CHAPTER 6
FUTURE COLLECTION SYSTEM EVALUATION

6.1. INTRODUCTION

This chapter provides an overview of the future conditions within the existing collection system and projected extension of the collection system to serve population growth within the planning area through 2025. The hydraulic model of the collection system was used to size the required infrastructure to accommodate the projected growth and expansion of the service area.

6.2. NEAR-TERM AND FUTURE SYSTEM MODEL

The City of Helena and the adjacent planning area is currently experiencing a high rate of development with some large residential and commercial subdivisions currently in various stages of planning and approval, and construction. Some of these proposed developments are requesting annexation into the City limits which, if approved, will require connection to City water and sewer services. The hydraulic model of the collection system was set up and loaded in a way that recognizes three types of areas: developed areas within the City limits, commercial and residential developments currently requesting annexation (near-term development), and developed and undeveloped areas within the planning area, but outside the City limits. This section provides a description of how each of these areas was set up and loaded in the model.

In general, the model was set up similarly to the existing system scenario described in Chapter 5. The following criteria apply to the near-term and future system model scenarios:

- Actual flow over maximum capacity (q/Q) does not exceed 75 percent,
- A Manning's friction coefficient of 0.013 for new PVC pipe,
- Manhole spacing to meet DEQ2 and City requirements of 400 LF maximum distance (≤15" pipe) or 500 LF maximum distance (for 18" – 30" pipe),
- Minimum drop across manholes no less than 0.1 feet,
- Minimum sewer diameter of 8-inches, and

- 150 gallons per acre per day allowance for infiltration and inflow as required by City design standard for all new sewer in the near-term and future evaluations.

For the future conditions evaluation (both near-term and future 2025), only the maximum day conditions were assumed since these conditions control the sizing of the needed system improvements. Maximum day conditions are the wet weather (Max. Day) loading condition with a 10-Year 60-Minute storm event, as described in Chapter 5.

6.2.1. *Developed Areas Within the City Limits*

As described in Chapter 3, the TAZ-based population estimates were used for the area within the City limits. The loading was a result of applying the per capita daily flow of 118 gpcd to the population as described in Chapter 5. A secondary load was added to the per capita sewer flows to account for infiltration and inflow. This secondary load was based on the flow monitoring performed and the resulting data described in Chapter 5.

6.2.2. *Subdivisions Currently in the Planning Stage*

At the City's direction, the areas listed in Table 6-1 were included in the master planning effort and were analyzed as "Near-Term" system expansion under five- and ten-year build out conditions with the assumption being that these areas would reach total build out by 2015. These subdivisions are in varying stages of development from preliminary plat approval to construction and all of them have requested annexation, pending approval by the City. These subdivisions are shown in Figure 6-1.

If information was available from preliminary planning documents submitted to the City, then the number of planned lots was used along with the average household population of 2.34 to estimate the population in the planned development. The average per capita flow of 118 gpcd was applied to the assumed population to determine an approximate wastewater load for each area. An allowance for infiltration and inflow of 150 gallons/acre/day was calculated and input as an additional load. In general, one to three manholes at the point of connection to the City's existing collection system were inserted into the model and the manholes were loaded based on maximum day conditions. The model results indicate the effects on the existing collection system at ten-year build out conditions.

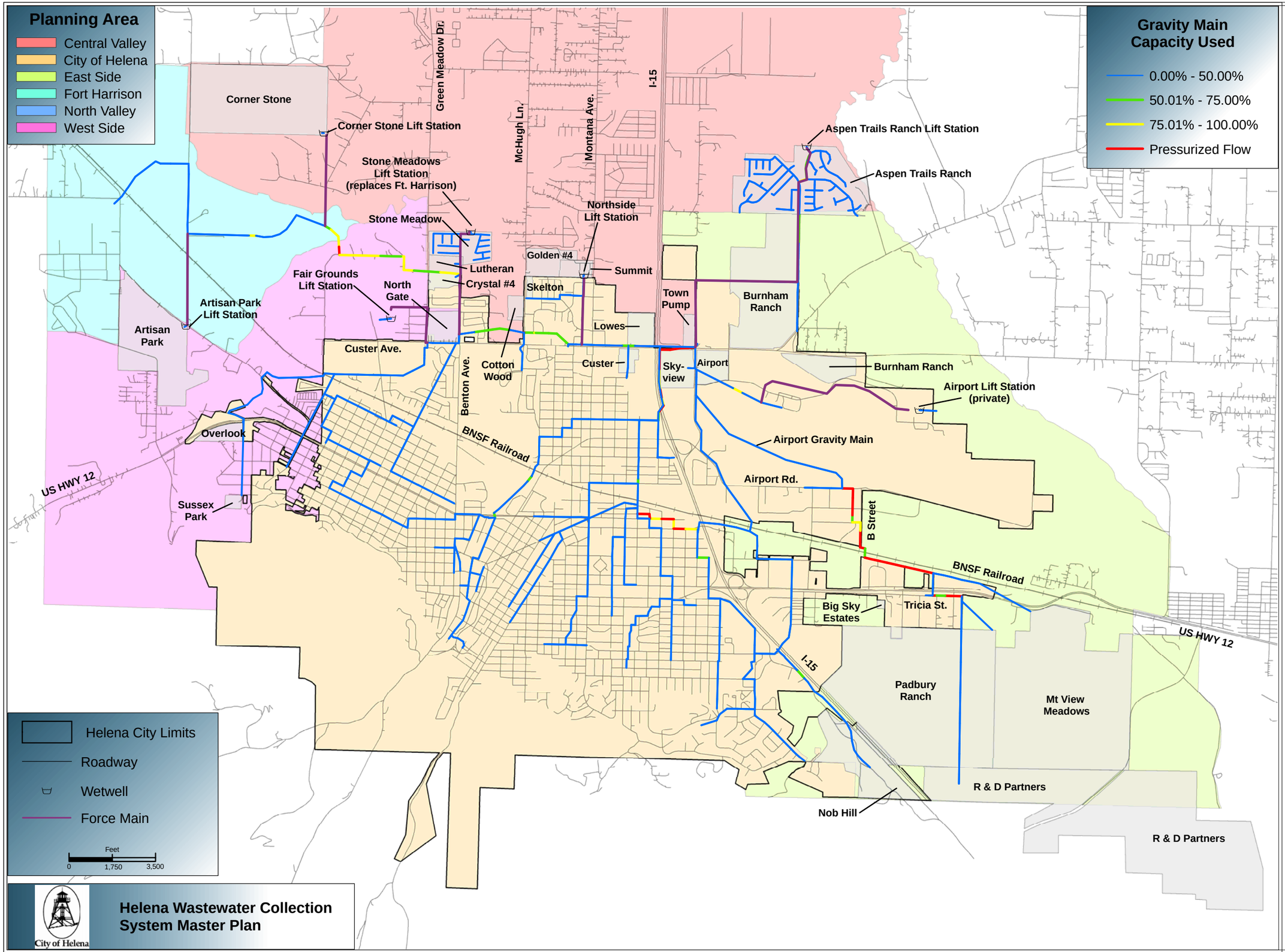

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Table 6-1
Summary of Subdivisions Included in Near-Term Model

Name of Property	Total Estimated Population	Current Stage of Development (Early 2007)	Service Area
Corner Stone	2,192	In Process	Central Valley
Padbury Ranch	1,826	Concept	East Side
Artisan Park	1,760	Prelim. Plat Approved	West Side
Mt. View Meadows	1,709	Prelim. Plat Approved	East Side
Burnham Property	1,500	Concept	City of Helena & East Side
Aspen Trails	1,090	Prelim. Plat Approved	Central Valley
Dahl/Runckle Property (in northern Jefferson County)	652	Concept	East Side
Stone Meadows	585	In Process	Central Valley
Overlook & Sussex	217	Approved – Under Construction	West Side
Lutheran	175	Concept	Central Valley
Crystal Springs Phase 4	70	Prelim. Plat Approved	City of Helena

6.2.3. *Planning Area Outside City Limits*

Loading in the areas outside the City limits was based on the population projections from the TAZ analysis and the per capita wastewater flows similar to existing and near-term conditions. Where a development included in the near-term evaluation was located within the planning area, the build out population of the subdivision was used, rather than the TAZ-based population projection.

In order to locate proposed future extensions of the City's collection system, existing topography and natural drainage subbasins were defined. Once the basins were defined, future extensions were laid out throughout the planning area. There are several natural land features which influenced the proposed extensions. They include:

- The Helena Valley Irrigation Ditch (HVID). This ditch bisects the planning area in an arc and averages about 15 feet in depth. Crossing under the ditch with

gravity sewer presents design and maintenance challenges and therefore is considered a barrier to sewer line extension and effectively defines a subbasin.

- The Helena Valley Irrigation System Drain (HVISD) or Drain D-2. This ditch runs from west to east toward Lake Helena, bisecting the planning area and is the physical low point of the planning area. It is approximately 10 to 12 feet deep. The area north of the HVISD drains to the south and east and the area south of the HVISD drains to the north and east.

- Interstate 15 also acts as a barrier since it is comparatively expensive to bore and jack under the highway. The number of crossings was kept to a minimum, although the number and location of these crossings will ultimately be influenced by the progression of development and connection of that development to City services.

- Tenmile and Silver Creeks. These creeks flow into Lake Helena and present somewhat of a barrier to utility extensions. Creek crossings were minimized in order to reduce costs.

The sewer extensions were assumed to follow major road corridors and existing development where possible to facilitate construction without extensive easement or property acquisition. There are a few instances where this convention could not be adhered to. In these cases, the extensions were located on section lines or where extensions of main roads were considered likely.

Because of topography and the location of the existing wastewater treatment plant, development to the north of Custer Avenue will require lift stations to the Custer Avenue Trunk. The area north of Custer Avenue and south of the HVID will likely be served by numerous smaller lift stations while the area north of the HVID may ultimately be served by a regional lift and secondary booster stations. Flows collected from the area east of the Helena Regional Airport and between Highway 287 and Custer Avenue will also require one or more lift stations to take flow to Custer Avenue.

6.3. NEAR-TERM SYSTEM EXPANSION EVALUATION

Figure 6-1 shows the future near-term proposed lift stations and improvements based on peak day–wet weather flows with the additional flows from near-term developments. The near-term expansion evaluation includes the airport gravity main, since this future improvement will directly influence the collection system capacities when subjected to additional subdivision flows. All subdivisions included in the evaluation were assumed to be at full build out (2015). The improvements required to accommodate near-term flows are described in the following sections and summarized in Table 6-2. Model results were used to size the needed improvements within the existing collection system.

Table 6-2
Near-Term Collection System Improvements (2015)

Sewer Line	Total Length (LF)	Length by Diameter (LF)				
		12”	15”	18”	24”	36”
New Airport Gravity Main	7,150				7,150	
South Railroad from P3052 to P473	2,738		2,483	255		
B Street	2,529		2,529			
Tricia Street	484		484			
Airport Road	424		424			
Custer Outfall	100					100
HD 12” Outfall	3,868			3,468	400	
Fort Harrison Gravity Main	4,838		4,838			
Fort Harrison Gravity Main (with all Ft. Harrison flow reserve)	*6,613*[1]		*6,018*[1]	*595*[1]		
Oakes (Lyndale to Lewis)	178		178			
Lyndale (Oakes to Hannaford)	931	455		476		
Lewis (Harris to Oakes)	469		469			
Boulder (Hannaford to Washington)	940		940			
Hannaford (Lyndale to Boulder)	372	372				
Skyway Drive	400	400				
TOTAL	**25,421**	**1,227**	**12,345**	**4,199**	**7,550**	**100**

[1] These pipe lengths are not included in the total pipe lengths

6.3.1. *Airport Gravity Main*

The topography of the Helena Regional Airport generally slopes to the north, allowing for gravity flow to the sewer trunk lines currently serving the Airport sewer lines. It is proposed that the City take advantage of this natural drainage and eliminate the City’s South Airport lift station and force main, rather than increase its capacity to accommodate ongoing development. This project was previously identified by City planning efforts and is included in their long-term capital improvements projects. The modeling results verify the feasibility of the project.

With the installation of an airport gravity main, the City’s South Airport lift station (450 gpm capacity) would be taken offline, and removed and/or abandoned. This change would eliminate ongoing operation and maintenance costs associated with this lift station. The proposed airport gravity main begins at manhole SI293-7A, located on

Airport Road and runs approximately 7,150 feet on a northwest alignment across the Helena Regional Airport Authority property to manhole 75-7-24, located along North Washington Street. With an average slope of 0.0026 ft/ft, a diameter of 18-inches is adequate for the flows produced by near-term system expansion in the southern portion of the East Side service area. However, it is recommended that the airport gravity main be 24-inch diameter to allow for additional capacity in the 20-year planning period and beyond.

6.3.2. *Near-Term Lift Station Improvements*

The near-term system expansion includes four new lift stations, and elimination of two existing lift stations, including the City's South Airport lift station previously discussed. The second lift station to be removed is the existing Fort Harrison lift station. Under the near-term scenario, the Fort Harrison lift station would be replaced by a new lift station located on the north boundary of the Stone Meadows planned development, shown in Figure 6-1 and described below.

The four lift stations added for the near-term system expansion are currently proposed and included as part of several of the subdivision applications included in this analysis. The four lift stations are located within the Stone Meadows, Artisan Park, Aspen Trails Ranch, and Corner Stone Subdivisions. The following paragraphs describe each lift station. For the purposes of conservatively modeling the impact of lift station flows within the collection system, the proposed pump capacities for each lift station was computed by multiplying the peak wet well inflow by a safety factor of 1.5.

The Artisan Park lift station was modeled with the force main discharging to the existing Fort Harrison gravity main (upstream of the Fort Harrison lift station) at manhole 99-16-11. The lift station was modeled with a pump capacity of 380 gpm to handle the model-generated peak flow from the subdivision. The Artisan Park preliminary plat (March 2007) included a proposed lift station capacity of 554 gpm, and which would provide more than adequate capacity. The difference between the model results and the preliminary plat is likely due to the assumptions for the design population assumed for the subdivision in the preliminary plat.

The Corner Stone lift station was modeled with the force main discharging to the existing Fort Harrison gravity main at manhole 99-16-27. The lift station was modeled with a pump capacity of 475 gpm to handle the peak flow from the subdivision. The location of the lift station is approximately 28 feet higher in elevation than the connection point on the Fort Harrison gravity main, which suggests that gravity sewer could be feasible. However, the lift station alternative was included in the model instead of a gravity main due to the required crossing of Sevenmile Creek. Detailed design including a detailed topographic survey of the area between Corner Stone and the Fort Harrison gravity main is required to determine if a gravity main from Corner Stone is a viable design option.

The Stone Meadows lift station is located approximately 1,700 feet northeast of the existing Fort Harrison lift station and replaces this existing lift station. The Stone Meadows lift station was modeled with the force main discharging to the same Custer Avenue manhole as the existing Fort Harrison force main. The new lift station was

sized with a pump capacity of 1,575 gpm to accommodate flows from Crystal Springs - Phase 4, Lutheran, and Stone Meadows subdivisions. The Stone Meadows planning documents include a gravity line which parallels the force main to convey all gravity flow to the lift station. Because it is located downstream of the proposed Artisan Park and Corner Stone lift stations, and because it replaces the existing Fort Harrison lift station, the Stone Meadows lift station was sized to handle these flows as well, including the reserve capacity of 415 gpm for Fort Harrison.

The Aspen Trails Ranch lift station was modeled with the force main discharging to Custer Avenue manhole 64-21, immediately upstream of the 42-inch interceptor. The lift station was modeled with a pump capacity of 595 gpm to handle the peak flow from the Aspen Trails Ranch and Burnham developments. The lift station capacity proposed in the Aspen Trail Ranch design drawings, dated May 2006 was 325 gpm, and was sized to handle only these areas.

It should be noted that as of June 2007, Lewis & Clark County was in the process of designing a "regional lift station" located on Munger Road immediately west of Prickly Pear Creek with a proposed design capacity of 2,000 gpm. The service area of this lift station is generally bounded by Prickly Pear Creek on the east, the HVID on the south, Interstate 15 on the west and Munger Road on the north. The service area includes Aspen Trails Ranch, Burnham properties, as well as the existing Ten Mile Estates, Treasure State Acres and Pleasant Valley residential developments and would be constructed in lieu of the proposed Aspen Trails Ranch lift station. This proposed lift station was not included in the model of the near-term or future 2025 collection system extension because the design had not been finalized at the time this report was prepared.

6.3.3. *Near-Term Gravity Main Improvements*

In general, new gravity sewer mains to connect the new subdivisions to the existing collection system were required for the Overlook, Sussex, Padbury Ranch, Mountain View Meadows, Burnham, and the Dahl-Runckle property. The majority of the near-term gravity main improvements are located within the subdivisions that they are connecting and therefore will be installed by the developer. These lines were sized for the model scenario to meet City standards.

6.3.4. *Improvements to Accommodate Near-Term Subdivision Annexation*

Modeling of the wet weather (Maximum Day) flows with a 10-year 60-minute storm event for the near-term subdivisions demonstrated significant capacity deficiencies in several areas of the system. However, system-wide capacity issues were not observed. The recommended collection system improvements are summarized in Table 6-2. The model results showed 56 gravity main sections with flows that exceeded 75 percent capacity compared to the 22 mains identified under maximum day conditions for the existing conditions identified in Chapter 5. This is a total of approximately 18,500 lineal feet, requiring installation of primarily 15- and 18-inch diameter pipe, not including the proposed Airport gravity line.

The area of the collection system with the most significant capacity deficiencies is the southern portion of the East Side planning area upstream of the new airport gravity main. The capacity deficiencies are associated with projected flows generated by the Padbury, Mountain View Meadows and Dahl-Runckle developments under full build out conditions. The existing capacity deficiencies in the previously identified portions of the Fort Harrison gravity line were exacerbated by the increased flows from the Corner Stone and Artisan Park connections. A complete listing of each pipe segment with capacity deficiencies and the recommended diameter is included in Appendix D.

Several pipe segments were reported in the model results as being over capacity due to adverse or inadequate pipe slopes. These included one segment on Custer Avenue (P2239), and two sections on the Fort Harrison gravity main (P899 and P1202). In these cases, it was assumed that the pipe diameter was increased rather than correcting the adverse slope conditions. Pipe segments with adverse or backwards sloping pipe, is automatically computed as flowing pressurized by the modeling software, regardless of the diameter.

Under near-term maximum day flow conditions, the maximum surcharge in the downstream manholes is less than two feet and overflow does not appear to be likely. However, it is recommended that these pipe segments be studied further to verify the manhole rim and invert elevations utilized in the model.

In many cases within a collection system, a pipe segment with adverse slope results in a slight decrease in pipe capacity and requires a hydraulic head or manhole surcharge conditions to provide the required capacity. While this is not a desirable condition in general, isolated instances of these conditions are not uncommon in sewer collection systems. To eliminate the adverse slope, a detailed engineering study would be required to devise a plan for slope correction, and may involve expensive replacement of numerous upstream and downstream pipe segments. Flow monitoring and more detailed survey information is recommended to verify that these adverse slopes actually exist and that they are not impacting the overall capacity of the pipe or posing a risk of sewer overflows under the anticipated future wet weather flows.

6.4. FUTURE SYSTEM EVALUATION

Figure 6-2 shows the capacity deficiencies in the existing collection system under future 2025 peak day – wet weather flows. Figure 6-3 shows the proposed improvements and system extensions based on the evaluation of future 2025 flows. Like the near-term evaluation, the future evaluation includes the airport gravity main, since this future improvement will directly influence the collection system capacities when subjected to future flows. All of the subdivisions included in the evaluation were assumed to be at full build out (2015), and TAZ-based growth projections were applied to areas outside of the development boundaries but within the proposed service area.

The improvements required to accommodate 2025 flows are described in the following sections and summarized in Table 6-4 at the end of this section. The improvements include the near-term improvements summarized in Table 6-2, with some modification of total pipe length, based on some rerouting of flows under the future conditions. A

Planning Area
- Central Valley
- City of Helena
- East Side
- Fort Harrison
- North Valley
- West Side

Gravity Main Capacity Used
- 0.00% - 50.00%
- 50.01% - 75.00%
- 75.01% - 100.00%
- Pressurized Flow

Regional Lift Station
Green Meadow Dr.
McHugh Ln.
Montana Ave.
I-15
Tenmile Creek
Aspen Trails Ranch Lift Station
Sevenmile Creek
Fort Harrison Lift Station
Northside Lift Station
Fair Grounds Lift Station
Artisan Park Lift Station
Custer Ave.
Benton Ave.
Airport Lift Station (private)
East Side Lift Station
Airport Gravity Main
BNSF Railroad
Prickly Pear Creek
US HWY 12

Helena City Limits
Roadway
Wetwell
Force Main
Stream - Waterways

Feet
0 2,125 4,250

City of Helena

Helena Wastewater Collection System Master Plan

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Figure 6-2
Collection System Capacity Under Future 2025 Conditions
Helena Wastewater Collection System Master Plan

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Planning Area
- Central Valley
- City of Helena
- East Side
- Fort Harrison
- North Valley
- West Side

Gravity Main Diameter
- 36" & Larger
- 30"
- 24"
- 21"
- 18"
- 15"
- 12"
- 10" & Smaller

Prairie Rd.
Lincoln Rd.
I-15
Montana Ave.
Green Meadow Dr.
Sierra Rd.
McHugh Ln.
Munger Rd.
Regional Lift Station
Aspen Trails Ranch Lift Station
Fort Harrison Lift Station
Northside Lift Station
Artisan Park Lift Station
Custer Ave.
Benton Ave.
BNSF Railroad
US HWY 12
Canyon Ferry Rd.
East Side Lift Station
Airport Gravity Main

- Helena City Limits
- Roadway
- Wetwell
- Force Main
- Existing Gravity Main

Feet
0 3,125 6,250

City of Helena

Helena Wastewater Collection System Master Plan

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Figure 6-3
Future System Proposed Extensions, Lift Stations, & Collection System Improvements
Helena Wastewater Collection System Master Plan

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complete listing of each pipe segment with capacity deficiencies and the recommended diameter is included in Appendix E. Model results were used to size the needed improvements within the existing collection system.

6.4.1. *Airport Gravity Main*

The new airport gravity main modeled under the near-term scenario and previously described in section 6.3.1 did not require a larger diameter to accommodate the future 2025 loading conditions. The proposed 24-inch diameter adequately handled the flows produced by the population growth in the East Side service area. The peak hour flow rates in the line increased from 832 gpm under the near-term scenario to approximately 975 gpm for the 2025 scenario and the capacity of the 24-inch gravity main remained under 50 percent.

6.4.2. *2025 Lift Station Improvements*

Some modifications of the proposed lift stations required for the near-term scenario were required for the future 2025 flows. They are described in the following paragraphs, shown in Figure 6-2 and summarized in Table 6-3. For the purposes of conservatively modeling the impact of lift station flows within the collection system, the proposed pump capacities for each lift station, except for the regional lift station, was computed by multiplying the peak wet well inflow by a safety factor of 1.5.

Table 6-3
Summary of Future Lift Stations and Force Mains

Lift Station	Force Main Dia (in)	Length of Force Main (LF)	Firm Capacity (gpm)	Discharge Trunk
Fort Harrison	18	5,000	2,432	Custer Avenue
Northside	8	4,400	180	Custer Avenue
Artisan Park	12	3,684	900	Fort Harrison Gravity Main
Aspen Trails Ranch	16	12,170	1,357	42-inch WWTF Interceptor
Eastside	10	13,100	292	42-inch WWTF Interceptor
Regional	30[1]	20,000	5,200	42-inch WWTF Interceptor

[1] The model shows that a force main with an equivalent diameter of 30-inches is required. This would be accomplished with multiple smaller diameter force mains installed parallel to each other. See Table 7-4.

Fort Harrison lift station. Under 2025 conditions, the near-term Stone Meadows lift station was replaced by the new Fort Harrison lift station located approximately 2,465 feet to the northwest on McHugh Lane. This new lift station will handle all the future

flows from the Fort Harrison service area (including the reserve capacity) and a portion of the west side service area which is served by the proposed Artisan Park lift station under the near-term scenario. This is discussed further in section 6.4.4. The Fort Harrison lift station also serves a small portion of the Central Valley service area between Tenmile Creek and Custer Avenue. This lift station has an estimated capacity of 2,432 gpm and discharges to the Custer Avenue Trunk main at manhole 551-6.

Under this scenario, sewer flows from the Corner Stone subdivision and surrounding area were rerouted through gravity mains to the proposed Regional Lift Station described below. This resulted in a decrease of 2,200 lineal feet requiring upsizing in the Fort Harrison gravity main.

Northside lift station. A second proposed lift station, Northside lift station was located approximately 4,400 feet north of Custer Avenue near North Montana Avenue. This lift station replaces the existing Northside lift station located at the intersection of Claim Jumper Drive and Gold Dust Drive. The new lift station serves a small portion of the Central Valley service area which is south of the HVID, West of Interstate 15, and south of Custer Avenue. The capacity of the proposed Northside lift station is 180 gpm and discharges to the Custer Avenue trunk main at manhole 84-17-1.

The Artisan Park lift station previously described in section 6.2.2 remained in the same location with the force main discharging to the same manhole along the Fort Harrison gravity main. The only modification assumed for this lift station was a capacity increase to 900 gpm. This increase was due to projected increased flows from the West Side service area that the lift station serves.

The Aspen Trails Ranch lift station previously described in section 6.2.2 also remained in the same location with the force main continuing to discharge to the 42-inch treatment plant interceptor. The only modification assumed for this lift station was a capacity increase to 1,357 gpm. This capacity will accommodate the increase in sewer flows from the portions of the East Side and Central Valley service areas served by the lift station. The service area of the Aspen Trails Ranch lift station comprises everything east of interstate 15, north of Canyon Ferry Road, and south of the Karmen Street.

Eastside lift station. A third proposed new lift station labeled the Eastside lift station was located approximately 1,860 feet east of the existing privately-operated airport lift station located immediately north of the Attack Battalion Armory. The Eastside lift station would serve the portion of the East Side service area which is south of the Canyon Ferry Road and north of Highway 12. Despite the fairly large service area, the estimated lift station capacity estimated is 292 gpm and discharges to the 42-inch treatment plant interceptor.

Regional lift station. The fourth proposed lift station is the Regional lift station and was located at the northeast corner of the Central Valley service area on the north side of Tenmile Creek. This location is approximately 4.2 miles northeast of the City's wastewater treatment plant. This lift station would serve all of the North Valley service area and the majority of the Central Valley service area not served by the Aspen Trails Ranch lift station. The Regional lift station has an estimated capacity of 5,200 gpm and the 30-inch diameter force main discharges to the 42-inch treatment plant interceptor. It

should be noted that the design of this lift station will likely require a booster station which would serve to boost the force main flows due to the high head requirements between the Regional lift station location and the WWTF.

As discussed in Section 6.3.2, the County's design for a "regional lift station" located on Munger Road immediately west of Prickly Pear Creek was not included in the model of the future 2025 collection system extension because the design had not been finalized at the time this report was prepared. It is considered an interim regional lift station because it does not serve the entire planning area. The ultimate location of the Regional lift station will be dictated by the existing topography and be located at the physical low point of the planning area, as previously described.

6.4.3. *West Side Service Area Improvements*

The projected sewer loading for the west side service area was incorporated into the model by including two new gravity mains. The first is an 8-inch diameter gravity main that parallels US Highway 12 on the north side for approximately 7,250 feet, and connects to existing manhole 99-14-6 on Highway 12 (Euclid Avenue). This new main serves the area immediately south of US Highway 12. The second proposed line to serve the west side is an 8-inch diameter gravity main that parallels Williams Street on a northerly alignment. The new Williams Street gravity main begins immediately south of US Highway 12 and runs approximately 5,235 feet to the proposed Artisan Park lift station. This new gravity main serves the area immediately north of US Highway 12 and south of the Artisan Park development.

6.4.4. *Existing System Improvements to Accommodate 2025 Loading*

Model results were used to identify gravity lines and lift stations that were undersized for the 2025 peak day – wet weather conditions. Figure 6-2 shows those lines that exceed 75 percent of the line capacity within the existing and near-term system. There were 62 gravity main sections with capacity deficiencies in excess of 75 percent capacity compared to the 22 mains identified under maximum day conditions for the existing conditions identified in Chapter 5. In many cases, problems identified in the near-term scenario worsened; few new capacity problems were identified.

Key deficiencies at 2025 flows include:

- 12-inch HD line: Existing capacity issues worsen; q/Q ranges from 1.1 to 4 times capacity under peak flow conditions.
- Harris Street line: Portions of this line between Phoenix and Cole Avenues are at 90 percent capacity under peak flow conditions.
- East Side system: Capacity issues identified under the near-term scenario worsen under future peak flow conditions.
- Country Club Avenue: The area south of West Euclid Avenue between Country Club Avenue and Brady Street has pipe segments that exceed 100 percent capacity at 2025 flows.

- Custer Avenue line: Portions of this line exceed 75 percent capacity. Included in the Custer Avenue line is a portion near the west end of the existing service area identified as West Euclid, which is in excess of 100% capacity.
- Brady Street and Stewart Street lines: Portions of this line exceed 50 percent capacity at 2025 flows.

The existing capacity deficiencies in the previously identified portions of the Fort Harrison line, without the total reserve flow of 415 gpm, were reduced due to the rerouting of flows generated by the Corner Stone development to the proposed Regional lift station. However, if the Fort Harrison reserve of 415 gpm is included in the loading, then a total of 8,523 lineal feet of 15- and 18-inch diameter pipe is required to handle the future conditions.

The near-term capacity deficiencies previously identified for the South Railroad and Tricia Street were reduced due to redistribution of the Padbury and Mt. View Meadows flows. All flows generated by these two developments were still routed to the B Street gravity main; however, a more comprehensive loading method utilized the additional future scenario manholes and gravity mains in the immediate vicinity of the developments. The recommended existing system improvements are shown in Figure 6-3 and summarized in Table 6-4.

6.4.5. *Collection System Extensions*

Under the 2025 scenario, the existing wastewater collection system was expanded to serve the entire planning area including the West Side, East Side, Fort Harrison and southern portion of the Central Valley service areas. The Northern portion of the Central Valley service area and the entire North Valley service area were assumed to be served by an entirely new wastewater collection system which flows to the Regional lift station and is then pumped to the existing wastewater treatment plant. Table 6-5 summarizes these proposed future collection system extensions. Figure 6-3 shows the proposed sewer collection system extensions to accommodate 2025 projected flows.

Table 6-4
Existing Collection System Improvements to Accommodate Future (2025) Flows

Sewer Line	Total Length	Length by Diameter								
		10”	12”	15”	18”	21”	24”	27”	30”	36”
Airport Gravity Main	7,150						7,150			
South Railroad	2,738				2,738					
B Street	2,883				2,883					
Tricia Street	152		152							
Airport Road	424			424						
Skyway Drive	400	400								
Custer Trunk	1,246								1,153	93
West Euclid	2,097		2,097							
HD 12” Outfall	4,183					3,783		400		
Fort Harrison Gravity Main	2,630		1,514		1,116					
Fort Harrison Gravity Main (w/ reserve)	*8,523*[1]			*8,201*[1]	*322*[1]					
Harris (Phoenix to Walnut & Cedar to Cole)	540						540			
Lewis (Harris to Oakes)	470			470						
Boulder (Hannaford to Washington)	940			476	464					
Lyndale (Oakes to Lamborn)	931			455	476					
Hannaford (Lyndale to Boulder)	372			372						
Oakes (Lyndale to Lewis)	178				178					
TOTAL	**27,333**	**400**	**3,763**	**1,720**	**8,331**	**3,783**	**7,690**	**400**	**1,153**	**93**

[1] These pipe lengths are not included in the total pipe lengths

Table 6-5
Proposed Collection System Extensions for Future (2025) Conditions

Sewer Line	Total Length	Length by Diameter							
		8”	10”	12”	15”	18”	21”	24”	36”
West Side Service Area Highway 12 Extension	7,250	7,250							
West Side Service Area Williams St. Extension	5,235	5,235							
West Side Service Area Fort Harrison Extension	3,175	3,175							
East Side Lift Station Extension	17,280	17,280							
East Side Service Area Extension South of Highway 12	42,230	32,200	1,020		9,010				
Fort Harrison Service Area Barrett Road Extension	2,495	2,495							
Fort Harrison Service Area Birdseye Road Extension	4,490	4,490							
Central Valley Service Area Fort Harrison LS Extension	3,515				3,515				
Central Valley Service Area Northside LS Extension	1,685			1,685					
East Side Service Area Aspen Trails Ranch Extensions	22,180	20,645	1,535						
Central Valley Service Area Aspen Trails Ranch Extensions	5,145	5,145							
Central Valley / North Valley Service Area Extensions to Regional lift station	298,585	189,705	26,605	20,590	25,585	14,090	9,890	2,695	9,425
TOTAL	**413,265**	**287,620**	**29,160**	**22,275**	**38,110**	**14,090**	**9,890**	**2,695**	**9,425**

6.4.6. *Future Extensions*

The proposed collection system extension in the North Valley and Central Valley service areas flow to the Regional lift station described in Section 6.4.2 which pumps to the existing wastewater treatment plant. This scenario was chosen to reflect the City's current situation and assumes that the existing treatment plant would have to be improved at some future date to provide enhanced treatment and additional capacity. This scenario does not preclude other alternatives which the City may choose to pursue, such as location of a new wastewater treatment plant in the vicinity of the proposed regional lift station. The evaluation of these treatment plant location alternatives is outside the scope of this master plan and will be considered by the City in a future wastewater treatment facilities plan.

The proposed future collection system consists of an interceptor which runs from west to east serving the Regional lift station; three trunk lines which run north-south and connect to the interceptor; and two trunk lines that run east-west and connect to north-south trunk lines. Eight inch diameter collectors and laterals connect to the trunk lines to serve the planning area.

The proposed interceptor is 36-inches in diameter and is 9,410 lineal feet in length from Interstate 15 to the lift station. The interceptor crosses under Interstate 15 where it reduces to an 18-inch diameter and serves as a trunk line extending west approximately 7,660 lineal feet to the intersection of Applegate/Dairy Drive.

Three trunk lines connect to the 36-inch interceptor from the north. The east trunk line follows Glass Drive and consists of 12-inch and 8-inch diameter pipe with a total length of 22,620 lineal feet from the interceptor to No Creek Court. The I-15 trunk line follows Interstate 15 on the east right-of-way boundary. It is varies in diameter and includes 24-21-, 18-, 15-, 12-, and 8-inch diameter pipes and totals 22,800 lineal feet. The west trunk line follows the alignment of Applegate Drive, ranges in diameter from 24-inches to 8-inches and is 22,670 feet in length.

Three trunk lines connect to the interceptor from the south. The east trunk line serves the Munger Road area and includes 10-inch and 8-inch diameter pipe with a total length of 8,670 feet. The I-15 trunk follows the Interstate 15 right-of-way boundary south approximately 7,200 lineal feet and is 21-inches in diameter. The west trunk line follows the alignment of Dairy Road for 8,050 feet and is 8-inches in diameter.

Finally, a trunk line serving the southwest portion of the Central Valley service area connects to the west trunk on Dairy Road and runs west to Green Meadow Road. It is approximately 12,500 feet in length with a diameter of 18- and 15-inches.

Each of the described interceptor and trunk mains is assumed to have a network of laterals and collectors that were placed on either existing roadway alignments or ¼-section boundary lines. The laterals were laid out so that each ¼-section had at least one collector serving that area. The laterals were also placed within at least ¼ mile of the service area boundary.

The major physical obstacles encountered in the proposed gravity main extensions were Tenmile Creek, Sevenmile Creek, Interstate 15, and the Helena Valley Irrigation Ditch and D-2 drain. Gravity main crossings of these obstacles were limited, and in most cases the obstacles defined sub-basin boundaries for the gravity main extensions.

6.5. CONCLUSIONS

The City's future collection system improvements include extension of the system to serve growth to the east, north and west, as well as improvements within the existing system to address capacity deficiencies anticipated with increased flows. Most of the improvements to the existing system are in areas that are already experiencing capacity deficiencies at peak flows. Increased flows from anticipated near-term developments exacerbate these deficiencies.

The hydraulic model should continue to be updated and utilized to evaluate the impacts of future development as they occur. This will allow the City to update priorities for improvements and allow the City to plan for required infrastructure improvements.

Chapter 7 presents recommendations for prioritization of the improvements and estimated costs of each project. Trigger flows are identified in key pipes that the City can use to schedule and initiate improvement projects. Chapter 7 also includes costs for future extension of the collection system into the service area.