

## Technical Memorandum

**To:** Bruce Peterson  
Director of Planning and Development Services  
City of Willmar, Minnesota

**From:** Paul Jurek PE, through Scott Schaefer, PE

**Re:** **Lakeland Drive Interceptor Facility Plan Amendment**

**Date:** February 8, 2013

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### Introduction and Purpose

The City of Willmar, Minnesota retained Bollig Inc/AE2S to amend the 2006 Comprehensive Collection System Plan for the portion of the collection system served by the Lakeland Drive Interceptor. The 2006 Comprehensive Collection System Plan identified deficiencies in the existing State Hospital Lift Station and the Lakeland Drive Interceptor. Both of these components of the City's collection system are undersized for existing and future flows. This Facility Plan Amendment updates the service area and system capacity needs for the State Hospital Lift Station and the Lakeland Drive Interceptor. Due to the staged conversion of the State Hospital to the MinnWest Technology Campus, the future lift station will be renamed the MinnWest lift station. This document meets the requirements of the Minnesota Pollution Control Agency (MPCA) for facility planning in order to qualify for placement on the Project Priority List (PPL) to obtain a low interest loan from the Clean Water Revolving Fund (CWRF).

### Existing Capacity (Lakeland Drive Interceptor)

The 2006 Comprehensive Collection System Plan (Comprehensive Plan) concluded that the Lakeland Drive Interceptor does not have sufficient capacity to handle peak flows from a fully developed existing service area. Flow monitoring was conducted on the existing Lakeland Drive Interceptor (see Comprehensive Plan section 4.4). The existing Lakeland Drive Interceptor was also previously modeled under four flow conditions to determine capacity deficiencies (see Comprehensive Plan section 5.5). When consideration is given to future service and planning areas, the capacity deficiencies become more apparent. According to the 2006 Plan, several segments of

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the Lakeland Drive Interceptor appear to have been constructed nearly flat (zero slope), or even have a negative slope. Survey information collected in January 2013 revealed that one reach (approximately 310 feet between High Avenue and US Highway 12) has a zero percent slope. It is possible this reach was installed with this slope because of a local increase in the grade elevation (e.g. to minimize the burial depth of this reach). This situation causes the flow rate to slow down and creates segments of the interceptor with capacity significantly below the typical capacity for the pipe diameter. These pipes surcharge and flow becomes a low pressure flow rather than gravity flow.

The existing Lakeland Drive Interceptor model (presented in the 2006 Comprehensive Plan) indicates that flows in the interceptor often exceed the capacity for gravity flow at existing conditions.

Figure 1 depicts the 2006 sanitary sewer collection system, lift stations, pertinent manhole locations, and sanitary basins that contribute to the Lakeland Drive Interceptor. Manhole numbers were taken from the 2006 Comprehensive Plan and the Willmar SewerWeb program. Existing sanitary basins that contribute to the Lakeland Drive Interceptor are basins 1, 2, 5, 10, 11 & 14. The 2006 Comprehensive Collection System Plan projected a peak flow of 7.36 cubic feet per second (cfs) from a fully developed existing service area.

### **Existing Capacity (MinnWest/State Hospital Lift Station)**

The State Hospital lift station was likely constructed in the 1950's or earlier. The lift station has several deficiencies, including lack of capacity, plugging, safety, lack of a standby power source, out-dated pumps and equipment, structural defects, and electrical code compliance issues. The existing firm pumping capacity (one unit out of service) is 0.89 cfs, which is insufficient to handle future flows of 4.07 cfs. The existing eight inch diameter discharge forcemain would have a velocity of 11.7 feet per second (fps) at the future flows, which is higher than the desired maximum velocity of 10.0 fps (based on EPA recommended forcemain design criteria).

### **Future Planning Areas and Interceptor Flows**

The existing sanitary sewer service area, future service area, and planning area were defined in the 2006 Plan. No modifications to the service areas or planning areas have occurred, and no modifications are anticipated. Figure 2 shows the City of Willmar's existing sanitary sewer system, future service area, and planning area divided into sanitary basins. The future service areas and the planning service areas are anticipated to require sanitary service within the next 20 years and 50 years, respectively. The sanitary basin boundaries are generally based on natural topography, the configuration

of the existing collection system, and the location of major lift stations. Average flows from each sanitary basin were calculated based on land use. A peaking factor was then applied to account for groundwater infiltration, surface inflow and peak hour flows. Peaking factors were established in the 2006 Plan. Flow projections for this Amendment were confirmed to be consistent with the development and planning areas stated in the Comprehensive Plan. Projected peak flows for existing, future, and planning area sanitary basins that contribute to the Lakeland Drive Interceptor are presented in Table 1 below. Note that the Eagle Lake sanitary basin represents the wastewater flow from the Eagle Lake Sanitary Sewer District, which has a sewer service agreement with the City of Willmar.

**Table 1: Projected Peak Flows**

Sanitary Basin	Existing, Future, or Planning Basin	Basin Peak Flow (CFS)	Cumulative Interceptor Flow (CFS)
F-18	Planning	0.121	0.121
F-2	Future	0.546	0.667
1	Existing	0.970	1.637
Eagle Lake	Existing	0.655	2.292
2 (MWLS)	Existing	1.780	4.072
5	Existing	0.730	4.802
F-4	Future	1.625	6.427
F-17	Planning	0.113	6.540
10	Existing	0.550	7.090
11 (sub-basin A)	Existing	1.730	8.820
14	Existing	0.940	9.760
F-8	Future	1.533	11.293
F-16	Planning	0.853	12.146
F-5*	Future	0.622	12.768
F-15*	Planning	0.044	12.812

\*Sanitary Basins F-5 & F-15 will contribute flow to the Lakeland Drive Interceptor as part of Phase 2 of the project for both alternatives.

## Alternatives

As previously determined by the Comprehensive Plan, the Lakeland Drive Interceptor will require additional capacity to handle future flows from existing and future service areas. Due to the limited flow capacity of the existing interceptor and the age of the pipeline, a "no action alternative" is not feasible for the Lakeland Drive Interceptor.

The Comprehensive Plan previously evaluated alternatives to reduce and/or redirect flows to provide a reduction in peak flow to the Lakeland Drive Interceptor as part of the "Secondary Collection System Alternatives" (section 7.2 and Technical Memorandum 105.1.2). The Comprehensive Plan determined that the Lakeland Drive Interceptor capacity should be increased. The Comprehensive Plan also considered two alignments for the extension of the Lakeland Drive Interceptor and made an initial recommendation. The alternatives presented in the 2006 Plan have been updated to provide additional replacement of undersized existing pipeline.

Two alternatives to provide relief for the existing Lakeland Drive Interceptor were evaluated. Both alternatives were sized to accommodate projected existing, future and planning flows by gravity. The two alternatives are presented in Figures 3 and 4.

### Alternative 1

Alternative 1 generally includes replacement of the existing Lakeland Drive Interceptor following the existing interceptor alignment. This generally includes increased capacity upstream of the State Hospital (MinnWest) lift station, replacement of the lift station and forcemain, and increased capacity downstream of the lift station. The proposed Alternative 1 features are shown on Figure 3.

Two sections of gravity sewer upstream of the lift station would require capacity increases. Upstream (north) of the State Hospital lift station, the gravity sewer pipe would be replaced with 15-inch diameter pipe from the Eagle Lake forcemain discharge [manhole (MH) 3027] near the intersection of Highway 23/71 and 41<sup>st</sup> Avenue NE to the Country Club lift station discharge (Sanitary Basin 1 connection; MH 3006] near the intersection of Business Highway 71 and 23<sup>rd</sup> Street NE. The gravity sewer pipe from the Country Club lift station discharge to the State Hospital Lift Station would be replaced with 21-inch diameter gravity pipe.

This alternative includes constructing a new lift station adjacent to the existing State Hospital Lift Station and demolishing the existing lift station. The future lift station will be named the MinnWest lift station to reflect conversion of significant portions of the State Hospital to the MinnWest Technology Campus. Approximately 3,500 feet of 12-inch forcemain from the lift station to the Lakeland Drive Interceptor will also be replaced under this alternative using a combination of directional boring and open trench construction methods. The future MinnWest lift station would be a wet pit/dry

pit type configuration, similar to the recently constructed Jennie-O Turkey Store Benson Avenue lift station.

The existing gravity sewer running south along Lakeland Drive would be replaced as follows:

- 21-inch diameter pipe from MH 3576 (near the intersection of Lakeland Drive and 11th Avenue) and MH 1839 (north of the intersection of Lakeland Drive and High Ave)
- 27-inch diameter pipe from MH 1839 to MH 1826 (near the intersection of Lakeland Drive and Trott Avenue)
- 30-inch diameter pipe from MH 1826 to MH 1822 (near the intersection of Lakeland Drive and 7<sup>th</sup> Avenue)
- 36-inch diameter pipe from MH 1822 to MH 1820 (near the intersection of Lakeland Drive and Olena Ave); note that the proposed alternatives include the same alignment to MH 1820
- 36-inch diameter pipe from MH 1820 to the Old Wastewater Treatment Plant (WWTP) site where a connection would be made to the new main Interceptor

Alternative 1 would likely be phased such that the Lakeland Interceptor system would be initially upgraded from the MinnWest lift station to MH 1816, which is approximately 1,200 feet west of Lakeland Drive and is the location where the existing gravity sewer transitions to 24-inch diameter. Phase 2 would include the remaining upgrades that were not constructed in Phase 1. Based on inverts and pipe diameters and reach lengths available on the [WillmarSewerWeb](#), the maximum flow rates without surcharging through this reach of interceptor is approximately 5.6 cfs (2,500 gpm). Accounting for peaking factors, the Phase 2 design should then be initiated when the average dry weather flow at MH 1816 reaches 1.4 cfs (625 gpm). This trigger flow for Phase 2 provides approximately 24 months for design and construction of Phase 2, although the schedule could be reduced depending on how the schedule aligns with construction seasons. The flow study conducted for the 2006 Comprehensive Plan indicated an average day flow at that time of approximately 0.6 cfs (268 gpm).

Additionally, a 200 gpm lift station, six-inch forcemain and 10-inch gravity sewer would be required to serve basin F-5 and F-15. These Phase 2 improvements are depicted in Figure 3. The cost associated with this additional infrastructure is included to provide an equal comparison between Alternative 1 and Alternative 2.

The cost of Alternative 1 is presented in Table 2. The segment of Lakeland Drive from Civic Center Drive to Willmar Avenue SE is eligible for immediate reconstruction but has been delayed pending this sanitary sewer improvement project. The cost of pavement restoration could be minimized by constructing the interceptor concurrent with the pavement improvements. Pavement restoration cost is included for the length of the piping on Lakeland Drive.

## Alternative 2

Alternative 2 is similar to Alternative 1 for the majority of the proposed alignment. The major deviation occurs at MH 1820 (near the intersection of Lakeland Drive and Olena Ave) where Alternative 2 would continue south along Lakeland Drive instead of turning west to follow the existing alignment. Alternative 2 also serves additional future sewer basins (F-5 and F-15) because of the modified alignment. This alternative conveys flow to the new interceptor sewer and bypasses the old WWTP site. The proposed Alternative 2 features are shown on Figure 4.

Two sections of gravity sewer upstream of the lift station would require capacity increases. Upstream (north) of the State Hospital lift station, the gravity sewer pipe would be replaced with 15-inch diameter pipe from the Eagle Lake forcemain discharge to the Country Club lift station discharge [Sanitary Basin 1 connection; manhole (MH) 3006]. The gravity sewer pipe from the Country Club lift station discharge to the State Hospital Lift Station would be replaced with 21-inch diameter gravity pipe.

This alternative includes constructing a new lift station adjacent to the existing State Hospital Lift Station and demolishing the existing lift station. The future lift station will be named the MinnWest lift station to reflect conversion of significant portions of the State Hospital to the MinnWest Technology Campus. Approximately 3,500 feet of 12-inch forcemain from the lift station to the Lakeland Drive Interceptor will also be replaced under this alternative using a combination of directional boring and open trench construction methods. The future MinnWest lift station would be a wet pit/dry pit type configuration, similar to the recently constructed Jennie-O Turkey Store Benson Avenue lift station.

The existing gravity sewer running south along Lakeland Drive would be replaced as follows:

- 21-inch diameter pipe from MH 3576 (near the intersection of Lakeland Drive and 11<sup>th</sup> Avenue) and MH 1839 (north of the intersection of Lakeland Drive and High Ave)
- 27-inch diameter pipe from MH 1839 to MH 1826 (near the intersection of Lakeland Drive and Trott Avenue)
- 30-inch diameter pipe from MH 1826 to MH 1822 (near the intersection of Lakeland Drive and 7<sup>th</sup> Avenue)
- 36-inch diameter pipe from MH 1822 to MH 1820 (near the intersection of Lakeland Drive and Olena Ave); note that the proposed alternatives include the same alignment to MH 1820
- 36-inch diameter pipe from MH 1820 to MH 9004 near the intersection of 28<sup>th</sup> Avenue SE and 5<sup>th</sup> Street SE (Phase 2)

This alignment would require a significant underground crossing of a drainage ditch 23A. Preliminary surveying data indicates sufficient gradient to accomplish this crossing under the drainage ditch with sufficient cover, but additional precautions may need to be constructed to protect the pipe at the crossing, such as insulation or stream bed erosion prevention. The extent of these precautions will be determined during final design.

Alternative 2 would likely be phased such that the Lakeland Drive Interceptor system would be initially upgraded from the MinnWest lift station to MH 1820, a temporary connection made to MH 1816 with a 24-inch gravity pipeline to tie into the existing 24-inch diameter, and a "dry" section of 36-inch gravity pipeline to Willmar Avenue SE to correspond with the associated road reconstruction project. Phase 2 would include the remaining upgrades that were not constructed in Phase 1 as well as decommissioning the temporary 24-inch connection pipe. As detailed in Alternative 1, the Phase 2 design should be initiated when the average dry weather flow at MH 1816 reaches 625 gpm. This trigger flow for Phase 2 provides approximately 24 months for design and construction of Phase 2, although the schedule could be reduced depending on how the schedule aligns with construction seasons.

The cost of Alternative 2 is presented in Table 3. The segment of Lakeland Drive from Civic Center Drive to Willmar Ave SE is eligible for immediate pavement reconstruction. Therefore, the cost of pavement restoration could be minimized by constructing the interceptor concurrent with the pavement improvements. Pavement restoration cost is included for the length of the piping on Lakeland Drive.

## **Economic and Non-Economic Evaluation**

The construction cost opinions presented are based on 2013 dollars. Detailed financial analysis should provide an inflation factor, which is checked and adjusted annually through the life of the facility. The opinion of probable cost was developed based on previous project data and RS Means cost estimating manuals. Conceptual costs are as of January 2013. These cost opinions represent Class 4 Estimates based on the definitions of the Association for Advancement of Cost Engineering (AACE) International. This level of cost opinion is appropriate for facility planning level evaluations made with incomplete information. The cost opinion at this level of engineering is considered to have an accuracy range of +50/-30 percent and is appropriate for comparing alternatives.

Alternative 1 would replace the existing interceptor with larger diameter pipe using the existing alignment to the old WWTP site. Pavement restoration is included for 20-percent of the length of the piping on Lakeland Drive. Additional pavement and utility protection costs were added to Phase 2 to account for construction through developed areas. It was assumed that approximately 50-percent of backfill would be select

granular fill. Manhole cost is included in the gravity sewer unit cost based on 400-foot spacing. The State Hospital lift station would be decommissioned and replaced with a new MinnWest lift station. The opinion of probable cost for Alternative 1 is presented in Table 2 below.

**Table 2: ALTERNATIVE 1 Opinion of Probable Project Capital Cost  
Lakeland Drive Interceptor (Existing Alignment)**

Item	Unit	Units Required	Unit Cost	Extended Cost
<b>PHASE 1</b>				
10-inch RCP	LF	1,500	\$136	\$204,000
15-inch RCP	LF	5,600	\$160	\$896,000
21-inch RCP	LF	3,650	\$180	\$657,000
24-inch RCP	LF	1,200	\$192	\$230,400
27-inch RCP	LF	3,250	\$216	\$702,000
30-inch RCP	LF	1,100	\$239	\$262,900
36-inch RCP	LF	800	\$268	\$214,400
12-inch DIP Forcemain	LF	3,500	\$128	\$447,000
State Hospital Lift Station	EA	1	\$750,000	\$750,000
Bore/Jacking	LF	500	\$700	\$350,000
Dewatering	LS	1	\$20,000	\$20,000
Pavement	LS	1	\$1,325,000	\$1,325,000
Phase 1 Subtotal				\$6,058,700
<b>PHASE 2</b>				
36-inch RCP	LF	5,450	\$268	\$1,460,600
6-inch DIP Forcemain	LF	2,000	\$85	\$170,000
New Lift Station	EA	1	\$300,000	\$300,000
Pavement/Utility Protection	LS	1	\$1,075,000	\$1,075,000
Phase 2 Subtotal				\$3,005,600
Subtotal (Rounded)				\$9,064,000
Contingency				\$906,000
Mobilization, Engineering, Legal, & Admin				\$1,360,000
Total (Rounded)				\$11,330,000

Alternative 2 would replace the existing interceptor with larger diameter pipe using the existing alignment to MH 1820 and then follow a new southern alignment to connect to the Southern Interceptor at 5<sup>th</sup> Street and 28<sup>th</sup> Avenue SE. Pavement restoration is included for 20-percent of the length of the piping on Lakeland Drive. It was assumed that approximately 50-percent of backfill would be select granular fill. Manhole cost is included in the gravity sewer unit cost based on 400-foot spacing. The State Hospital lift station would be decommissioned and replaced with a new MinnWest lift station. The opinion of probable cost for Alternative 2 is presented in Table 3 below.

**Table 3: ALTERNATIVE 2 Opinion of Probable Project Capital Cost  
Lakeland Drive Interceptor (Southern Alignment)**

Item	Unit	Units Required	Unit Cost	Extended Cost
<b>PHASE 1</b>				
15-inch RCP	LF	5,600	\$160	\$896,000
21-inch RCP	LF	3,650	\$180	\$657,000
24-inch RCP	LF	1,200	\$192	\$230,400
27-inch RCP	LF	3,250	\$216	\$702,000
30-inch RCP	LF	1,100	\$239	\$262,900
36-inch RCP	LF	2,300	\$268	\$616,400
12-inch DIP Forcemain	LF	3,500	\$128	\$447,000
State Hospital Lift Station	EA	1	\$750,000	\$750,000
Bore/Jacking	LF	500	\$700	\$350,000
Dewatering	LS	1	\$20,000	\$20,000
Pavement	LS	1	\$1,325,000	\$1,325,000
Phase 1 Subtotal				\$6,256,700
<b>PHASE 2</b>				
36-inch RCP	LF	7,000	\$268	\$1,876,000
Bore/Jacking	LF	100	\$700	\$70,000
Pavement/Utility Protection	LS	1	\$350,000	\$350,000
Phase 2 Subtotal				\$2,296,000
Subtotal (Rounded)				\$8,553,000
Contingency				\$855,000
Mobilization, Engineering, Legal, & Admin				\$1,283,000
Total (Rounded)				\$10,691,000

An opinion of probable operation, maintenance, and repair (OM&R) costs is presented in Table 4 for both alternatives. OM&R costs are similar for both alternatives because the MinnWest lift station pumps and pumping requirements will be the same for both alternatives and both alternatives are of similar length. However, Alternative 1 is slightly higher due to the inclusion of an additional lift station in Phase 2 of the project.

**Table 4: Operation, Maintenance, and Repair  
Opinion of Probable Annual Cost**

Item	OM&R Annual Cost
Alternative 1	\$26,600
Alternative 2	\$23,800

Non-economic criteria were previously identified in Technical Memorandum 105.1.2 of the Comprehensive Plan as:

- “Accommodate future growth,
- Provide relief for over-capacity sewers (Lakeland Drive and main sewer east of Jennie-O),
- Minimize flow to existing WWTF by routing flow directly to new WWTF,
- Eliminate lift stations, if practical, and
- Whenever possible, perform collection system improvements in conjunction with street construction projects.”

Both alternatives would accommodate future growth, would provide relief to the Lakeland Drive Interceptor, and would be planned to be constructed with street projects. Neither alternative would eliminate existing lift stations, although Alternative 2 may be able to eliminate a future lift station. Alternative 2 minimizes flow to the old WWTF.

Additional non-economic factors that were considered during the Facility Plan Amendment are presented below:

- Immediate construction is possible because this project does not rely on completion of other collection system improvements
- The project would replace an older (1958) section of the existing collection system, which would likely reduce clearwater inflow and infiltration
- Alternative 2 avoids some construction in developed urban areas
- Project will include replacement of the State Hospital Lift Station

## Recommendation

Alternative 2, reconstruction of the Lakeland Drive Interceptor, with future extension to near the intersection of 28<sup>th</sup> Avenue SE and 5<sup>th</sup> Street SE, is the recommended alternative. Advantages of the recommended alternative are as follows:

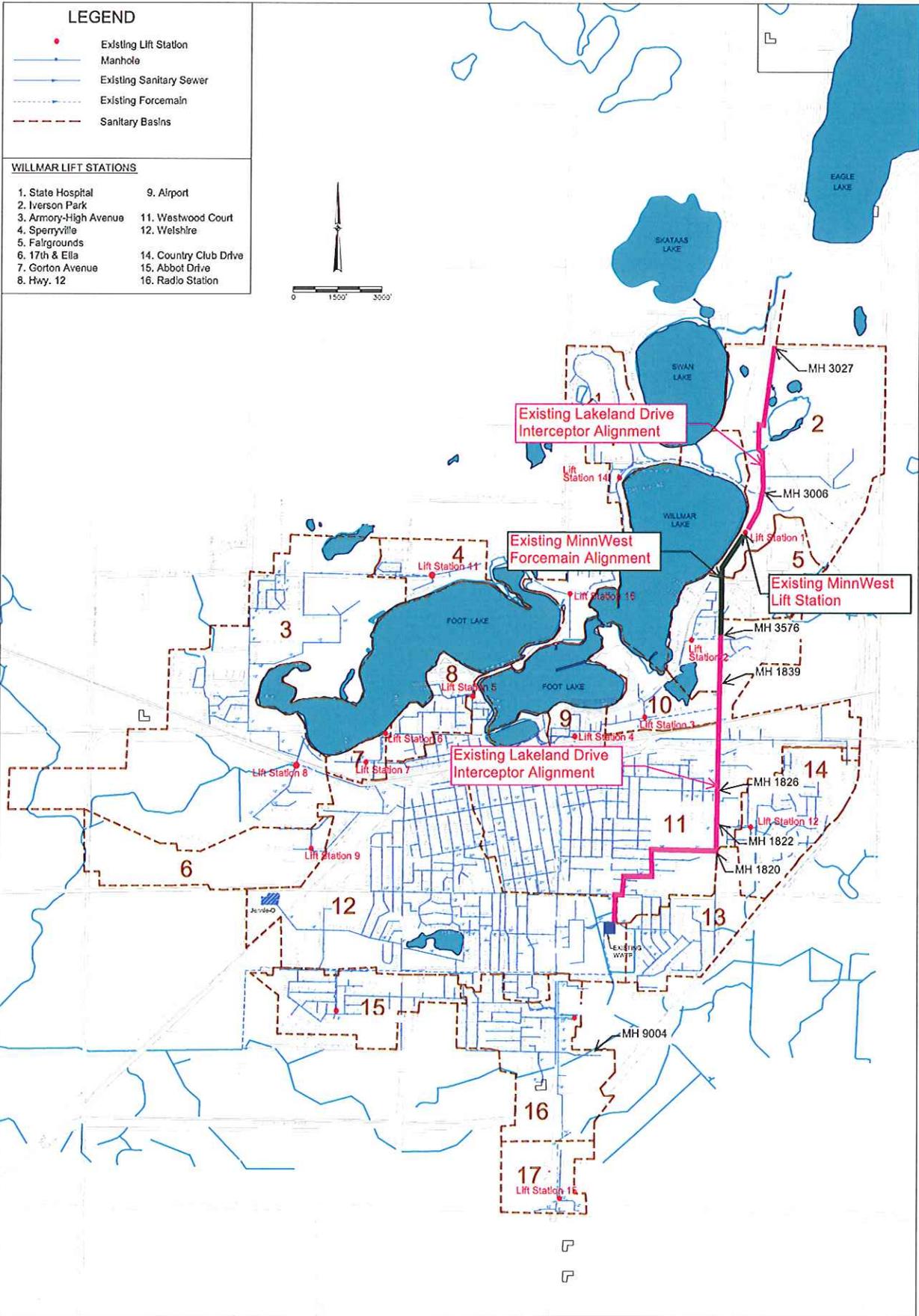
- At a facility planning level opinion of probable cost (+50/-30) the probable cost difference between Alternatives 1 and 2 is not significant
- Alternative 2 bypasses the old WWTF site
- Alternative 2 avoids some construction in developed urban areas
- Alternative 2 will be designed to serve future flows from the east side of the City by gravity

## Schedule

A preliminary project schedule is outlined below in Table 5.

Table 5: Preliminary Project Schedule

Item	Date
Public Hearing	February 19, 2013
Submittal of Facility Plan Amendment to MPCA	March 1, 2013
Submittal of EIW to MPCA	March 1, 2013
MPCA Facility Plan Amendment Approval	June 7, 2013
Letter Request for Placement on IUP	June 7, 2013
Submittal of Plans and Specs to MPCA	March, 2014
Project Construction	Summer/Fall 2014



**LEGEND**

- Existing Lift Station
- Manhole
- Existing Sanitary Sewer
- - - Existing Forcemain
- - - Sanitary Basins

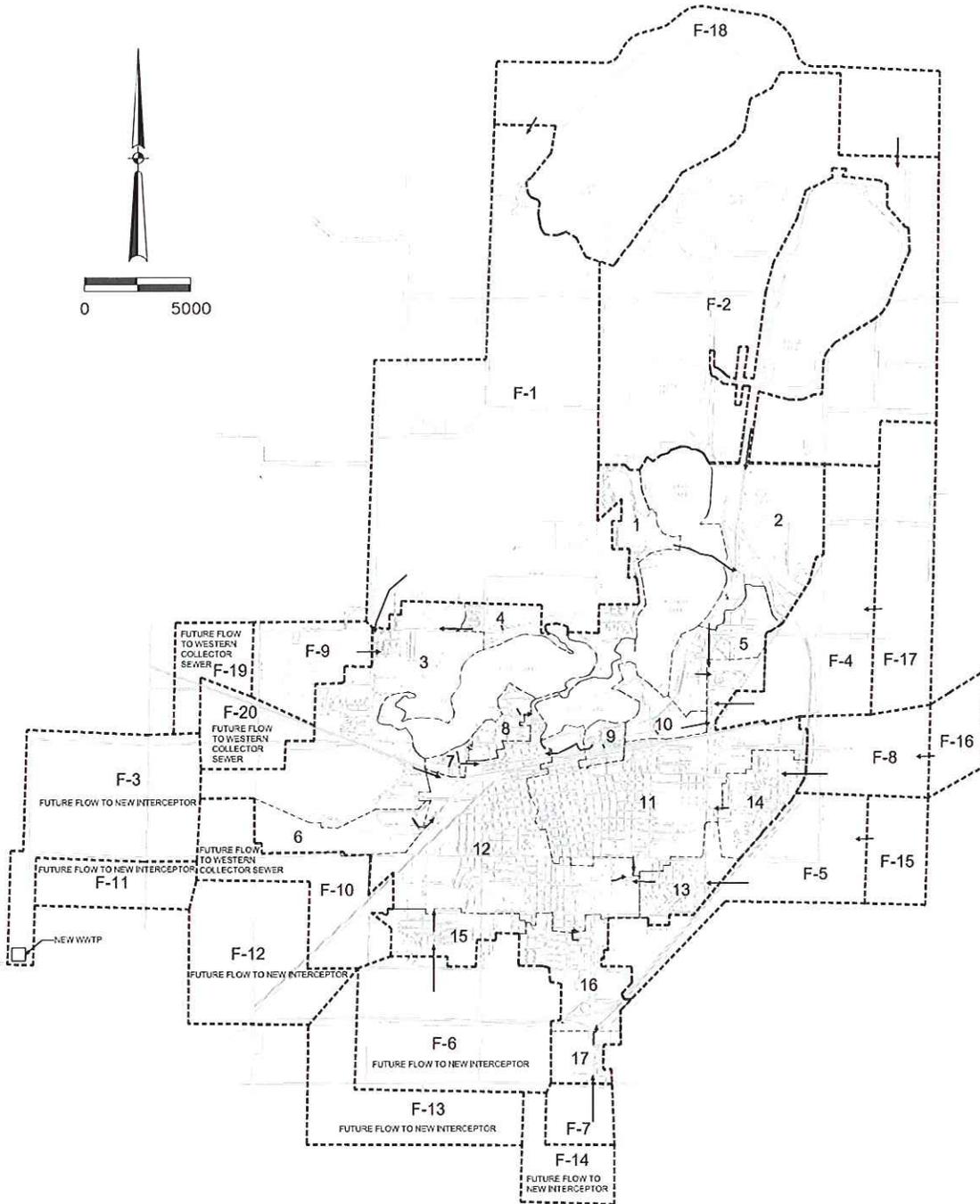
**WILLMAR LIFT STATIONS**

1. State Hospital	9. Airport
2. Iverson Park	11. Westwood Court
3. Armory-High Avenue	12. Welshire
4. Sperryville	14. Country Club Drive
5. Fairgrounds	15. Abbot Drive
6. 17th & Ella	16. Radio Station
7. Gorton Avenue	
8. Hwy. 12	



FIGURE 1: SANITARY SEWER COLLECTION SYSTEM CITY OF WILLMAR



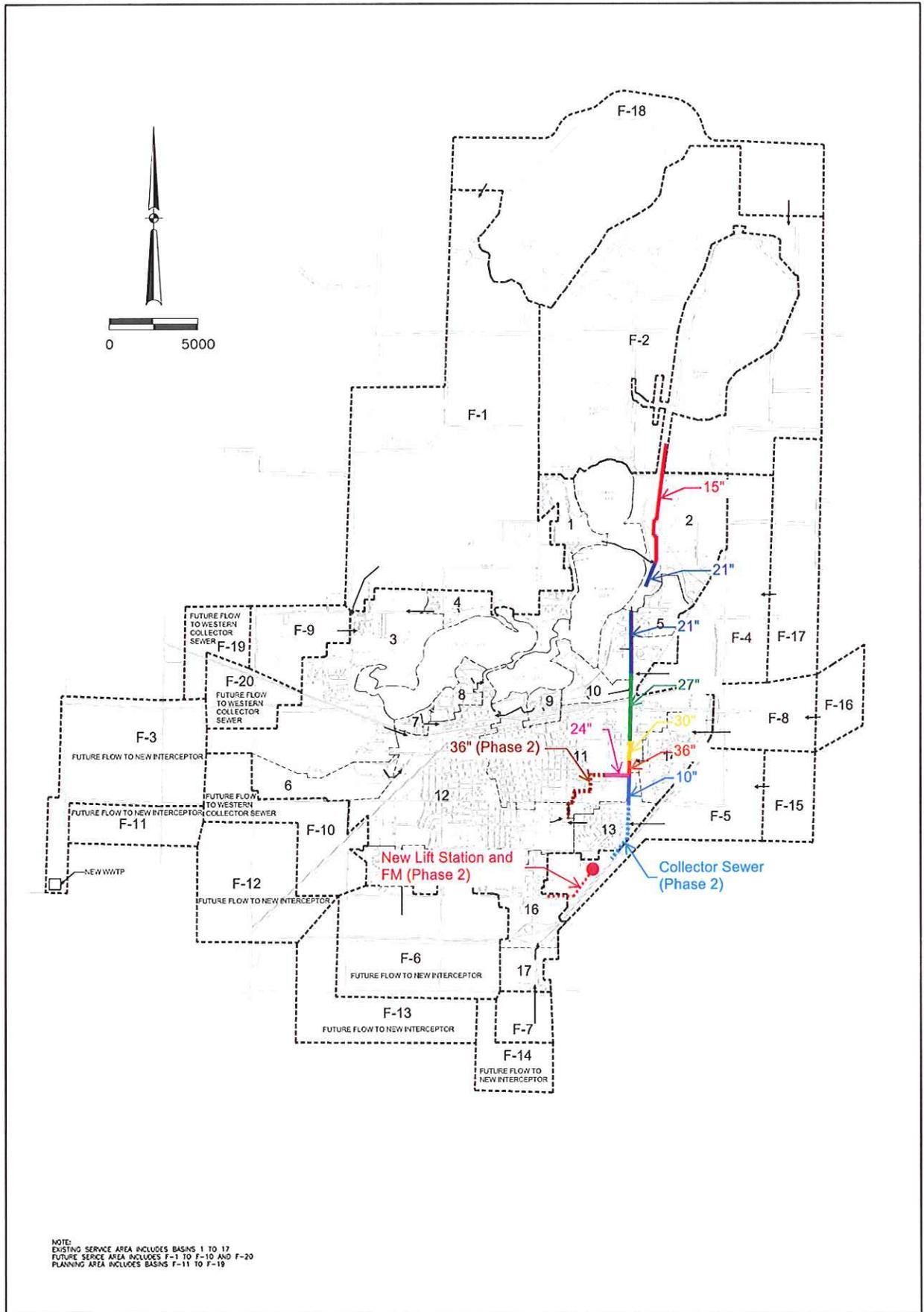


NOTE:  
 EXISTING SERVICE AREA INCLUDES BASINS 1 TO 17  
 FUTURE SERVICE AREA INCLUDES F-1 TO F-10 AND F-20  
 PLANNING AREA INCLUDES BASINS F-11 TO F-19



FIGURE 2: EXISTING, FUTURE AND PLANNED SANITARY SEWER COLLECTION SYSTEM CITY OF WILLMAR



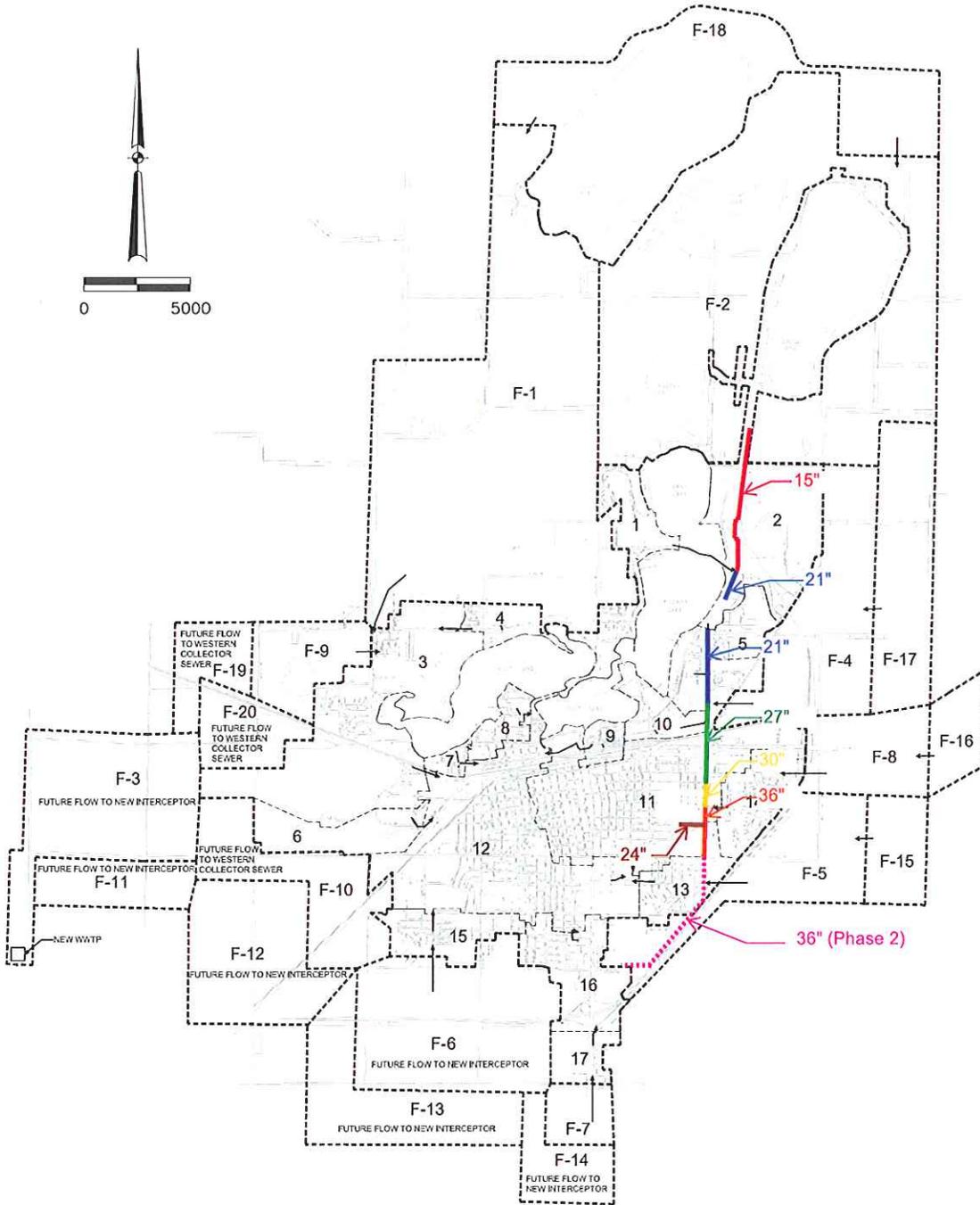
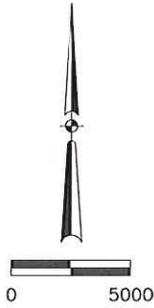


NOTE:  
 EXISTING SERVICE AREA INCLUDES BASINS 1 TO 17  
 FUTURE SERVICE AREA INCLUDES F-1 TO F-10 AND F-20  
 PLANNING AREA INCLUDES BASINS F-11 TO F-19



FIGURE 3:  
 ALTERNATIVE 1  
 CITY OF WILLMAR





NOTE:  
 EXISTING SERVICE AREA INCLUDES BASINS 1 TO 17  
 FUTURE SERVICE AREA INCLUDES F-1 TO F-10 AND F-20  
 PLANNING AREA INCLUDES BASINS F-11 TO F-19



FIGURE 4:  
 ALTERNATIVE 2  
 CITY OF WILLMAR

