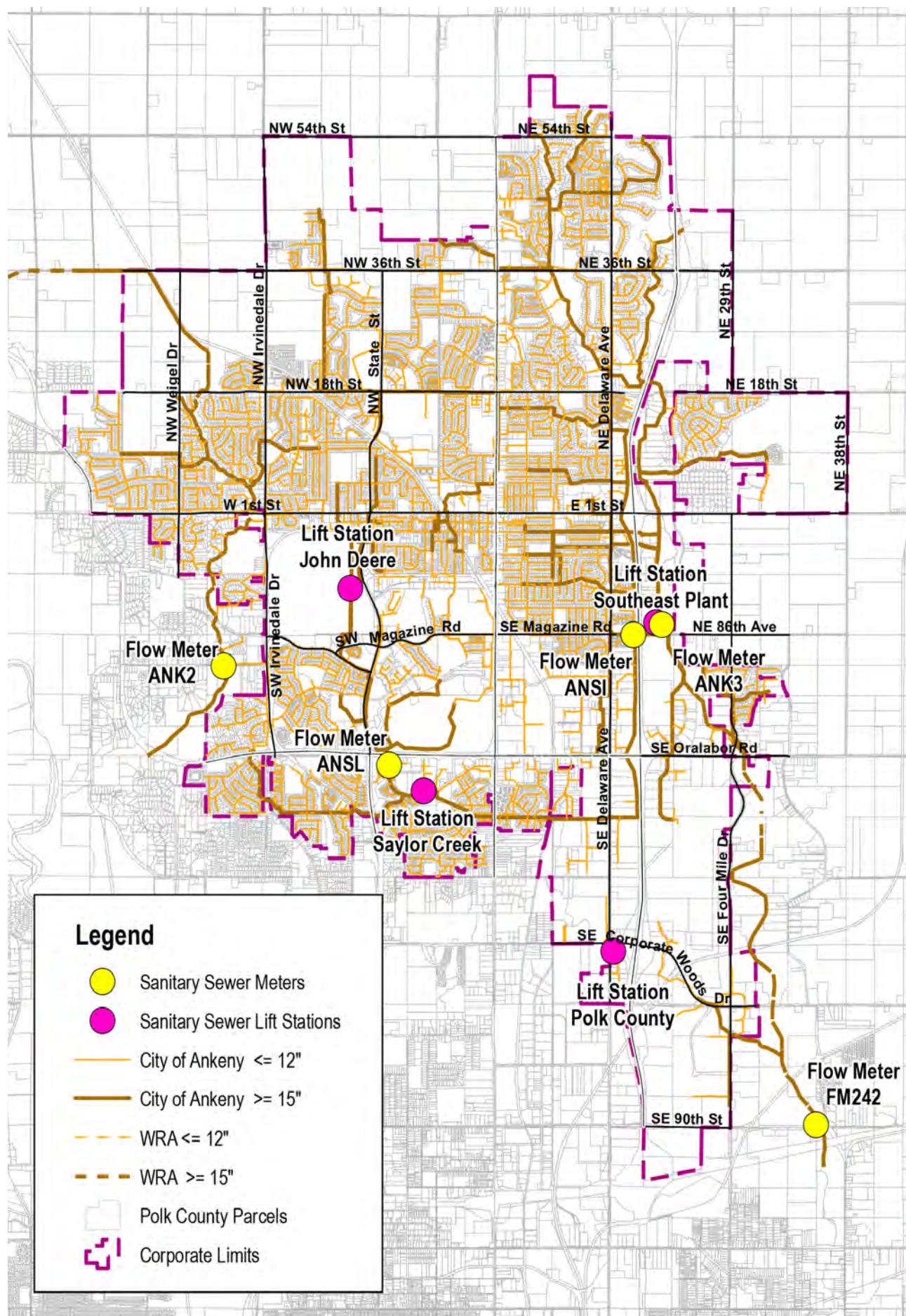
Refer to Figure 8.11 which provides a representation of the existing sanitary sewer system, including the WRA interceptor sewers.

The Northern Interceptor extends from the treatment plant area north to 18th Street where it meanders through developments and ultimately runs west on 18th Street to the High Trestle Trail (old UP railroad). It then turns north and extends to NW 36th Street. The Northern Interceptor serves the north central, central, and into the NW portions of the City.

The Four Mile Interceptor extends from the treatment plant area south of 1st Street north along Four Mile Creek. The Four Mile Interceptor will serve future development in the Deer Creek basin. The Deer Creek Trunk Sewer extends east along Deer Creek from the Four Mile Interceptor, approximately 1/3 mile north of E. 1st Street. The Deer Creek Trunk Sewer will serve future development in the Deer Creek basin. The Four Mile Interceptor splits into the North Four Mile Trunk Sewer and the Otter Creek Trunk Sewer just west of Interstate 35 (I-35) on the north side of 18th Street. The north Four Mile Trunk Sewer continues northerly along Four Mile Creek until 36th Street where it splits into north branch and the west branch.

The north branch of the North Four Mile Trunk Sewer continues northerly along Four Mile Creek and currently terminates at the intersection of Four Mile

FIGURE 8.11 Ankeny, Iowa Existing Sewer System



Legend

- Yellow circle: Sanitary Sewer Meters
- Pink circle: Sanitary Sewer Lift Stations
- Solid yellow line: City of Ankeny <= 12"
- Solid yellow line: City of Ankeny >= 15"
- Orange dashed line: WRA <= 12"
- Orange dashed line: WRA >= 15"
- Light gray area: Polk County Parcels
- Purple dashed line: Corporate Limits

Creek and NE 54th Street. The west branch of the North Four Mile Trunk Sewer continues west along 36th Street and veers northwesterly to its current termination point along NW Ash Drive, approximately 1/4 mile north of 36th Street. The North Four Mile Trunk Sewer (both branches) serves the northern part of the City west of I-35 and will serve future development in the north Four Mile basin. The Otter Creek Trunk Sewer extends north-northeast along Otter Creek and currently terminates east of I-35 approximately 1/3 mile north of 36th Street. The Otter Creek Trunk Sewer will serve future development east of I-35 in the Otter Creek basin.

The Southern Interceptor extends south from the treatment plant along the west side of I-35 to approximately 1/2 mile south of Oralabor Road. From there, the Southern Interceptor extends west into the far southern portions of the City. The Southern Interceptor serves the southeast and far south parts of the City. The Southern Interceptor also receives flow from the west outfall via the Saylor Creek lift station.

The West Outfall Trunk Sewer extends north from the Saylor Creek lift station (located east of State Street, south of Oralabor Road, north of Ankeny Road, along a tributary to Saylor Creek). The West Outfall generally follows State Street north up to the High Trestle Trail (old UP railroad). The West Outfall serves the west, west central, and southwest parts of the City and includes future development in Prairie Trail. The West Outfall drains to the Saylor Creek lift station. The Saylor Creek lift station has a firm capacity of 10.36 MGD. Wastewater is pumped from the Saylor Creek lift station east to the Southern Interceptor. The existing Corporate Woods area is served by a small gravity trunk sewer which outlets to an existing portion of the WRA Four Mile Interceptor Sewer.

As mentioned in the water system section, the proposed new planning boundaries in *The Ankeny Plan 2040* have extended farther north and east from those in the *2010 Ankeny Comprehensive Plan*. The sanitary sewer extensions to provide service to the planning areas contained in the previous comprehensive plan are still valid and could be extended farther to serve the new planning areas in this comp plan with gravity sewers. In certain areas east of I-35, pumping facilities rather than gravity sewers may be necessary to serve the planning area due to topography. Furthermore, a detailed study should be implemented to evaluate the existing trunk sewers and the capability for those sewers to provide adequate capacity for serving the new growth areas. It may be determined in that study that some may not have adequate capacity and additional improvements may be necessary.

Because of substantial development within the community since the *2010 Ankeny Comprehensive Plan*, it is recommended that a sanitary sewer study of the entire community be completed to address a variety of issues including infiltration & inflow reduction (which will result in more capacity for interceptor and trunk sewers that may be reaching their available capacity), determination of current and projected flows from drainage basins and how they may affect the future development potential given existing sanitary sewer capacities, determination of possible bottlenecks in the sewer system that may hamper growth capabilities, evaluation of existing and future trunk sewers to serve growth areas, and for use as a tool in future discussions with WRA relating to capacity at the WRA treatment facility and interceptors.

EXISTING COLLECTION SYSTEM CONCERNS

A portion of the North Four Mile Creek Trunk Sewer (a branch of the Four Mile Interceptor) extending from 36th Street south-southeast to Delaware Avenue was not sized for the current North Four Mile basin growth area. The North Four Mile basin growth area has expanded since the planning was done for the sewer. At some point in the future as development occurs, a parallel sewer will need to be installed to provide the additional required capacity.

Continued growth in the Prairie Trail development area (old ISU research farm) could potentially overload the Saylor Creek lift station and subsequently the Southern Interceptor trunk sewer. The City will continue to monitor the flows to this lift station as development occurs. The City may need to add capacity to the Saylor Creek lift station and force main and add parallel sewer capacity to the Southern Interceptor if growth exceeds their capacities. One thought was to take the Saylor Creek lift station off line with the construction of a WRA gravity sewer to the lift station location.

The sanitary sewer system experienced sewer backups in key trunk sewers during high flow events during 2007 and 2008. Veenstra & Kimm, Inc. completed a sanitary sewer capacity study in 2008 on the following trunk sewers:

- SE 3rd Street Trunk Sewer
- SE 2nd Street Trunk Sewer
- SE 8th Street Relief Sewer
- NE 5th Street and NE 7th Street Trunk Sewers
- Upper reaches of the West Outfall Trunk Sewer

The following sanitary sewer capacity improvements to remedy the sewer backups have been completed:

1. A 24-inch relief sewer constructed from Delaware Avenue to westerly on SE Uehlamar to SE Trilein Drive and north on SE Trilein to SE Third Street.
2. An 18-inch relief sewer constructed from SE Uehlamar to SE Peterson and then west along SE Peterson to SE Sharon Drive.
3. A 15-inch short interconnect relief sewer on SE Sharon Drive between SE 2nd Street and SE 3rd Street.
4. A 15-inch relief sewer constructed along NE 5th Street between NE Wanda and NE Sharon Drive.
5. A 24-inch relief sewer constructed from the John Deere lift station to W 1st Street.

City Staff has advised that there are currently no capacity issues causing sewer backups on the system since completing the above improvements. Backups that do occur now are mainly due to obstructions in the sewers such as root build-up, debris from construction, and grease build-up. As in many other communities, connection of sump pumps to the sanitary sewer system in Ankeny causes high flows during rain events.

SANITARY SEWER DEVELOPMENT BASINS

The City of Ankeny has eight main sanitary sewer basins for future development (Refer to Figure 8.13 for a map of the basins):

1. North Four Mile Basin
2. Northern Interceptor Basin
3. Otter Creek Basin
4. Deer Creek Basin
5. Oralabor Basin
6. Corporate Woods Basin
7. Rock Creek Basin
8. South East Four Mile Basin

There are three other existing sewer basins within the community that are currently developed, or nearly developed, which include:

1. Central Basin
2. South Interceptor Basin
3. West Outfall Basin, Includes the Prairie Trail Development

NORTH FOUR MILE BASIN

The main trunk connection points for this basin are the following:

1. 15-inch trunk sewer located along NW Ash Drive approximately 1/4 mile north of 36th Street. This sewer is intended to serve the southern part of the basin generally south of county NW 118th Avenue.
2. 30-inch trunk sewer located along county NW 118th Avenue near Four Mile Creek. This is the main trunk sewer for the basin and is intended to serve the far northwest and northern parts of the basin along Four Mile Creek.
3. 18-inch trunk sewer located on the north side of county NW 118th Avenue approximately 1/4 mile west of Delaware Avenue. This trunk sewer is intended to serve a northern 1/4 mile section of the basin.
4. 15-inch trunk sewer located just north of NE 47th Street approximately 1/3 mile south of county NW 118th Avenue and approximately 1/8 mile east of Delaware Avenue. This trunk sewer is intended to serve the eastern most 1/4 mile section of the basin along I-35.

The only known downstream capacity constraint for this basin is the 24-inch trunk sewer that extends through the Briarwood Golf Course. As development occurs upstream of that sewer it is anticipated that flows to that sewer segment will soon reach its design carrying capacity and thus capacity improvements should be considered in the near term. All the wastewater flow generated from this basin will eventually drain to the WRA Four Mile Interceptor Trunk Sewer.

NORTHERN INTERCEPTOR BASIN

The trunk sewer for this basin has been extended north from NW 18th Street to a termination point just north of NW 43rd Street, approximately 1/2 mile west of State Street. The trunk sewer infrastructure is in place for future development of this area.

Analysis of the basin indicated that all the pipe segments have full flow capacity to handle the flow from the proposed land uses; however, a few pipe segments do not have the design capacity (2/3 or 3/4 full) to handle the flow from the proposed land uses. It is also recommended that the City conduct a capacity analysis of the Northern Interceptor downstream of the development area as future development continues. All the wastewater flow generated from this basin will eventually drain to the WRA Four Mile Interceptor Trunk Sewer.

OTTER CREEK BASIN

The main trunk connection point is a 24-inch trunk sewer located east of I-35 approximately 1/3 mile north of NE 36th Street. This sewer is intended to serve the majority of the Otter Creek Basin. All the wastewater flow generated from this basin will eventually drain to the WRA Four Mile Interceptor Trunk Sewer.

DEER CREEK BASIN

The trunk sewer infrastructure is in place for future development of this area. The main 30-inch trunk sewer for this basin has been extended into the basin to a current termination point along Deer Creek approximately 2/3 mile east of I-35. This 30-inch trunk sewer is intended to serve the majority of the basin. All the wastewater flow generated from this basin will eventually drain to the WRA Four Mile Interceptor Trunk Sewer. Due to existing trunk sewer some of the southeastern portion of this basin may need to flow south into the Southeast Four Mile Basin.

ORALABOR BASIN

The main trunk connection points for this basin are the following:

1. 24-inch trunk sewer located along the east side of Four Mile Creek approximately 3/4 mile north of Oralabor Road. This trunk sewer is intended to serve the majority of the north half of the basin.

2. 15-inch trunk sewer located along NE 20th Street to just east of Berwick Drive. This trunk sewer is intended to serve the south central part of the basin. The remaining parts of the basin will be served with smaller sewers.

All the wastewater flow generated from this basin will eventually drain to the WRA Four Mile Interceptor Trunk Sewer.

CORPORATE WOODS BASIN

The trunk sewer serving the northern part of the basin is fully constructed to the northern fringe of the basin. The connection point for the 15-inch trunk sewer that will serve the south part of the basin is located along county NE 29th Street approximately $\frac{1}{4}$ mile north of county NE 54th Street. All the wastewater flow generated from this basin will eventually drain to the WRA Four Mile Interceptor Trunk Sewer.

ROCK CREEK BASIN

The trunk sewer infrastructure is in place for development of this area. The main connection point will be a 30-inch sewer located along Rock Creek then follows High Trestle Trail to NW 36th St where it heads west to county NW 44th St. The trunk sewer infrastructure that serves Ankeny's Rock Creek Basin branches off the Rock Creek Trunk Sewer. The trunk sewer will serve the remaining undeveloped portion of the basin. All wastewater flow from this basin will ultimately drain to the WRA Rock Creek trunk sewer.

SOUTH EAST FOUR MILE BASIN

The South East Four Mile Basin will serve future development in the southeastern portion of the planning area of the City. The future development area is general bound by Four Mile Creek on the west, Interstate 80 on the south, county NE 56th Street on the east, and county NE 94th Avenue on the north. It is adjacent and east of the Oralabor Basin in the northern portion of the basin. This sewer basin will connect to the existing WRA Four Mile Interceptor in the southern portion of the basin.

PRAIRIE TRAIL DEVELOPMENT

The Prairie Trail Development area will be served by the west outfall trunk sewer and subsequently the Saylor Creek Lift Station. The capacity of the sewer system is dependent on the capacity of the Saylor Creek lift station. The flows to the lift station will continue to be monitored as development progresses in Prairie Trail. The possibility of taking the Saylor Creek Lift Station out of service and transporting the flow from this point southerly to the new Rock Creek Sewer may be considered in the future after the new WRA East Side Interceptor is completed in 2019 and available capacity in that interceptor is increased. This will then reduce the flow to the Four Mile Interceptor.

Figure 8.12 indicates the extents of the existing and new development area sewer basins.

PROJECTED FLOWS FROM SEWER BASINS

The projected wastewater flows from each of the separate sewer basins after ultimate build out in each area have been developed. The projected flows are based on typical wastewater generation for each type of future land use in each basin on a per acre calculation. Figure 8.13 below presents the wastewater generation based on the approximate values used in the previous comprehensive plan.

FIGURE 8.13 Projected Flows by Future Land Use Type

Type of Development	Wastewater Generation (AWW)
Single-Family Residential	990 gpd / acre
Medium Density Residential	1,800 gpd / acre
High Density Residential	3,700 gpd / acre
Commercial	3,000 gpd / acre
Industrial	50,000 gpd / acre

Sanitary sewers are designed to transport the peak hourly wet weather (PHWW) flows generated from the areas that they serve. The wastewater generation values for each type of development in the table above are for average wet weather flows and therefore a peaking factor must be applied to arrive at the projected peak hourly wet weather flows. The peaking factor used in this evaluation is 2.3 times the average wet weather flow (based on IDNR's Wastewater Design Standards, Chapter 12). This peaking factor is applied only to residential development as values for wastewater generation in commercial and industrial development are considered peak flows.

FIGURE 8.12 Sewer Basins - Ankeny, Iowa

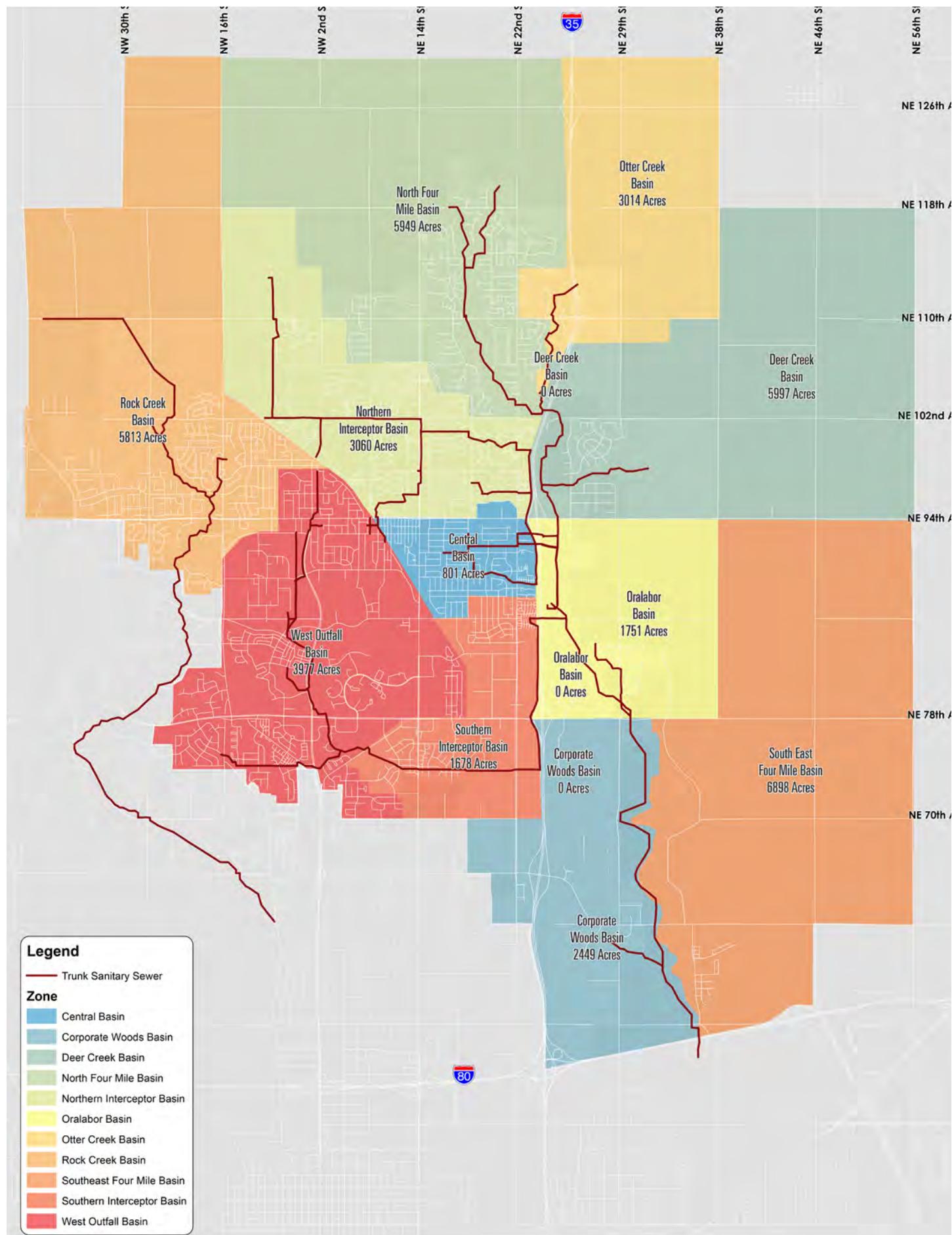


Figure 8.14 below presents the projected peak hourly wet weather wastewater flows in millions of gallons per day (MGD) generated by ultimate development within each sewer basin considering the future land use in each.

FIGURE 8.14 Projected Flows by Sewer Basin

Sewer Basin	Total Basin Size (Acres)	Projected PHWW Flow (MGD)
Tributary to WRA Four Mile Interceptor		
Central Basin	804	2.1
North Four Mile Basin	5,974	15.4
Northern Interceptor Basin	3,074	7.4
Otter Creek Basin	3,015	8.3
Deer Creek Basin	6,034	11.0
Oralabor Basin	1,761	3.4
Corporate Woods Basin	2,458	7.4
West Outfall Basin	3,991	10.9
South East Four Mile Basin	6,957	18.6
South Interceptor Basin	1,684	4.8
TOTAL	35,752 acres	89.3 MGD
Tributary to WRA Rock Creek Interceptor		
Rock Creek Basin	5,822	13.5
TOTAL	5,822 acres	13.5 MGD

The total projected PHWW wastewater flows generated based upon land use type for each of the areas tributary to the two WRA interceptor sewers are 89.3 MGD for the Four Mile Interceptor and 13.5 MGD for the Rock Creek Interceptor.

This is a very high level projection of wastewater flows in each sewer basin. More detailed study of the anticipated flows and a determination of capacities of existing sewers and ability to transport flows should be implemented as part of a community-wide sanitary sewer system study or master plan, similar to the recently completed Water System Master Plan. Also, potential routing of new trunk sewers to serve the new development areas should be included in that detailed sewer study.

CAPITAL IMPROVEMENT PROJECTS

The remaining 2010 Ankeny Comprehensive Plan CIP recommendations yet to be implemented are the future design and construction of the Otter Creek Trunk Sewer Phases 3 and 4 and continuance of the Annual Sanitary Sewer Repair/Replacement program. New CIP plan sewer improvements that are included on the current CIP plan include:

- Deer Creek Trunk Sewer – to be in constructed in 2018 and 2019
- New sewers for the Prairie Trail development are which include:
 - SW Des Moines Street Trunk Sewer – Phase 1 was completed in 2017 with Phase 2 scheduled for design in 2018 and construction in 2019

IMPLEMENTATION RECOMMENDATIONS

The following recommendations for implementation of continued sanitary sewer system improvements include:

- Commissioning of a detailed community-wide sanitary sewer study that will focus on necessary improvements to existing and future sewer infrastructure to allow for future growth to occur. It is anticipated that additional CIP improvement projects will be recommended as a result of the detailed study
- Review and possibly update the current methodology of passing on the costs of sewer improvements for new growth areas to developers in the cases where the City constructs the sewer improvements
- Continue to fund and implement the annual sanitary sewer repair and replacement program to ensure that the aging infrastructure is adequately maintained and available to serve the community for many years to come

SANITARY SEWER SYSTEM GOALS + POLICIES

Goal 1: Provide a low-maintenance and cost-effective sanitary sewer system that meets the long-term needs of the City's residents and businesses

- Policy 1.1*** - Develop and construct a sanitary sewer system that supports the City's land use plan and its ultimate development
- Policy 1.2*** - Continue use of connection fees to ensure development pays for the construction of sewers installed by the City
- Policy 1.3*** - Operate and maintain the sanitary sewer system to ensure its long-term function with equitable user fees
- Policy 1.4*** - Continue to address infiltration / inflow of clear water into the sanitary sewer system

Goal 2: Work with the Wastewater Reclamation Authority and adjoining communities to provide a mutually cooperative sanitary sewer system

- Policy 2.1*** - Maintain existing arrangements for sanitary sewer with the WRA. Continue the negotiations process with the WRA to ensure the City has adequate interceptor and treatment capacity for future growth
- Policy 2.2*** - Provide a trunk system to meet the needs of Ankeny's current wastewater generation as well as to provide service to growth areas in the future

STORM SEWER AND STORMWATER MANAGEMENT

Storm sewer facilities collect stormwater runoff and convey it away from structures and through the roadway right-of-way in a manner that adequately drains sites and roadways and minimizes the potential for flooding and erosion to properties. Storm sewer facilities consist of curbs, gutters, intakes, manholes, and storm sewers. The City of Ankeny's existing storm water management system includes over 40 stormwater detention basins, several engineered and constructed wetlands, approximately 13,000 storm sewer structures (intakes, manholes, and outlets), and 270 miles of storm sewer pipe. The storm water system furthermore serves nine watersheds subdivided into additional subwatersheds.

Figure 8.15 illustrates Ankeny's current stormwater infrastructure system.

The most significant street drainage and drainage channel degradation improvement needs within the Ankeny corporate limits were compiled by City staff in late 2016. These areas are locations of persistent street flooding during - and as a result of - heavy rain events. Figure 8.16 and Figure 8.17 identify concerns that will either need to be addressed individually as specific project improvements, or in conjunction with other street reconstruction or stream stabilization improvement projects in the future.

To address street flooding and open channel stabilization, priority projects, recommended actions, and best management practices offered in the City's Public Stormwater Detention Basin Study (approved spring 2016) will be observed to help guide future improvement recommendations. In addition, Ankeny's Public Works Department intends to prepare a Stormwater Management Study and Master Plan ("Stormwater Plan") in 2018. The purpose of the plan is to provide an assessment of the City's existing stormwater management system, determine the future needs for the system, and provide specific recommendations for modifications or improvements to the system.

There are a number of working components to a Stormwater Plan that the City of Ankeny should consider as it determines the working scope of the plan. The following components of a Stormwater Plan will help the City identify, study, and plan for appropriate improvements, prioritize needs, preserve and protect stormwater investments over time, and secure sustainable funding sources.

DEVELOPMENT OF A HYDRAULIC MODEL

Major components of the City's stormwater conveyance system will need to be incorporated into a Citywide "macro-scale" model. Macro-scale models provide a broad overview of performance of major conveyance components. Additional detail and surface topography will need to be incorporated into a "basin-scale" or micro-level model for the city's drainage basins. Macro model results differentiate pipes that flow full because they are actual bottlenecks (undersized) or surcharged by downstream bottlenecks from those that flow more than or less than half full. Basin model results do the same, but also identify and differentiate surface ponding areas to indicate surface ponding depths. These models can then be used to develop basin models for Ankeny over the next several years to evaluate individual projects as well as basin wide mitigation alternatives, including the potential merits of green infrastructure, local and regional detention, and/or conveyance improvements. Future model results can also be developed to inform and improve the City's Capital Improvement Plan (CIP). A multi-year strategy will also allow the models to be improved and updated as more data become available.

FIGURE 8.15 City of Ankeny Existing Storm Sewer Lines and Points

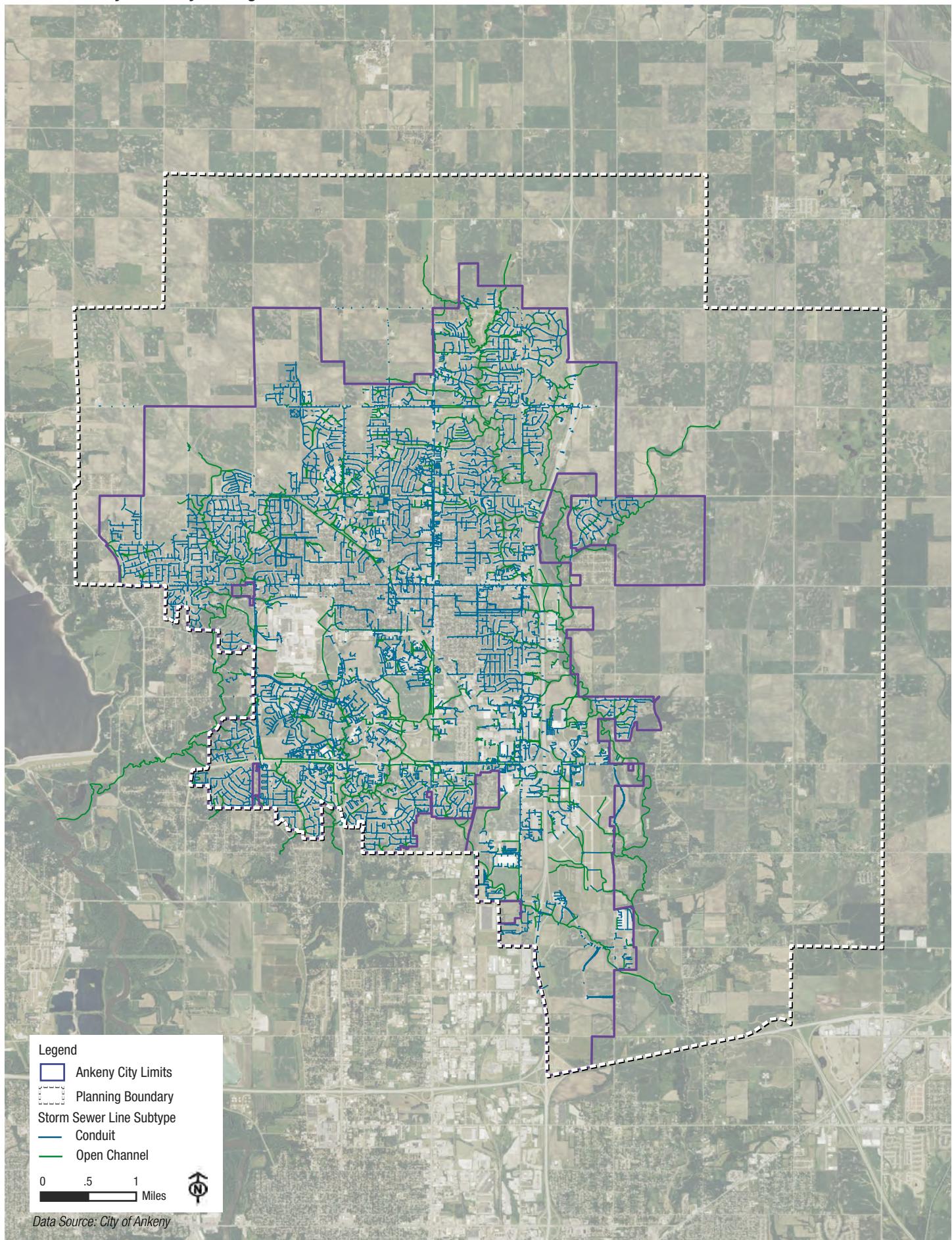


FIGURE 8.16 Street Drainage and Stream Channel Degradation Issues

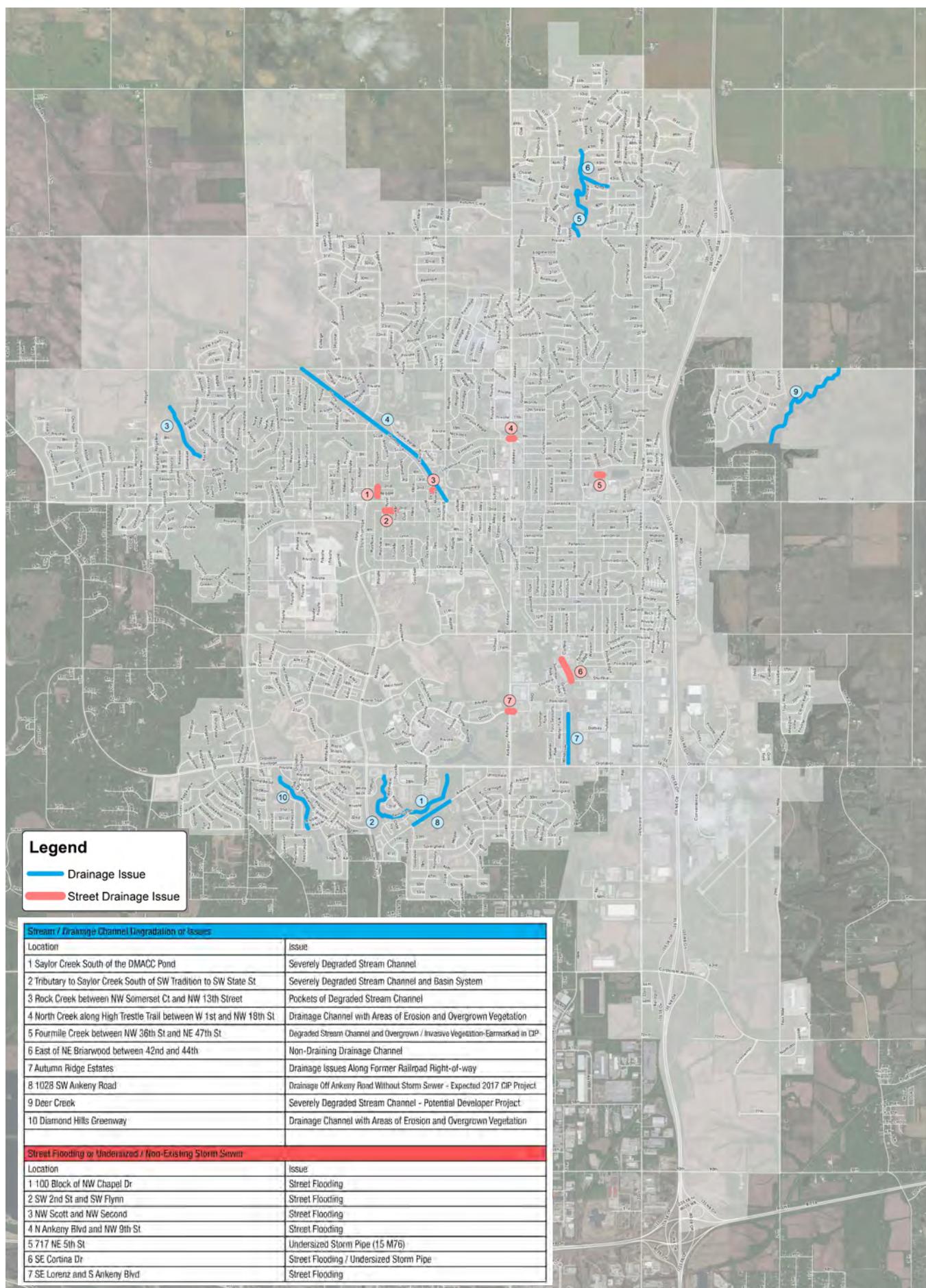


FIGURE 8.17 Street Drainage and Stream Channel Degradation Issues

Stream/Drainage Channel Degradation or Issues

Location	Issue
Saylor Creek South of the DMACC Pond	Severely Degraded Stream Channel
Tributary to Saylor Creek South of SW Tradition Dr to SW State St	Severely Degraded Stream Channel and Basins remediated in 2017
Rock Creek Between NW Somerset Ct and NW 13th St	Pockets of Degraded Stream Channel
North Creek Along High Trestle Trail between W 1st St and NW 18th St	Drainage Channel with Areas of Erosion and Overgrown Vegetation
Four Mile Creek between NE 36th St and NE 47th St	Degraded Stream Channel and Overgrown/Invasive Vegetation - Earmarked in CIP
East of NE Briarwood Dr between 42nd Ct and 44th Ct	Non-Draining Drainage Channel
Autumn Ridge Estates	Drainage Issues along former Railroad Right-of-Way
Deer Creek	Severely Degraded Stream Channel - Potential Developer Project
Diamond Hills Greenway	Drainage Channel with Areas of Erosion and Overgrown Vegetation

Street Flooding or Undersized/Non-Existing Storm Sewer

Location	Issue
100 Block of NW Chapel Dr	Street Flooding
SW 2nd Street and SW Flynn Dr	Street Flooding
NW Scott St and NW Second St	Street Flooding
N Ankeny Blvd and NW 9th St	Street Flooding
717 NE 5th St	Undersized Storm Pipe (15M 76)
SE Cortina Dr	Street Flooding/Undersized Storm Pipe
SE Lorenz and S Ankeny Blvd	Street Flooding

DEVELOPMENT OF A STORMWATER SYSTEM MOBILE SPATIAL DATA COLLECTION APPLICATION

The Ankeny Public Works Department is charged with operating and maintaining the City's existing stormwater system. Operational changes may be needed in the City's current policies to inventory assets, assess the condition, perform maintenance, and refine management policies for stormwater infrastructure. Resources such as the Iowa Stormwater Management Manual and benchmarking of other utilities to refine existing operations and maintenance standards can be adapted for use in Ankeny to further enhance management of existing stormwater assets through standardizing maintenance activities.

DEVELOPMENT AND PRIORITIZATION OF PROJECTS FOR THE ANKENY CAPITAL IMPROVEMENTS PLAN

The City's current CIP (FY 2017-2021) indicates \$3.15 million is planned for expenditure on citywide stormwater improvement projects. Improvement needs are associated with municipal street construction projects (new construction and reconstructed facilities) and in response to local drainage and street flooding problems. Stormwater modeling results may indicate that there are additional capacity related needs not yet reflected in the CIP. Those additional needs, and their associated implementation costs, will need to be added to future CIP updates. The analysis of model results will help the City prioritize improvement projects over the next several years. Stream and drainage way assessments and condition analyses will also be done to help determine and prioritize stream stabilization projects in the CIP.

As the City continues to refine and implement its mobile spatial data collection application, condition-related needs will be more accurately identified and reflected in the CIP as well. Doing so could also warrant a significant increase in total capital need moving forward to maintain and preserve the City's investment in the existing system.

The City's current CIP does not include expenditures to address growth-related stormwater infrastructure needs associated with *The Ankeny Plan 2040*'s future land use plan. As the City continues to grow and annex new properties, given the magnitude of funding needs, it is critical that growth areas be served by stormwater infrastructure paid for by associated developer(s). This will require conceptual planning to identify stormwater needs in growth areas. It will also require due diligence to assure that growth-related stormwater infrastructure is adequate for both initial development and future growth in the surrounding watershed.

IDENTIFICATION OF FINANCIAL NEEDS AND POTENTIAL FUNDING SOURCES

Ankeny's stormwater plan will likely indicate a large gap between available funding and CIP needs. The Stormwater Plan may recommend additional sources of revenue, including potential fee increases based on modified formulas for calculating impervious surfaces (for example) in addition to locating additional potential funding sources that may be available to the City of Ankeny. To that end, the City should consider proceeding with the following:

- Continue to monitor and aggressively seek grant or other special funding opportunities as they arise
- Consider other potential funding sources to provide a significant longer-term revenue source for stormwater (and other infrastructure) needs
- Continue to refine the stormwater utility fee structure so that it more accurately reflects stormwater quantities and cost of service
- Plan to prepare basin studies in *The Ankeny Plan 2040*'s growth areas to identify regional stormwater needs in expansion areas
- Address localized stormwater needs in collaboration with street reconstruction, water, sewer, and other public projects to realize economies of scale
- Work collaboratively with a neighborhood and a large commercial property on a pilot assessment district and a pilot cost share, respectively
- Continue to provide the public with information on the benefits provided by the City's stormwater management program, along with the associated costs and funding challenges

RECOMMENDATIONS TO ADDRESS FUNDAMENTAL ISSUES

Increasing efforts to incorporate green infrastructure into existing stormwater management and other infrastructure policies will need to be incorporated into the list of policy recommendations. This is consistent with *The Ankeny Plan 2040* resiliency approach and is consistent with what other communities are doing regionally and nationally. Green infrastructure provides a more holistic stormwater management approach that mimics aspects of the natural hydrological cycle, including retention, infiltration, and evapotranspiration. Promoting stormwater infiltration and runoff reduction postpones or delays the need for future grey infrastructure projects. Green infrastructure projects should include life cycle costs including operation and maintenance needs.

Other policy related issues for consideration to enhance the City's existing policies follow in no particular order. These recommendations typically originate as Public Works staff respond to citizen requests and target the safety and welfare of residents:

- Adopt a post-construction stormwater control ordinance, consistent with other communities
- Implement a post construction grading survey for all development sites to assure that planned grading is achieved
- Implement a "Soil Quality Plan" to reduce runoff to each area of infiltration post development
- Incentivize green practices
- Develop a funding policy to clarify liability for non-City stormwater property losses
- Require Minimum Protection Elevations (MPEs) for properties where there is drainage sensitivity and require lot corner grades on site development plans that reflect the associated drainage plans
- Move towards regional rather than individual style detention basins for economies of scale
- Develop a policy to discourage facilities encroaching on drainage easements or in floodplains
- Increase educational program awareness
- Consider developing a footing drain collection line program to provide property owners a connection for sump pump outlets

Conduct Updates to the Stormwater Plan as the City Grows, Local and Regional Best Management Practices Change, and Regulatory Agency Permits Require

The Stormwater Plan is intended to be a living document and regular updates to it should be expected to maintain and progress the plan. The primary responsibility for implementation lies with the City's Public Works Department, as well as other city staff, and the Mayor and City Council. All will have a role and must have a vested interest in implementation to maintain regulatory compliance, meet public needs, and address the associated financial constraints.

STORM SEWER DESIGN

The placement and hydraulic capacities of storm sewer facilities should be designed to take into consideration damage to adjacent property and to secure as low a degree of risk of traffic interruption by flooding as is consistent with the importance of the road, the design traffic service requirements, and available funds. The City of Ankeny will continue to implement Iowa Statewide Urban Design and Specifications (SUDAS) design guidance for its storm sewers, including specifications for the following:

- Location of storm sewers within or outside of the roadway right-of-way
- Pipe sizes and component materials
- Physical requirements for the installation and proper operation of storm sewers, including depth, flow velocity (within pipes and at outlets)
- Grades
- Horizontal alignment
- Separation of storm sewer drains from water and sanitary sewer mains

STORM SEWER + STORMWATER MANAGEMENT GOALS + POLICIES

Goal 1: Implement an effective, economical, and sustainable stormwater management system

Policy 1.1 - All new development shall be designed such that post-development stormwater runoff from the site shall be substantially similar to or better than predevelopment runoff and shall meet applicable state and water management district water quality standards

Policy 1.2 - Nonresidential and nonagricultural redevelopment shall meet applicable water quality standards.

Action 1.3 - Consider the development of a footing drain collector line program to provide property owners with a connection for sump pump lines potentially eliminating existing connections to the sanitary sewer system

Action 1.4 - Adopt a post-construction stormwater control ordinance, consistent with other communities in Iowa

Goal 2: Complete a Stormwater Management Study and Master Plan to comprehensively identify, address, and manage stormwater issues in the community

Action 2.1 - Update and refine policies and procedures to better manage surface water flows and water bodies in the community

Action 2.2 - Complete hydraulic modeling to serve as a platform to better define stormwater management issues, needs, and potentially cost-effective solutions

Goal 3: Maintain and preserve the existing stormwater system through asset management

Policy 3.1 - Consider developing an asset management tool to continually monitor and evaluate the condition and needs of the community

Policy 3.2 - Continue to work with the City's watershed management partners to evaluate water quality and environmental conditions of its subbasins and watersheds

Policy 3.3 - Continue to incorporate existing storm sewer infrastructure needs with new stormwater projects in the Capital Improvement Plan

Policy 3.4 - Maintenance work will continue to be conducted in a manner that will result in the the most minimal possible disturbance of the natural features of environmentally-sensitive storage and conveyance areas

Goal 4: Identify, prioritize, and recommend projects for the Capital Improvements Plan

Policy 4.1 - Use recommendations from the Stormwater Plan to plan, prioritize, and budget for stormwater infrastructure projects in the CIP

Policy 4.2 - The use of non-structural Best Management Practices for solving stormwater management issues will continue to be considered to reduce costs and future maintenance needs

Policy 4.3 - All stormwater management improvement projects will seek to maximize, to the greatest extent practicable, improvements to wetland habitat, water quality and groundwater recharge functions.

Action 4.3 - Identify financial needs and potential funding to close the gap between revenues and identified needs.

Goal 5: Consider potential policy solutions to address fundamental issues that contribute to current flooding problems and erosion issues

Policy 5.1 - Best Management Practices (i.e., approved erosion control methods) will be required for minimizing contributions of poor quality stormwater runoff to both groundwater and surface water bodies

Action 5.2 - Implement the National Pollutant Discharge Elimination System (NPDES) program and establish Low Impact Development principles for new development to maintain compliance with the City's NPDES permit

STORM SEWER + STORMWATER MANAGEMENT GOALS + POLICIES CONTINUED

Goal 6: Periodically update the Stormwater Plan

Action 6.1 - Stormwater quality data will be periodically evaluated to determine the presence of contaminants and effectiveness of the City of Ankeny's stormwater management and treatment system performance

Policy 6.2 - The City of Ankeny will continue to maintain communication with regulatory and watershed advisory agencies which have authority over, or interest in, stormwater management practices in the City

Action 6.3 - The stormwater management system inventory will be updated regularly and utilized to identify the physical location and characteristics of the system components, and which components are due for maintenance and/or replacement

Policy 6.4 - The City will continue to use new stormwater management technology, such as pollutant filters and sub-surface storage, as well as Low Impact Development techniques in order to minimize the impervious surfaces in new developments, and to minimize pollutant loads due to stormwater runoff

Policy 6.5 - The City will stay current with emerging technical design standards which manage the impacts of stormwater quantity and water quality for new development and redevelopment in the community in order to reflect current conditions in Ankeny and to address cumulative impacts of stormwater runoff