Utility Systems

Sanitary Sewer System Plan

The Comprehensive Sanitary Sewer Plan is intended to serve as a guide to completing the future sanitary sewer trunk system to serve future development as outlined in the City's Comprehensive Plan. The existing sanitary sewer system for which analysis was developed was the City's existing sanitary sewer system as of December 31, 2005. Analysis for the City's ultimate sewer system was based on the future land use plan as of December 2007. Future development plans or the existing sewer system may have changed since this "snapshot" in time the report was based on.

The existing City sanitary sewer system is a collection system only, Chisago Lakes Joint Sanitary Treatment Commission (CLJSTC) is responsible for treatment. All wastewater flows from the existing City service area are collected through a network of collection mains and flow to the County Road 84 lift station on the eastern City boundary, where they are pumped to the CLJSTC treatment plant for treatment as shown in Figure U-1 (provided by CLJSTC engineer). The existing serviced area within Wyoming comprises 1,800 acres and can be split into twelve (12) different sewer districts based on the location of the existing lift stations and the sewer mains flowing to each lift station. Figure U-1 shows the existing service area, sewer sheds, and City sewer system including lift stations. Although not shown in Figure U-1, the Polaris site is served.

A SewerCAD model was used to evaluate the capacity of the existing system. Analysis indicated existing trunk sewer mains have adequate capacity to serve the existing City service area once the area that currently has been extended sewer becomes fully developed, including the Wyoming interceptor. However, lift stations 2 and 7 may not be adequate to serve the existing City service area once it is fully developed. Capacity of the lift station in sewer district 6 should be verified prior to any future development or the addition of flow in sewer districts 6 and 12.

The topography of the undeveloped areas (areas to which City sewer service has not been extended) was studied to determine future sewer sheds (districts), sub-districts, and general direction of surface water flow. It was determined that sewer districts generally flow north to Carlos Avery. The intention with designing the future system was to follow the existing ground topography as much as possible in order to minimize the number of trunk lift stations, keep the maximum depth of gravity sewers to less than 40 feet deep, and route sewers through all sub-districts to collect wastewater generated in future developments.

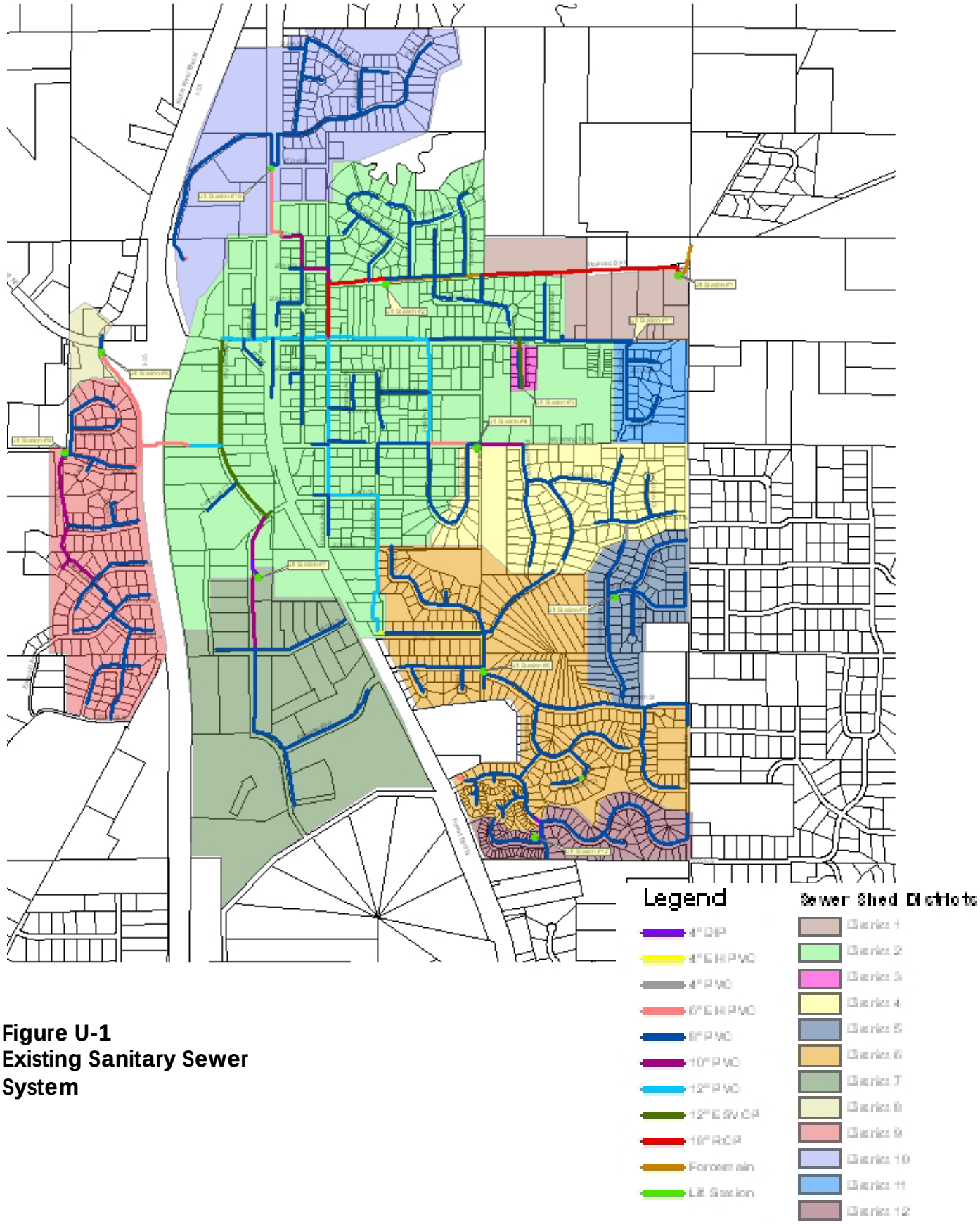

Figure U-1
Existing Sanitary Sewer System

The layout of the future trunk sewer system is shown in Figure U-2. The layout is general in nature and exact routing will be determined at the time of final design. It is important that the general concept and sizing be adhered to for assurance of an economical and adequate ultimate system. In addition, additional sewer infrastructure will be required to serve individual developments as proposed by developers not accounted for in this plan because it is assumed it will be funded by developers.

Future trunk sewers were designed to flow around the existing City service area because reconstruction of trunk sewers within the City would be more expensive than if constructed with new development. Unfortunately, not all sewers could be routed around the existing service area and flows from the northwest would have to flow through the City because the route is confined by Carlos Avery to the east. Also, the property immediately west of I-35 is anticipated to develop in the near future. Due to its development timing and location relative to the interceptor, future flows were routed through the existing service area. The existing SewerCAD model was expanded to determine the adequacy of the existing system to serve future development where necessary and design the future trunk sewer system.

The existing Wyoming interceptor has capacity for approximately 7.0 MGD peak flow, although Wyoming's capacity is not clearly defined at this time. Based on the City's land use plan it will be difficult to define a trigger point as to when additional capacity should be added to this interceptor. Future development will occur due to market demand, therefore the rate and type of development is not possible to project for the ultimate service area. Since ultimate future flows are projected to exceed interceptor capacity, additional interceptor capacity will have to be purchased in the future. Meetings with the CLJSTC's engineer have indicated that when Wyoming has reached its interceptor capacity, CLJSTC will be responsible for adding capacity to serve the remaining future developable acres within Wyoming. Wyoming will be assessed the increased capacity cost by CLJSTC to serve the remaining future development.

Future expansion of the sanitary sewer system will be driven by development demand and proximately to the existing sewer system. Based on information provided by the City, a development phasing map was completed as shown in Figure U-3. The map shows the order of likely development or property to which water will be extended due to development demand. Development demand was one of many factors taken into account in developing the ultimate trunk sewer system.

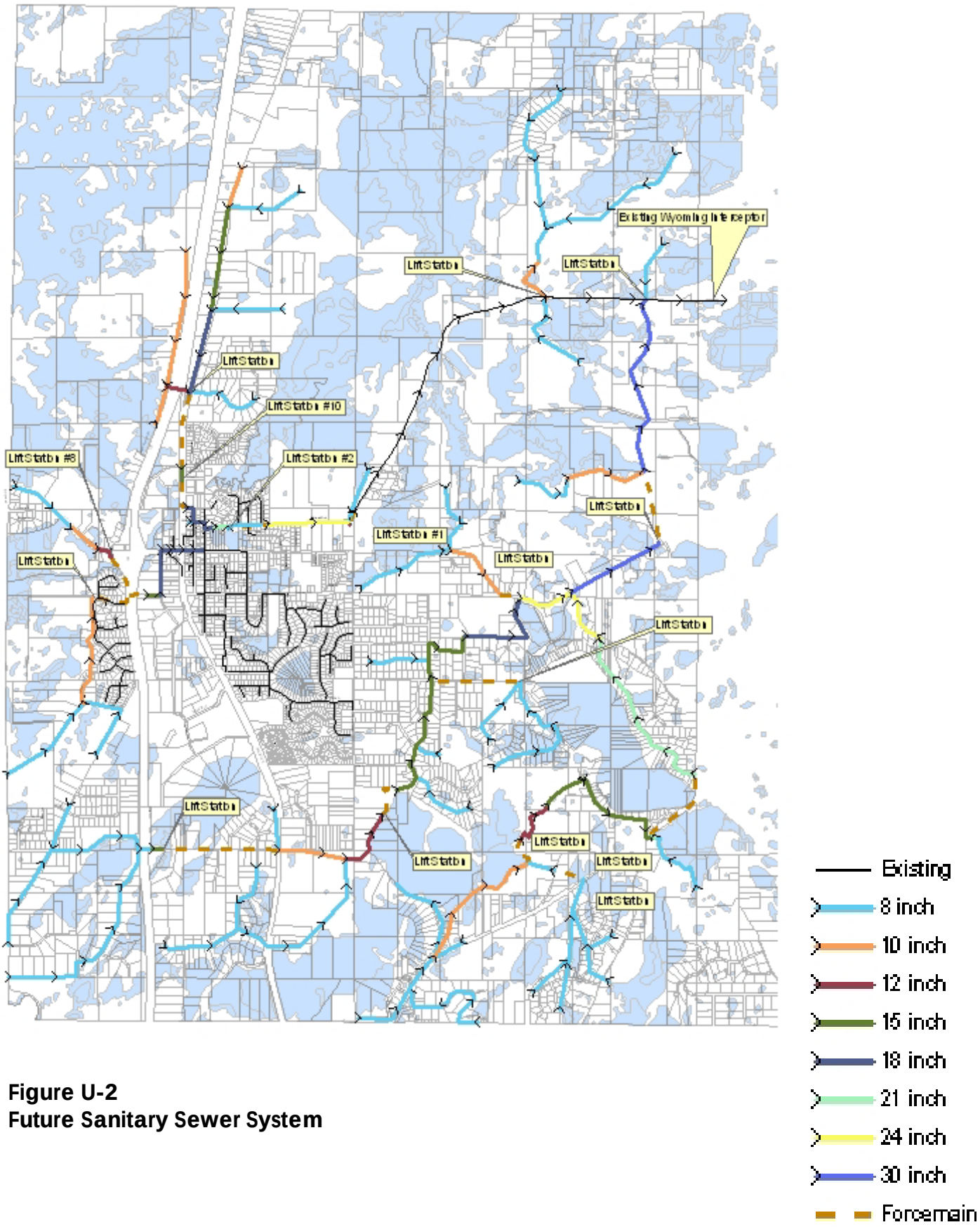

Figure U-2
Future Sanitary Sewer System

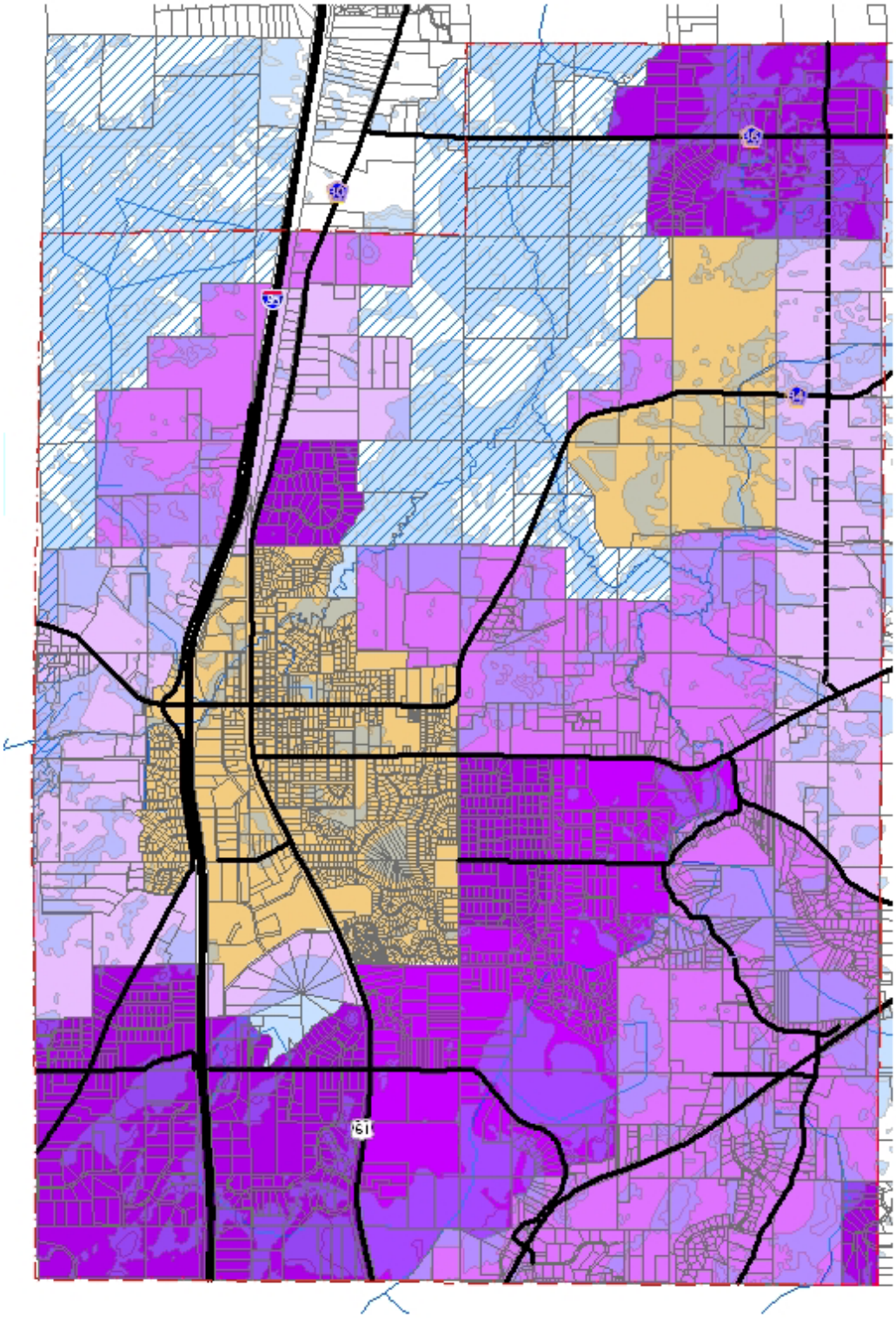

Figure U-3
Potential Ultiimate Sewer
Service Area and Development

Water System

The Comprehensive Water System Plan is intended to serve as a guide to completing the future water system to serve future development as outlined in the City's Comprehensive Plan. The existing water system for which analysis was developed was the City's existing water system as of December 31, 2005. Analysis for the City's ultimate water system was based on the future land use plan as of December 2007. Future development plans or the existing water system may have changed since this "snapshot" in time the report was based on.

The existing municipal water system is shown in Figure U-4 and consists of three wells, two elevated storage tanks, disinfection and fluoridation at each well site, and distribution mains ranging in size from 6 to 16 inches in diameter. The total supply capacity (rated well pumping capacity) of the three wells is 2,125 gpm, and the firm capacity (firm capacity assumes the largest well out of service in the system) of the system is 1,250 gpm. Each well pump discharges into the distribution system after chlorine, fluoride, and polyphosphate addition. System storage includes one 300,000 gallon tower and one 75,000 gallon tower.

The 2005 average day water demand was approximately 353,000 gallons per day (gpd) and a maximum day demand of 1,059,000 gallons per day (mgd). An extended period simulation (EPS) computer model (WaterCAD v. 7.0) was used to evaluate the existing system's operating pressures and available fire flow. In addition, the existing system water quality was reviewed. Evaluation of the existing water system indicated:

- The system is capable of providing adequate supply and pressure during average day, maximum day, and peak hour demands while operating at supply firm capacity.

- System fire protection (available fire flow) is adequate with the exception of residential areas west of I-35 and north of 272nd Street, where mains provide less than 1,000 gpm capacity.

- Well No. 3 radium concentration exceeds MCL.

The quantity of future water demands were estimated based on the City's draft Comprehensive Plan. A maximum day to average day demand ratio of 3.0 was used for estimating ultimate system demands. In the past three years, maximum day to average day demand ratios have ranged from 2.7 to 3.5. This ratio is significant in that the maximum day demand and peak hour demand are used in sizing the water supply, treatment, storage, and distribution system for a community. The resulting projected average day and maximum day demands were approximately 4.11 and 12.32 MGD respectively.

City water system needs are met by first providing a water source capable of satisfying a maximum day water demand. When the source water is from groundwater, as is the case in Wyoming, the maximum day demand should be satisfied assuming the largest well is temporarily out service (firm capacity). It is anticipated that approximately 7,000 gpm of additional supply will be necessary to serve Wyoming's ultimate system demands. If each well produces approximately 800 gpm, as the City's geology indicates, 9 new wells would be required.

Considering the typical water quality from the region, we anticipate future water supply wells to pump to treatment facilities prior to distribution. Well No. 3 currently exceeds the combined radium MCL, and secondary standards for iron and manganese will most likely be exceeded in future water sources. Therefore, it was assumed that a future water treatment facility would be constructed for removal of radium, iron, and manganese with capacity to treat water from all new supply (7,000 gpm or 10.5 MGD)

American Water Works Association (AWWA) standards indicate that water storage should equal 70 to 100% of average day demand or the sum of required fire fighting storage, equalization storage, and reserve storage, whichever is greater as discussed in Section 6. Since projected future average day demands are projected to be greater than future equalization, firefighting, and reserve storage, the average day demand of 4.0 MGD was used for future storage planning.

The water distribution system will need to be expanded as development requires service. The future trunk water main system presented in Figure U-4 consists of a 24-inch trunk main loop and several12-inch trunk main loops. The system would provide capacity to distribute water throughout the City from one point, as would be the case for a treatment plant. If treatment is not required of future water sources, and the City decides not to provide treated water to residents, then wells will be scattered throughout the system. The trunk water main system designed in Figure U-5 would be capable of providing adequate fire flow and pressure to residents regardless of how water is supplied.

If development occurs quicker than anticipated or in different locations than anticipated, construction phasing can be changed. Since the water system is under pressure there is some flexibility in infrastructure location and additional siting studies can be performed as development progresses.

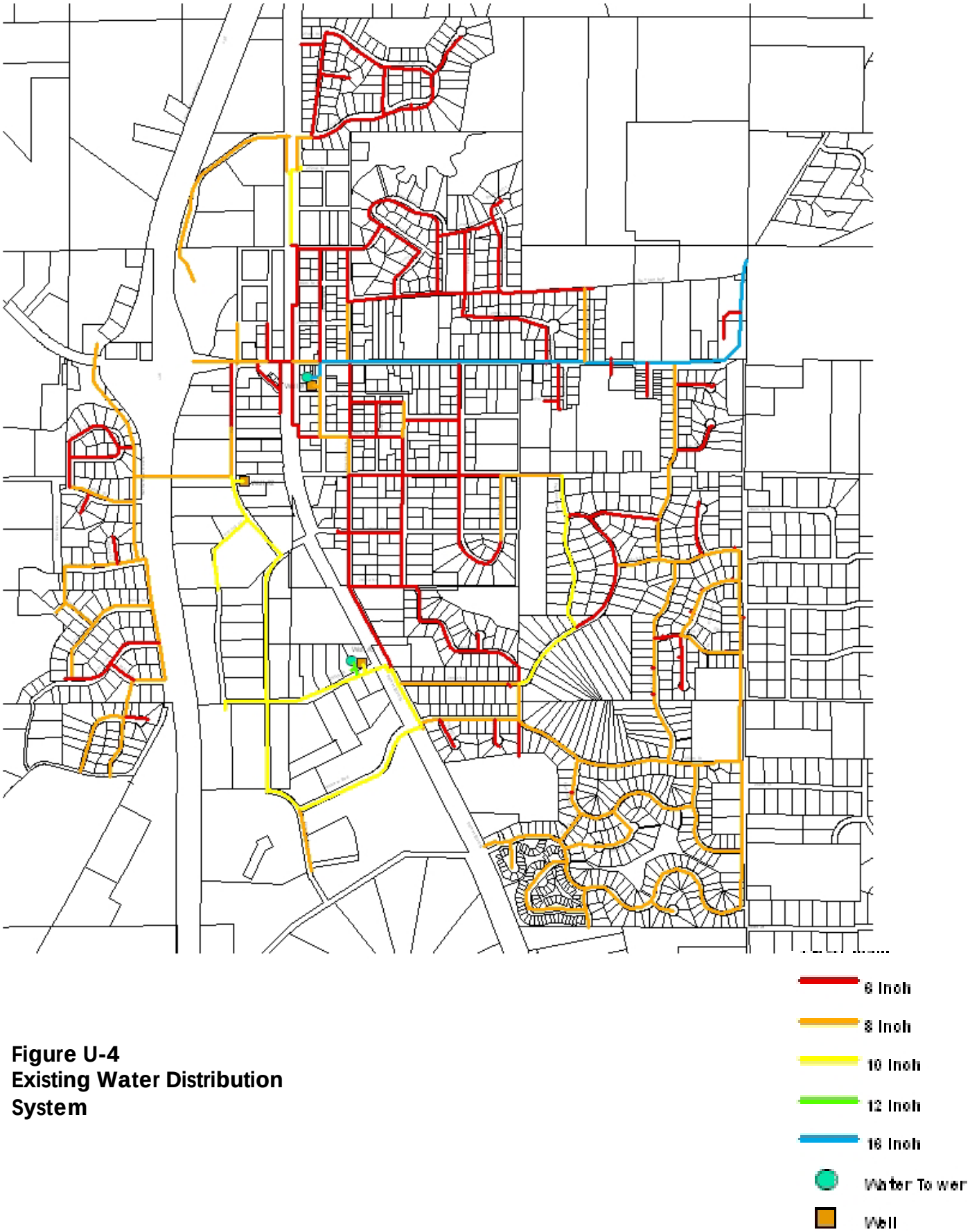

Figure U-4
Existing Water Distribution System

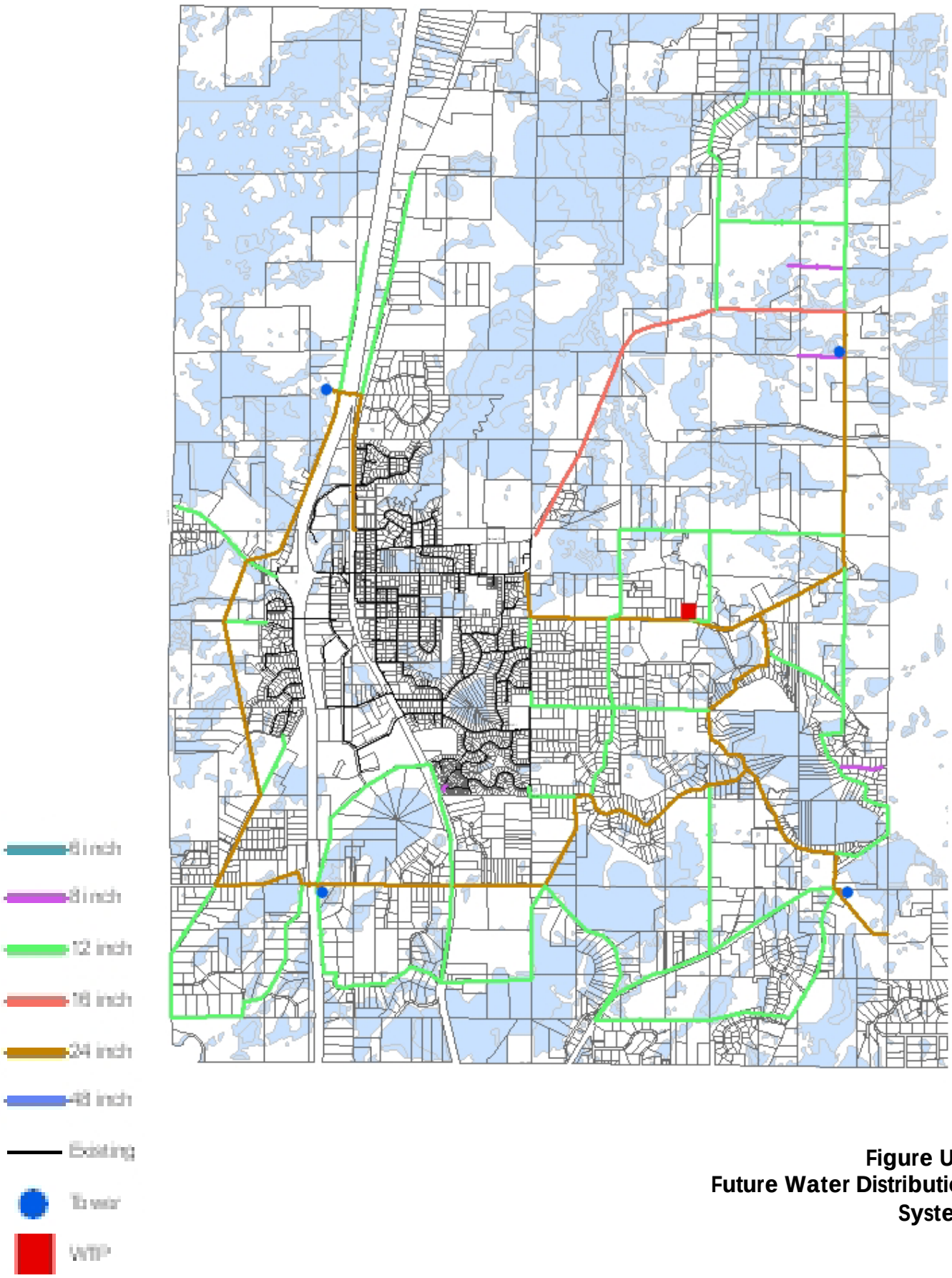

Figure U-5
Future Water Distribution System